CHAPTER 3 SECTOR ANALYSIS

3.1 Agriculture Sector

3.1.1 Land Use

(1) Current Situation

311-1 In 1999, out of 1.92 million km^2 area of the country as a whole, 1.27 million km^2, or 66% of the total area, is categorized as forest. The remaining 0.65 million km^2 (65 million ha) is categorized into paddy fields, upland arable land, grass land/fallow, dikes, ponds, woodland, estates, and so on. Table 3.1.1 shows land utilization by province except Maluku and Irian Jaya, and summarized in the following table. Around 8.11 million ha is utilized as paddy fields, out of which 42% are located in Java Island, while 27% in Sumatra Island. On the other hand, the predominant area for estates is Sumatra Island.

Land Use (1999)

(Unit: 1,000ha)

Region	Paddy Fields	Upland arable land	Grass Land/ Fallow	Swamps, Fish Pond, etc.	House compounds, etc.	Estates	Total
Sumatra	2,173	4,998	3,068	192	1,863	13,023	25,317
Java	3,375	3,093	222	164	1,736	1,076	9,666
Bali, Nusa Tonggara, Timor	598	1,198	1,769	43	263	1,372	5,243
Kalimantan	1,066	1,741	5,828	91	798	6,550	16,074
Sulawesi	894	1,739	1,797	154	472	3,427	8,483
Maluku, Irian Jaya*	—	—	—	—	—	—	—
Whole country	8,106	12,769	12,684	644	5,132	25,448	64,783

*: No data for Maluku, Irian Jaya
Source: Statistical Yearbook of Indonesia 2000, Central Bureau of Statistics

311-2 Table 3.1.2 shows the annual transition of land utilization during the period from 1995 to 1999. As shown in the table, 400,000ha of paddy fields and 700,000ha of wood lands disappeared within the four years. In contrast, uplands, meadows, shifting cultivation area, fallow lands, and estate crop area are on the rise. According to a report by the MOA, it is estimated that on Java Island the conversion of irrigated paddy fields to other land uses is around 30,000 to 50,000ha in Java Island per annum due to rapid urbanization and industrialization, insufficient land use plans, etc.[1]

1: In the period of 1983 to 1993, about 425,000ha of irrigated rice land and 510,000ha of dry land area were disappeared from rice production on Java to become housing and industrial estates. (Strategy Plan 1999-2004,

311-3 According to the population census in 2000, there are 120 million people in Java Island, which is equivalent to 60% of the entire Indonesian population of 206 million as shown in Table 3.1.3. The Intercensal Population Census 1995 of Central Bureau of Statistics estimates around 29.7 million households in rural area of Indonesia. The number of households in rural area by land holding size is shown in Table 3.1.4 and is summarized as follows:

Number of Households by Land Holding Size (Rural area)

(Unit: %)

Region	Landless	Less than 0.25ha	0.25ha to 0.5ha	0.50ha to 1.0ha	1.0ha to 2.0ha	More than 2.0ha	Whole
Sumatra	29	5	9	15	22	20	100
Java	44	20	16	12	6	2	100
Bali, Nusa Tenggara	30	9	12	16	21	12	100
Kalimantan	27	4	7	10	22	30	100
Sulawesi	25	4	8	19	27	17	100
Maluku	16	2	4	14	31	33	100
Country	37	14	13	14	13	9	100

Source : Intercensal Population Census 1995, Central Bureau of Statistics

311-4 As shown in Table 3.1.4 and the above table, the proportion of landless households in rural area is estimated at 37% of total households, of which around 70% of this number are in the Java Region. More than 90% of households in rural area of the Java Region are categorized as landless households or households that own less than 1.0ha of farm land. The proportion of households, which own more than 1.0ha of farm land, is generally higher in Regions other than Java Region. Especially Kalimantan and Maluku Regions have the higher tendency.

311-5 The average size of paddy fields for farm households in Indonesia is 0.4 ha (Agricultural Census 1993), while the average holding size of paddy fields in Java Island is estimated at 0.28ha. It appears that land segmentation in Java Island has been caused by population increase (as well as other reasons including inheritance), and the household income depends on non-farm income (refer to Section 3.1.7). Therefore, some farmers have abandoned their farmland and seek additional non-farm income.

311-6 Currently, the Regional Development Planning Agency (BAPPEDA) at the provincial level has their own land use plans, but the land use has not been controlled based on the plan. Illegal land conversion has been also taking place. Some incidents of illegal agricultural cultivation are observed in some estate crop areas and forest reserves in Sumatra and Kalimantan, while some

Ministry of Agriculture, July 1999)

small farmers have been known to invade large farms for illegal cultivation in Java Island. Although this situation was occurring before decentralization, it has been expanding under the process of decentralization. Furthermore, over-population, and leftover farm (fallow lands), etc. are difficult subjects in relation to land use (refer to Table 3.1.2). Unplanned land diversion is a complex problem from the viewpoints of stable supply of food and environmental conservation. In addition, the economic gap between urban and rural areas is expanding. These social circumstances in turn have a major influence on the social environment of rural areas.

311-7 Directorate Generals (DGs) in the MOA have their own "Strategic Plan for Mid-term Development (2001 to 2004)" based on the Five Years Agricultural Development Plan[2], and the Annual Action Plans of DGs are prepared based on their own Strategic Plans.

311-8 Various numerical targets are available in those Strategic Plans. Originally those figures were prepared by local government, and then the MOA compiled them through the Regional Meetings, in which the Ministry and local governments meet together and engage in discussion about implementation of the annual action plan as well as project monitoring and evaluation. Numerical targets for the Strategic Plans and Action Plans mentioned above are directly derived from past actual yield, but the self-sufficiency rations of major crops, the land use plan, etc., considering regional characteristics, are not adopted[3].

311-9 The DG of Food Crop Production estimated at around 2.5 million ha of the potential development area for paddy field in order to realize stable paddy production. As a result, the DG aims at the new development of paddy field with 100,000ha in 2003[4].

(2) Subjects to be Considered in the Future

311-10 It is necessary to rehabilitate the land use law and other relevant laws and regulations, and also promote implementation of a systematic land use plan that operates adequately. In terms of promotion of land use plan, it is necessary to

2: Refer Chapter 4 for National Agricultural Development Plan of Ministry of Agriculture. The Ministry has revised the development Plan as needed, so the latest version is Program *Pembangunan Pertanina* 2001-2004, December 2001. Further *Penjabaran Program dan Kegiatan Pembangunan Pertanian 2001-2004* is available as summary of the Development Plan by commodity.

3: *Program dan Rencana Kegiatan Pembangunan Agribisnis Berbasis Komoditas*: Concerning priority districts for development by commodity, arranged in the basis of the request from local governments.

4: 10 Priority Provinces for the new development; West Sumatra, South Sumatra, Lampung, West Kalimantan, Central Kalimantan, South Kalimantan, DI. Yogyakarta, South-East Sulawesi, East Nusa Tenggara, and Papua.

establish harmonized countermeasures, considering sustainable agricultural development, environmentally sound agriculture, and the social environment concerning population issues, etc.

3.1.2 Agricultural Production

(1) Crop Production

312-1 The major food crops in Indonesia are paddy, soybean, cassava, sweet potato, peanut, maize, etc. As shown in Table 3.1.5, around 70% out of total production in the whole country are produced in Java and Sumatra Islands, except for sweet potato. As for paddy production, a unit yield of 4 to 5ton/ha is maintained in Bali and Java Islands.

312-2 Table 3.1.6 and Figure 3.1.1 show the transition of harvested areas and the production by major food crop during the period from 1968 to 2000. The transition for the last five years is given as below:

Harvested Area and Production of Major Food Crops

(Unit: Production: 1,000 ton
Harvested area: 1,000 ha
Unit Yield: ton/ha)

Major Food Crop		1997	1998	1999	2000	2001*
Paddy	Production	49,377	49,237	50,866	51,899	50,096
	Harvested Area	11,141	11,730	11,963	11,793	11,412
	Unit Yield	4.4	4.2	4.3	4.4	4.4
Soybean	Production	1,357	1,306	1,383	1,018	863
	Harvested Area	1,119	1,095	1,151	824	723
	Unit Yield	1.2	1.2	1.2	1.2	1.2
Cassava	Production	15,134	14,696	16,458	16,089	16,158
	Harvested Area	1,243	1,205	1,350	1,284	1,280
	Unit Yield	12.2	12.2	12.2	12.5	12.6
Sweet Potato	Production	1,847	1,935	1,665	1,828	1,606
	Harvested Area	195	202	172	194	167
	Unit Yield	9.5	9.6	9.7	9.4	9.6
Peanut	Production	688	692	660	737	696
	Harvested Area	628	651	625	684	651
	Unit Yield	1.1	1.1	1.1	1.1	1.1
Maize	Production	8,771	10,169	9,204	9,677	9,121
	Harvested Area	3,355	3,848	3,456	3,500	3,305
	Unit Yield	2.6	2.6	2.7	2.8	2.8

Note: *:Result of 3rd production prediction
Source: Agricultural Statistics 2001, Ministry of Agriculture

312-3 As shown in Table 3.1.6 and Figure 3.1.1, the improvement in food crop production over the past years was brought about by an expansion in the harvested area and the increment of unit yield. The trend in the unit yield over the past 30 years has shown an increase of two times in the unit yield of paddy

and soybean, 1.6 times for cassava, sweet potato, and peanut, and 2.7 times for maize. Japan and other donor countries have made a substantial contribution towards this achievement through technical cooperation. In recent years, however, the increase in the unit yields of major food crops has been poor.

312-4 The farm gate price is still hovering at a low level. The price of farm inputs has risen steeply since the removal of government subsidy in 1998. Therefore, the situation surrounding agriculture is considered to be fairly severe. It is reported that non-farm income of small-scale farmers in Java accounts for around 75% out of total farmer's income[5]. Accordingly, it is understandable that incentive for farmers could have declined due to the low profitability of food crops.

312-5 Indonesia is the third largest paddy-producing country, following China and India. And Indonesia is also the largest rice-importing country. As shown in the below table, paddy production in Indonesia accounted for about 8% out of the world total, while the country's rice import was about 12% of total rice import.

Worldwide Paddy Production

(Unit: million ton)

Countries	1997-99 Average	(%)	2000	(%)	2001	(%)	2002*	(%)
Bangladesh	30.9		37.6		38.1		39.0	
Brazil	9.9		11.4		10.4		11.5	
China	201.3		189.8		178.7		178.3	
EC	2.7		2.5		2.6		2.6	
Egypt	5.3		6.0		5.2		5.6	
India	129.0		127.3		136.1		133.0	
Indonesia	49.8	(8)	51.9	(9)	49.6	(8)	48.7	(8)
Japan	11.7		11.9		11.3		11.0	
Pakistan	7.1		7.2		5.7		5.2	
Philippines	10.8		12.5		13.1		13.0	
Thailand	23.6		25.6		25.3		24.6	
United States	8.7		8.7		9.7		9.6	
Vietnam	29.3		32.5		31.9		32.3	
World Total	589.8	(100)	598.7	(100)	593.1	(100)	587.2	(100)

Note:*:FAO prediction
Source: FAO, 2002

5: Information from Ministry of Agriculture

Major Import Countries and Import Transition

(Unit: million ton)

Countries	1997-99 Average	(%)	2000	(%)	2001	(%)	2002*	(%)
Bangladesh	1.5		0.5		0.4		0.2	
Brazil	1.0		0.7		0.7		0.7	
China	0.2		0.2		0.3		1.1	
EC	0.7		0.6		0.7		0.7	
Indonesia	3.6	(15)	2.0	(9)	1.5	(6)	3.0	(12)
Iran, Isl. Rep.	0.7		1.1		1.0		1.2	
Japan	0.6		0.7		0.6		0.7	
Malaysia	0.6		0.6		0.6		0.6	
Nigeria	0.7		1.2		1.6		1.2	
Philippines	1.2		0.8		0.9		0.6	
Saudi Arabia	0.8		0.8		0.8		0.8	
Senegal	0.5		0.5		0.6		0.6	
World Total	23.5	(100)	23.0	(100)	23.7	(100)	25.2	(100)

Note:*:FAO prediction
Source: FAO, 2002

312-6 According to the Food and Agriculture Organization of United Nations (FAO), the import of milled rice to Indonesia has decreased in recent years, i.e., 6 million ton in 1998, 4 million ton in 1999, 2 million ton in 2000, and 1.5 million ton in 2001. In 2002, import of milled rice is estimated at about 3 million tons on account of unseasonable weather such as flooding, heavy rain, etc. occurred in February and March 2002.

312-7 A forecast on supply and demand of rice for 2002 by province is shown in Table 3.1.7. According to the table, it is said that 5 million ton of milled rice is surplus in the entire country, while the provinces of North Sumatra, Riau, Southeast Sulawesi, East Nusa Tenggara, Irian Jaya, Maruku, and Jakarta are in deficit.

312-8 In early 2002, the President of Indonesia announced an attempt to improve the self-sufficiency of paddy, for which Indonesia is the largest import country in the world, in order to find a way out of the situation. Further, annual expansion of paddy field by 100,000ha is planned in provinces of Sumatra and Kalimantan Islands. Meanwhile, the Government of Indonesia requested the FAO to carry out technical cooperation for improvement of food security, the programme for which is called the National Programme for Food Security (NPFS). It was decided that the FAO would commence a full-fledged study to formulate NPFS from this year.

312-9 Table 3.1.8 and Figure 3.1.2 show status of import and export trades of major food crops during the period from 1969 to 2000. Furthermore, the following table shows the balance of supply and demand of maize and soybean.

Supply and Demand of Maize and Soybean

(Unit : 1,000ton)

Crop		1996	1997	1998	1999	2000
Maize	Local Production	9,307	8,771	10,169	9,204	9,677
	Import	639	1,123	327	635	1,286
	Dependency (%)	6	11	3	6	12
Soybean	Local Production	1,517	1,357	1,306	1,383	1,018
	Import	747	617	343	1,302	1,278
	Dependency (%)	33	31	21	48	56

Source : FAO

312-10 As of 2002, around 10% and 60% of total consumption of maize and soybean is dependent on import, respectively. Maize is mainly utilized as a feed material, while soybean is utilized as a material for agricultural processing. It is considered that the degree of dependency on the import of maize and soybean is relatively high due to the high price and unstable production of local products. The MOA has been promoting selection of promising varieties, improvement of farming techniques such as multiplication and dissemination of quality seeds, improvement of appropriate technique of fertilizer application, enhancement of Integrated Pest Management (IPM), selection of promising rhizobium, etc.

(2) Horticultural Production

312-11 The annual average temperature and precipitation are estimated at 27 °C and 2,190 mm, respectively. Many kinds of vegetables are cultivated in hilly areas 700-1,000 meters above sea level. The main vegetables cultivated in hilly areas are cabbage, Chinese cabbage, onion, tomato, potato, carrot, etc., while chili, eggplant, cucumber, etc. are common in more lowland areas.

312-12 In recent years, demand has been rising in the nation for meats, dairy products, and horticultural crops. This is because of population increase, growing concern about improvement of nutrition, and increase of purchasing power due to improved income levels. However, as shown in Tables 3.1.8 and 3.1.9 as well as Figure 3.1.2, supply of vegetables has been slowing down recently, due to the economic crisis in 1997/98. The following table shows the current situation of major vegetable production in Indonesia.

Transition of Production of Major Vegetables

(Unit: Production 1,000ton
Harvested area 1,000ha)

Vegetable		1996	1997	1998	1999	2000
Onion	Production	769	606	599	938	772
	Harvested area	96	89	76	104	84
Cabbage	Production	1,580	1,339	1,459	1,448	1,336
	Harvested area	70	65	69	65	67
Carrot	Production	269	227	333	287	327
	Harvested area	20	17	21	18	20
Potato	Production	1,110	813	998	924	977
	Harvested area	70	50	65	63	73
Chili	Production	1,044	801	849	1,008	728
	Harvested area	170	162	165	183	175
Cucumber	Production	614	490	507	432	423
	Harvested area	56	52	55	48	44
Egg plant	Production	365	280	312	300	270
	Harvested area	43	41	44	39	36
Tomato	Production	592	461	547	562	593
	Harvested area	50	44	47	46	45

Source: Agricultural Statistics 2001、Ministry of Agriculture

312-13 Table 3.1.10 shows current situation of major vegetable production by region and summarized as follows:

Production of Major Vegetables by Region in 2000

Unit: 1,000 ton

Region	Onion	Cabbage	Potato	Pepper	Tomato
Sumatra	71	389	290	182	94
Java	592	841	630	448	129
Bali / Nusa Tenggara	33	54	7	46	5
Kalimantan	0	0	0	14	20
Sulawesi	74	52	50	36	23
Maluku / Irian Jaya	2	0	-	0	0
Whole Country	772	1,336	977	728	271

Source: INFORMASI, Hortikultura dan Aneka Tanaman, 2001、DG Horticulture Production

312-14 As can be observed from the above table, the major producing centres for vegetables are Java and Sumatra Islands. Vegetables produced in Java Island are mainly for domestic consumption, while those in Sumatra Island are both for domestic consumption and export to Singapore and Malaysia. As shown in the following table, North Sumatra province is one of the most active provinces for the export of vegetables in Sumatra Island. As shown in Figure 3.1.2, it is clear that export growth has been eroded recently.

Export of Major Vegetables in North Sumatra Province (1999)

(Unit: ton)

	North Sumatra Province		*Whole of Indonesia*		*Ratio*
	Production (1)	Export (2)	Production (3)	Export (4)	(2) / (4) (%)
Potato	192,570	31,550	924,060	32,270	98
Tomato	71,340	580	330,340	1,720	34
Onion	51,570	2,340	938,290	8,600	27
Leek	16,070	630	323,860	940	67
Cauliflower	n/a	680	n/a	3,580	19
Cabbage	n/a	33,170	n/a	35,870	92
Cucumber	20,290	5	253,450	10	50

Source: Internal Data, Central Bureau of Statistics

(3) Fruit Production

312-15 In addition to vegetable production, fruits production is also contributing a great deal to crop diversification in Indonesia. The major production of fruits is for eating fresh, while utilization for processing applications such as canning, jam, and juice is also expanding. The production and cultivated area of fruit are still struggling for stable growth as shown below:

Fruit Production in Indonesia

(Unit: Production: 1,000 ton, Cultivated area: 1,000ha)

Fruit Crop		1996	1997	1998	1999	2000
Avocado	Production	143	130	131	126	146
	Cultivated area	19	11	12	11	13
Durian	Production	267	236	210	194	237
	Cultivated area	39	25	26	24	23
Orange	Production	731	696	490	450	644
	Cultivated area	38	25	23	25	37
Mango	Production	782	1,088	600	827	876
	Cultivated area	149	48	33	37	44
Pineapple	Production	501	386	327	317	393
	Cultivated area	30	6	5	7	7
Papaya	Production	382	361	490	450	429
	Cultivated area	10	10	10	10	9
Banana	Production	3,023	3,057	3,177	3,376	3,747
	Cultivated area	49	78	71	71	74
Ranbutan	Production	370	296	278	263	296
	Cultivated area	85	46	46	45	48

Source: Agricultural Statistics 2001、Ministry of Agriculture

312-16 In general, Java and Sumatra Islands are the major production area of fruit as shown in Table 3.1.11. The main production centre for oranges and mangoes is South Sulawesi province, while South Sumatra province is the main centre for pineapples.

(4) Estate Crop Production

312-17 The cultivated area and production of major estate crops by production type (large and small estates) are shown in Table 3.1.12 and summarized as follows:

Small Farmers in Production and Cultivated Area of Major Estate Crops

(Unit: %)

Estate Crops		1996	1997	1998	1999	2000
Rubber	Production	78	78	81	81	79
	Cultivated Area	85	84	85	85	86
Coconut	Production	97	97	97	97	97
	Cultivated Area	96	97	97	97	97
Oil Palm	Production	31	24	25	26	26
	Cultivated Area	39	32	32	33	33
Coffee	Production	94	93	94	94	94
	Cultivated Area	96	95	94	94	94
Cocoa	Production	87	80	86	87	84
	Cultivated Area	79	72	74	74	74
Tea	Production	20	21	20	22	21
	Cultivated Area	42	42	42	41	42
Cashew Nut	Production	99	99	99	99	100
	Cultivated Area	98	98	98	98	98
Sugarcane	Production	0	0	0	0	0
	Cultivated Area	0	0	0	0	0

Source : Statistic Indonesia 2000、Central Bureau of Statistics

312-18 As shown in the above table, cultivation of oil palm, tea, and sugarcane depends on large estate, while small farmers for other estate crops.

312-19 Table 3.1.13 shows the cultivated area and production of major estate crops by province as of 1999. The major production centre for rubber and oil palm are Sumatra and Kalimantan Islands. Java Island is main centre for the production of sugarcane, tea, and tobacco. In the case of coffee, Robusta is broadly cultivated across whole country, especially Sumatra Island where the dominant production centre is located, while Sumatra and Sulawesi Islands contain for Arabica. Since 1992, the MOA has been promoting the cultivation of Arabica. Kalimantan and Sulawesi Islands are main producing centres for cocoa.

312-20 The DG of Estate Crops guides sub-districts (Kabupaten) on the formulation of the Industrial Tree Crops Community Region (*Kawasan Industri Masyarakat Perkebunan*: KIMBUN) for the development of estate crops. Each sub-district formulates an integrated development plan for each KIMBUN and implement activities according to the development plan. National development budget is allocated on a KIMBUN basis. This KIMBUN framework has been enforced since 1998, and 415 units of KIMBUN have been established in the country as a whole in 2001. These KIMBUNs are reviewed every year and new ones are formed, according to the situations of sub-districts.

(5) Subjects to be Considered in the Future

1) Improvement of Agricultural Income

312-21 In the case of small-scale farmers mentioned above, it is necessary to establish proper farming practice for cash crops (including horticultural crops), which are suitable to the region,, and to promote the right crop for the right land in consideration of production profitability, in order to improve agricultural income. It is imperative that the extension service and agricultural credit services are enhanced.

2) Dissemination of Appropriate Technologies

312-22 In recent years, the increase in the unit yields of major food crops has been poor, as shown in Figure 3.1.1. Productivity and profitability are subjects to be considered at farm level. Adaptable technology needs to be developed and disseminated, with consideration given to regional characteristics[6]. It is recommendable that appropriate skills, which were established, be disseminated to farmers properly.

312-23 Stable increase of crop production in Indonesia is an important subject in the current situation of increasing import of agricultural products. It is necessary to strengthen competitive power against imported agricultural commodities. Various factors such as agricultural policy, distribution of farm inputs, farmers' consciousness and incentives, natural conditions, etc. are connected to the complicated circumstances surrounding the current agricultural situation. Working on plans to increase domestic supply is expected, while clarifying the causes of import dependence and its countermeasures. In order to produce cheap and good quality agricultural commodities, it is expected that unstable circumstances such as curtailment of agricultural subsidy, unstable producer prices, etc. be studied.

3) Improvement of Quality of Agricultural Commodities

312-24 In order to improve productivity and profitability of agricultural production, much attention should be paid to the limitation of the application of agro-chemicals, implementation of IPM including bio-chemicals and pheromone traps, establishment of farming practices with

6: The whole country is categorized into seven Regions such as Sumatra, Java/Bali, Kalimantan, Sulawesi, Nusa Tenggara, Maluku, Irian Jaya. Proper agricultural activities are proposed and described based on the agro-climatic conditions. (Strategic Plan 1999 to 2004, Agency for Agricultural Research and Development)

consideration given to quality control, implementation of sustainable agriculture, environmental conservation, etc. as well as technique for production increase. As a result, it is necessary to improve quality at the production stage. In addition, it is imperative to establish a shipping standard and quality specifications in the aspect of marketing. Furthermore, in line with the global concern regarding food safety, it is necessary to supply food, ensuring the safety against contaminations of agricultural products and environments.

4) Necessity of Cross-Sectional Cooperation in Ministry of Agriculture

312-25 DGs for production concerned such as the DG of Food Crop Production, DG of Estate Crop Production, DG of Horticulture Production, and DG of Livestock Production implement their own action plans in cooperation with local government, based on their Strategic Plans for Mid-term Development (2001 to 2004). However, those activities are not closely linked with support services such as credit, marketing, research/experiment, and thereby effectiveness of project implementation is not achieved. It is recommended that each DG implement their own project effectively, systematically linking with the other DGs concerned.

3.1.3 Livestock

(1) Livestock Production

313-1 Livestock numbers in Indonesia are shown in the following table. It is clear that the number of livestock decreased due to the Asian economic crisis in 1997; however the number of animals has recently shown signs of increase. In particular, the number of layers and broilers was remarkably low during the economic crisis, due to low production of formula feed[7].

7: Information from DG of Livestock Production, Ministry of Agriculture

Livestock Number Trends

Unit: 1,000heads, 1,000birds

Livestock	1997	1998	1999	2000	2001
Dairy cattle	334	322	332	354	368
Beef cattle	11,939	11,634	11,276	11,008	11,192
Buffalo	3,065	2,829	2,504	2,405	2,287
Sheep / Goats	21,861	20,704	19,927	19,993	19,750
Pigs	8,233	7,798	7,042	5,357	5,867
Native Chickens	260,835	253,133	252,653	259,257	262,630
Layers	70,623	38,861	45,531	69,366	66,928
Broilers	641,374	354,004	324,346	530,874	524,272
Ducks	30,320	25,950	27,552	29,035	29,905

Source: Statistical Book on Livestock 2001、Ministry of Agriculture

313-2 Table 3.1.14 shows the geographical distribution of livestock in Indonesia, as summarized in the following table. As of 2000, the number of livestock in the East Java province, Central Java province, and South Sulawesi province are estimated at around 3.3 million heads, 1.3 million heads, and 0.75 million heads, respectively. In the case of dairy cattle, more than 95% of total dairy cattle are in the three provinces of Java Island, that is West, Central, and East Java provinces. Sheep/goats, and broilers are predominant on Java Island, whereas buffalo and pigs are reared mainly on Sumatra and the eastern islands, respectively.

Number of Livestock by Region (2000)

Unit: 1,000heads, 1,000birds

Livestock	Sumatra	Java	Kalimantan	Sulawesi	Others	Total
Dairy cattle	7	347	1	0	0	354
Beef cattle	2,507	5,011	391	1,530	1,569	11,008
Buffalo	1,170	638	67	212	318	2,405
Sheep / Goats	3,544	14,113	284	910	1,142	19,993
Pigs	1,314	171	616	889	2,367	5,357
Native Chickens	89,147	108,494	14,689	25,712	21,215	259,257
Layers	26,277	34,665	2,604	3,828	1,992	69,366
Broilers	93,364	369,374	37,859	7,138	23,139	530,874
Ducks	11,263	10,546	2,965	2,724	1,537	29,035

Source: Statistical Book on Livestock 2001、Ministry of Agriculture

313-3 As shown in Tables 3.1.14, around 3 million farmers raise around 11 million heads of cattle (including dairy and beef cattle). Therefore the average number of cattle raised by each farmer is estimated at three to four heads.

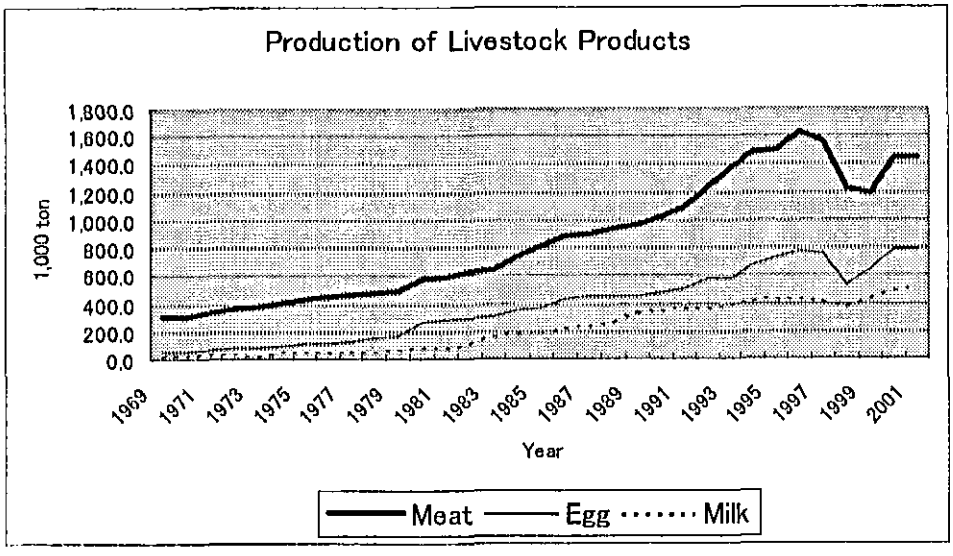
313-4 Raising cattle evolved from utilization as draft animal for farm cultivation and transportation. Recently, although production of beef meat has increased in relation to increment of consumption of beef meat, a major part of supply still relies on the export. The poor technical level together with the shortage of forage production and insufficient extension activities has resulted in a

reduction of milk performance and breeding efficiency. Therefore, considering the restriction of land size, it is essential to increase productivity per head rather than to increase the heads of livestock per household. Both cattle and buffalo productivity is low and have little impact on the livestock industry. It is necessary to strengthen the system of breeding and propagation of cattle.

313-5 DG of Livestock Production aims at increment of local milk production in order to contribute to the increase of farmers' income, the expansion of domestic milk production, and the improvement of nutrition. The DG's strategy is to expand feeding area of dairy cattle to South Sulawesi province and Sumatra Region including Bengkel province and South Sumatra province.

(2) Demand and Supply of Livestock Products

313-6 Transition of animal production is shown in Table 3.1.15 and summarized below. The production of meat, milk, and eggs has been increasing year by year to meet consumption growth, with the exception of 1998/99, due to the effect of the Asian economic crisis.



313-7 Table 3.1.16 shows current status of import and export of livestock products. As shown in the following table, the self-sufficiency of beef, eggs, and milk as of 2001 are 95%, 100%, and 32%, respectively.

Supply and Demand of Beef, Eggs and Dairy Products

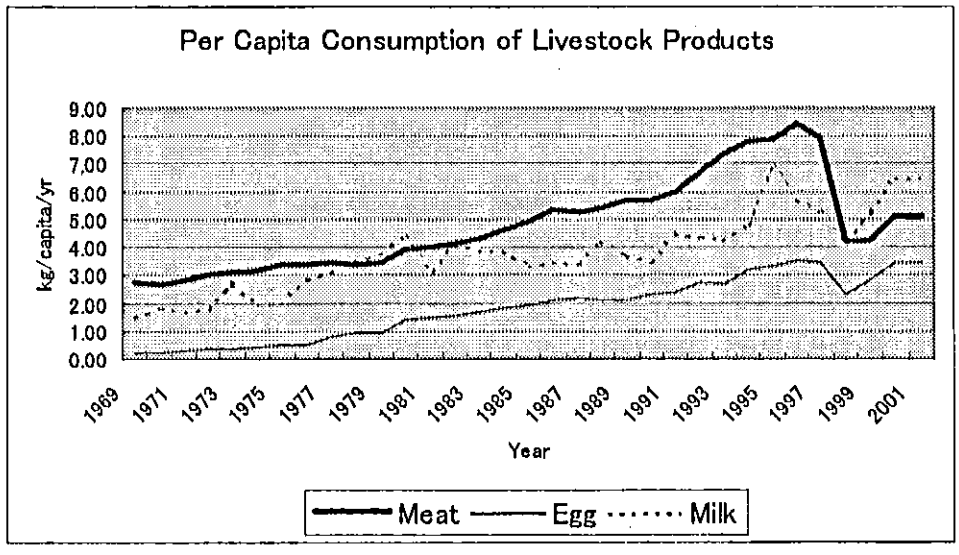
Unit: 1,000 ton

Item		1997	1998	1999	2000	2001
Meat *	Domestic Production	1,555	1,229	1,196	1,445	1,451
	Import	33	14	23	72	72
	Self-sufficiency (%)	98	99	98	95	95
Eggs**	Domestic Production	692	464	565	708	615
	Import	0	0	0	0	0
	Self-sufficiency (%)	100	100	100	100	100
Milk	Domestic Production	357	316	368	418	426
	Import	693	522	680	904	904
	Self-sufficiency (%)	34	38	35	32	32

Note: * including beef, buffalo, goat, sheep, pork, horse, and poultry (native chickens, layer, broiler and duck)
** including native chickens, layer, and duck

Source: Statistical Book on Livestock 2001, Ministry of Agriculture

313-8 As shown in Table 3.1.17, demand for animal protein such as meat, milk, and dairy products as well as vegetable protein has increased depending on increment of income, diversification of diet, population growth etc.[8] Consumption of livestock products during the economic crisis was drastically decreased, and then has been getting better gradually. Annual per-capita consumption of meat, eggs, and milk (equivalent to protein) is shown in the following figure.



8: Food Balance Sheet (1999) shows that annual per-capita consumption of animal and fish products is estimated at 4.11kg of meat, 2.74kg of eggs, 5.08kg of milk, 17.73kg of fish products. While daily caloric intake per capita of animal and fish products is estimated at 26kcal of meat, 11kcal of egg, 9kcal of milk, 39kcal of fish products.

(3) Local Feed Resources for Livestock

313-9 Livestock feed is divided into two types: one is formula feed, and the other is forage. The former has been used in feedlots, and large-scale commercial farms of layers, broilers, and pigs. Acquisition of feed, and protein materials in particular, is for the most part dependent on import, due to the limitations of domestic production. While the production of formula feed was 4.45 million tons in 1997, it decreased to 2.09 million tons in 1998, during the economic crisis.

313-10 As for forage, a basic constraint is the scarcity of roughage for big animals such as cattle, buffaloes etc. Dairy farming in high mountainous areas mostly uses wild grass growing in unutilized land and stubble in fields as much as possible. Draft cattle are normally grazed in paddy fields after the fields have been harvested.

313-11 The Government of Indonesia banned import of feed materials in order to prevent an invasion of foot-and-mouth disease in the past. As a result, supply of animal feed was stagnant for some time. It is imperative to promote local feed production and improve its sustainable and self-sufficient situation, in order to deal with certain situation properly.

(4) Animal Health System

313-12 In 1991, it was declared that foot-and-mouth disease was eradicated. At present, the major infectious diseases in Indonesia are brucellosis, cattle epizootic fever, blood poisoning and anthrax for cattle, hog cholera and hog erysipelas for pigs, and Newcastle disease and salmonellosis for chickens. Of these diseases, the most infectious and economically damaging are brucellosis, hog cholera and Newcastle disease.

(5) Subjects for Livestock Development in the Future

313-13 The livestock sector in Indonesia is divided into two types, the local resources based livestock industry and the imported feed and breeding stock based livestock industry (including the large scale commercial-based industry). In the large-scale industry, which relies on imported feed, the industry suffered during the economic crisis due to the high price of imported feed material. Import of feeder steers dropped sharply during the same period. In light of the above situation, it is necessary to promote small holder livestock development based on local stock raising and feed with the objectives of vitalization of rural

economy and countermeasures for poverty reduction rather than the livestock industry based on imported feed and breeding materials. Subjects for promotion of local resources based livestock industry are given as follows:

1) Shortage of Feed Resources for Livestock

313-14 A stable supply of roughage is crucial for the small holder livestock industry to succeed. Meat quality, milk amount, etc. depend on the availability of feed during the dry season. In order to guarantee the supply of feed during the dry season, it is required to study the possibility of the processing of feed such as silage, which is an effective measure to utilize forage in rainy season. In addition, it is necessary to increase the productivity and self-sufficiency rate for domestic feed.

2) Inadequacy of Animal Health System

313-15 Animal health has closed linkage with productivity of livestock as well as public health concerning zoonosis, etc. It is important to improve functions of low-end health facilities. Those existing facilities retain a lot of constraints such as shortage of budget, poor facilities and human resources, etc. Further it is necessary to collect required information swiftly and correctly from every region of the country, in order to make administrative service on animal health more efficient and precise. Strengthening public veterinary health and the system for production and distribution of animal medicines and vaccines is also needed urgently, and particularly inspection of public health, monitoring of residual medicinal substances, and improvement of slaughterhouses.

3) Insufficient Livestock Production and Management Technique

313-16 Subjects important for increasing the production are the increase of forage production, utilization of by-products from agricultural products, and improvement of the technological level for feeding and management of cattle.

3.1.4 Agricultural Infrastructure

(1) Irrigation Area

314-1 Irrigation facilities are the most important agricultural infrastructure for stable food supply. In Indonesia, small-scale irrigation systems had been traditionally

developed on a rural community basis through utilization small water sources, before the Dutch administration introduced the construction of modern irrigation systems in the 19th century.

314-2 Since independence in 1945, the government has been making great efforts toward irrigation development in order to attain foodstuff self-sufficiency. The construction and O&M of irrigation facilities has been carried out by the government with the assistance of international organizations and donors, and the irrigated area has been increased sharply since the 1960s. The irrigation area has been expanded from 3.60 million ha in 1982 to 5.03 million ha in 1999, a figure corresponding to 62% of the total paddy field area of 8.11 million ha. The following table shows the annual trend of irrigated area during the period from 1982 to 1999.

Irrigated Area

(Unit: ha)

Island	1982	1990	Increment 1982 to 90	1999	Increment 1990 to 99
Sumatra	613,000	900,000	(287,000)	1,077,000	(177,000)
Java	**2,500,000**	**2,536,000**	**(36,000)**	**2,605,000**	**(69,000)**
Kalimantan	31,000	207,000	(176,000)	240,000	(33,000)
Sulawesi	248,000	497,000	(249,000)	607,000	(110,000)
Others	208,000	308,000	(100,000)	503,000	(195,000)
Total in off-Java	**1,100,000**	**1,912,000**	**(812,000)**	**2,427,000**	**(515,000)**
Grand Total	**3,600,000**	**4,448,000**	**(848,000)**	**5,032,000**	**(583,000)**

Source: Basic Data by Sector, Agriculture Sector, JICA Indonesia Office

314-3 Increases in the irrigated area are predominant in the outer island (off-Java), because the government has emphasized the agricultural development of the off-Java area to promote transmigration from Java and Bali Islands. The following table shows the total irrigated area and non-irrigated area for the respective islands of Indonesia in 1999:

Paddy Field

(Unit: ha)

Island	Irrigated		Non-Irrigated		Total	
Sumatra	1,077,000	21.4%	1,096,000	35.7%	2,173,000	26.8%
(Proportion)	49.6%	-	50.4%	-	100.0%	-
Java	**2,605,000**	51.7%	**771,000**	25.1%	**3,375,000**	41.6%
(Proportion)	77.2%	-	22.8%	-	100.0%	-
Kalimantan	240,000	4.7%	826,000	26.9%	1,066,000	13.2%
(Proportion)	22.5%	-	77.5%		100.0%	
Sulawesi	607,000	12.1%	287,000	9.3%	894,000	11.0%
(Proportion)	67.9%	-	32.1%		100.0%	
Others	503,000	10.0%	95,000	3.1%	598,000	7.4%
(Proportion)	84.1%	-	15.9%		100.0%	
Total in off-Java	**2,427,000**	48.3%	**2,303,000**	74.9%	**4,731,000**	58.4%
	51.3%	-	48.7%	-	100.0%	-
Grand Total	**5,032,000**	100.0%	**3,074,000**	100.0%	**8,106,000**	100.0%
	62.1%	-	38.9%	-	100.0%	-

Source: Basic Data by Sector, Agriculture Sector, JICA Indonesia Office

314-4 The above table shows that about 52% of the total irrigated area is located on Java Island, followed by Sumatra (21%), Sulawesi (12%), etc.

314-5 Java, an island where paddy fields have long been traditionally developed, shows a high proportion of irrigated paddy field, 77% of total paddy fields. In Sulawesi and Nusa Tenggara, paddy fields have not been traditionally developed. However, the reclamation of paddy fields has been carried out along with irrigation development. This has resulted in high proportion of irrigated paddy fields in this area. On the contrary, the proportion of irrigated paddy fields remains low in Kalimantan and Sumatra.

314-6 According to the Indonesian standards for irrigation system design, the above-mentioned irrigation area is classified into three categories, depending on their technical levels, namely technical system, semi-technical system, and simple system, as explained below:

Standard of Irrigation System

Items	Irrigation System		
	Technical System	Semi-technical System	Simple System
Main intake	Permanent structure	Permanent structure and semi-permanent structure	Temporary structure
Diversion structure with measuring devices	Good	Fair	Poor
Canal system	Completely independent canal system for irrigation and drainage	Not completely independent canal system for irrigation and drainage	Dual function of irrigation and drainage
Tertiary canal system	Well developed.	Developed to some extent.	Not developed yet.
Irrigation efficiency	50 ~ 60%	40 ~ 50%	Less than 40%
Size of irrigation area	No limitation	Up to 2,000 ha	Less than 500 ha

314-7 Irrigation areas, classified based on the above standards, are presented below:

Irrigated Area by Irrigation Standard

(Unit : ha)

Islands	Irrigation System			
	Technical	Semi-technical	Simple	Total
Sumatra	296,000	282,000	499,000	1,077,000
Java	1,551,000	392,000	662,000	2,605,000
Kalimantan	25,000	30,000	185,000	240,000
Sulawesi	238,000	122,000	247,000	607,000
Others	130,000	240,000	133,000	503,000
Total	2,240,000	1,066,000	1,726,000	5,032,000

Source: Basic Data by Sector, Agriculture Sector, JICA Indonesia Office

314-8 The above table shows that irrigated areas with technical systems are concentrated on Java Island; accounting for about 70% of the total. Further, the table shows that irrigated areas with the simple systems, which have been constructed through farmers' initiative, account for a rather high percentage, 34%. Around 66% of the area is irrigated by technical or semi-technical systems that have been constructed by the central or local governments. From this fact, it can be inferred that farmers are eager to increase agricultural production through irrigated farming.

314-9 For semi-technical and simple systems, which still account for 55% of total irrigated area, irrigation efficiency can be improved through development of small-scale irrigation water sources like reservoirs and wells, as well as by upgrading the systems.

314-10 In Java, about half million ha of the irrigated paddy fields were turned into urban areas or industrial areas during the high economic growth period of the 1990s, and this process still continues at the rate of thirty to fifty thousand ha per annum. In off-Java, the same process is reported in the surrounding areas of large cities, where the economic growth that has taken place has been remarkable. The Irrigation Management Policy Reform (IMPR) published in 1999 focused on this situation and included the development strategy of avoiding non-regulated conversion of irrigated paddy fields to other purposes.

314-11 In addition to the above, the government implemented large-scale swamp development projects for resettlement of immigrants through drainage improvement. Its development progress reached 1.2 million ha in 1991. These swamp projects are usually located in remote areas, where, in many cases, the rural facilities for immigrants were poorly established and crop productivity was quite low due to problem soils such as peat and potential sulfate soils. Because of this, the life of the immigrants was not stable, and in some cases cultivation was abandoned.

(2) Present Condition of Irrigation Facilities

314-12 Irrigation projects are generally regarded as public works, and the main system including diversion work and main canals as well as secondary canals are constructed by the central government. The main irrigation systems, once constructed, are handed over to the regional governments of provinces, districts or cities, which carry out their O&M. However, O&M work is not satisfactory due to budget shortages, and it is reported that one third of government irrigation schemes have been rehabilitated twice in the past 25 years. The government has a tendency to prefer to periodic rehabilitation.

314-13 Regional governments are unable to ensure the proper functioning and O&M of irrigation systems due to deficiencies in institutional systems, capable staff and budget (the existing organization for irrigation management is shown on Figure 3.1.3). This prevents equitable distribution of irrigation water at tertiary block level, and farmers are not able to avail of irrigation farming. Therefore, farmers are not willing to pay irrigation service fees, and water users associations (WUAs) have no financial resources to enable proper management. This situation leads to insufficient O&M, and brings about a vicious cycle which gives rise to the mal-functioning of irrigation facilities and increased cost of rehabilitation. Other reasons that water users associations are not active are the lack of training system, low organizational functionality, and non-transparency of financial operation.

314-14 A feed-back study financed by Japan Bank for International Cooperation (JBIC) was conducted for the "Special Studies for Establishment of Framework on Policy Reform in Water Resource Sector," in order to drive forward policy reform under Water Resources Adjustment Loan (WATSAL) of the World Bank. According to the results of the study, the existing irrigation systems in Indonesia have been deteriorated due to the following reasons:

- Intake facilities: Design discharge cannot be taken in due to a lowering of the river water level at the intake site caused by riverbed erosion. Intake structures along rivers are choked by floating materials in the rivers.

- Canals: The flow area of canals becomes smaller than designed due to inflow of sediment loads from rivers. Some sections of canal become choked with sediment produced by erosion of the inside slopes of canals. Seepage losses are very high and canal water does

not reach the tail of the canal. Canal structures are kept unrepaired, and accordingly proper canal operation can not be practiced.

- On-farm facilities: Irrigation water is not used efficiently due to inadequate development of on-farm facilities. Some low-lying areas suffer from poor drainage due to deterioration of drainage canals.
- Water management: There are observed shortages of canal water in downstream reaches of canals and excessive intake in the upstream reaches due to poor water management. Precise water management cannot be conducted, because electric-driven gates can not be operated due to a shortage of electric supply, and have to be operated manually.
- There is irrigated land with absentee landowners, mainly in the outer islands.

(3) Farm Road

314-15 In Indonesia, farm roads are defined as roads that connect a village road with farmland. In the past, the construction and rehabilitation of farm roads has generally been included as one of the project components for irrigation or agricultural development and there has been no specific project dealing only with farm roads. For planning and design of farm roads, the following figures are generally used:

Specification of Farm Road

Item		General Farm Road	Estate Farm Road
Density of farm road		50 m/ha	50 m/ha
Road width	- Main farm road	5 ~ 6 m	7 ~ 8 m
	- Secondary farm road	3 ~ 4 m	5 ~ 6 m
	- Tertiary farm road	1 ~ 2 m	2 ~ 3 m

314-16 Maintenance and repair of farm roads are generally carried out from village budgets.

314-17 (4) Subjects to be Considered in the Future

- Proper repair and maintenance work for the existing irrigation facilities are major points to be considered.
- Irrigation facilities have been losing their function due to the decay. Furthermore, some canals were deteriorated even a few years after construction because of inadequate O&M. Accordingly, it is

required to review maintenance systems, and also formulate and implement a practical rehabilitation plan.

- For the canal system, which is not receiving proper water management, improvement is necessary under the beneficiaries' initiative, taking a step-wise approach, together with the efficient use of saved water, keeping pace with the establishment of O&M mechanism.
- It is necessary to promote small-scale irrigation in rural areas with low rainfall and low productivity, in areas where irrigation facilities are inadequate and their productivity low.
- Irrigated paddy fields have been converted to other purposes due to urbanization and industrial development. Proper countermeasures are required to curtail alteration of irrigated paddy fields.

3.1.5 Water Management and Operation and Maintenance of Irrigation Facilities

(1) Background of Operation and Maintenance (O&M) Activities and Water Users' Associations

315-1 Traditionally, the construction and O&M of irrigation facilities were generally carried out by farmers themselves in Indonesia, though on a small scale. After 1969, however, the government has been promoting the development of government-led irrigation schemes line with the 5-Year Development Plans in order to attain self-sufficiency for rice at a national level. After 1982, the government, recognizing the importance of water management at the on-farm level, promoted the reorganization of WUAs by replacing the traditional WUAs with those based on village boundaries, together with the promotion of tertiary development. In parallel with these activities, the government also promoted the BIMAS Program. Owing to these promotional measures, rice production showed a drastic increase and self-sufficiency in rice had been attained in 1984.

315-2 However, since the promotion had been a government initiative without the involvement of farmers, many problems quickly arose, particularly regarding water management and O&M of the irrigation systems as well as budgetary burden for O&M. In order to promote efficient water management and reduce the budgetary burden, the government plans to hand over the function of O&M to WUAs and WUA Federations. At present, the system of support from the central government to WUAs is being transferred to provinces and districts in accordance with Law No. 22/1999 "Regional Governance." After the decentralization is completed, the MOHA and KIMPRASWIL will take

responsibility for coordination among the ministries at the central level. On the other hand, all supporting systems to WUAs will be integrated in the management of district governments and managed in a unified manner.

315-3 The registration of WUA to BAPPEDA is being administered by the planning and programming department of the district government. The procedure of registration is set in the Regulation of MOHA (No.12/1992). In principle, WUAs are organized for; (i) each tertiary irrigation block and (ii) each small-scale pump irrigation scheme. Basically, one WUA is organized for one village. The chairman of the WUA is in charge of coordination among the members and with the governmental offices. And the technician (Ulu-Ulu) is in charge of technical matters such as water management and O&M of irrigation facilities. Each Quaternary Block Head is elected from all block members once every three years and can hold the post for 3 terms at the maximum. These people work on a full-time basis and their salary is paid from the WUA budget.

315-4 In addition to the above situation on management and O&M of irrigation, i) Irrigation Management Policy Reform, ii) WATSAL, and iii) JICA Study for improvement of Irrigation Management and Empowerment of Water Users' Associations for Enhancement of Turnover Program are described below.

1) Irrigation Management Policy Reform

315-5 Economic development and population increase in the 1990s drastically expanded the demand for water resources. This shifted the emphasis of water resources from being a natural resource issue to one of economic resources, and has stimulated the government to undertake a drastic review of water resources throughout the country. In the irrigation field, which is the largest user, consuming more than 80% of the total available water resources, it has become an urgent task to increase the efficiency of water use, to recover the function of irrigation facilities and to realize sound management of facilities in order to attain sustainable irrigation operation. Under such circumstances, the government announced the new development strategy by issuing Presidential Decree No.3/1999, "Irrigation Management Policy Reformation (IMPR)" addressing the concept of "one irrigation system – one management", as described below:

- Water, previously regarded as a "social good" is now regarded as an "economic entity,"
- Water management, previously undertaken on the basis of "supply

driven" should be excised as "demand driven,"

- Water resources development, previously undertaken on the basis of "project orientation" must be implemented as "integrated development" with other resources,
- Water planning and sustainability must be based on the "supply concept" rather than the "user concept,"
- The central government must develop policy in terms of "enabling strategies" rather than through a strategy based on "provision."

315-6 In order to implement the strategy of new IMPR, the following approaches are involved:

- Review of duties and responsibilities of organizations concerning irrigation water management (Restructure of irrigation water management institutions for better farmer participation, with better regulation and farmer empowerment programs),
- Strengthening of WUAs (Empowerment of WUA by adopting social and local culture aspects and better environment consideration enabling farmers to establish legal associations as registered companies),
- Hand over of irrigation management to WUAs (Handing over irrigation water management to farmers gradually, selectively, democratically; however, the government will continue to technical support and financial assistance),
- Collection of irrigation service fees (ISF) and O&M cost (Funding of financial sources for irrigation infrastructure that can be collected, managed, and utilized by the association itself),
- Provision of sustainable irrigation systems (Sustainable maintenance of water resources and prevention of land conversion from irrigated areas to other uses so that irrigation systems can be sustained).

315-7 In order to strengthen the existing water management and O&M system, the government has prepared the guidelines for establishing new WUAs based on the concept that the territories of WUAs should coincide with administrative boundaries. At the same, the government has been promoting the program for turnover of responsibility of water management and O&M of irrigation facilities to WUAs. In spite of such effort by the government, the results of the program are far lower than expectations.

315-8 In order to realize the above-mentioned development strategy, the WUAs need to be financially self-sufficient. From this viewpoint, the government allowed the WUAs to conduct economic activities such as group procurement of farm inputs, and group sale of agricultural products without limiting the WUAs' activities only to water management. However, very few WUAs have been advanced to the level of the government's expectations, because they are still financially immature and do not have enough capacity to perform the strategy.

2) Water Sector Adjustment Loan (WATSAL)

315-9 At present, the government has been initiating the establishment of new water resources policies and legal reform, and has requested the World Bank to provide financial assistance for their implementation. In response to this request, the World Bank loaned the government U.S.$300 million as WATSAL and work is being carried out. The scope of work consists of following six subjects concerning the strengthening of WUAs, turnover of irrigation management to WUAs and reform of laws and regulations:

i) Strengthening of WUAs.
ii) Hand over of irrigation management systems to WUAs.
iii) Sustainability of irrigation system.
iv) Reorganization of institutions for irrigation management.
v) O&M and rehabilitation of irrigation facilities.
vi) Mechanism of ISF and its collection.

315-10 In order to support the WATSAL program, JBIC provided financial assistance for the implementation of the "Special Studies for Establishment of Framework on Policy Reform in Water Resources Sector". This package consists of the following five components

i) Study on irrigation management policy reform
ii) Study on water resources management in regions and river basins,
iii) Study on water quality management,
iv) Development of management information system for rural development,
v) Review and feedback study on JBIC-financed irrigation projects

3) JICA Study

315-11 In order to realize sustainable irrigation agriculture in Indonesia, JICA has conducted the "Study for Improvement of Irrigation Management and Empowerment of Water Users' Association for Enhancement of Turnover Program". This study aims at the establishment and strengthening of WUAs to enable them to take over irrigation management systems from government agencies. This study was started in April 2000 and was completed by November 2001.

315-12 In this study, the issues identified in the field survey are categorized into i) Role of the government for support, laws and regulations, ii) Management and institutional aspects of WUA, iii) O&M of irrigation facilities and water management, and iv) Agriculture, economics and finance, through problem analysis. Based on the analysis of the issues, it has been concluded that the old WUAs, which were established under the government's top-down approach can be re-organized to become sustainable WUAs where farmers participate in irrigation management together with the government (joint management), through formation of the federation of individual WUAs.

315-13 Based on the above conclusion, the countermeasures were assumed and verified through field surveys in 25 selected irrigation schemes and workshops at central and regional levels. As a result, the countermeasures were verified as applicable and acceptable to farmers and government staff. It is pointed out that the current policies for agricultural development are not justified or effective for stimulating farmers' incentives and realizing profitable irrigated agriculture that enables the implementation of O&M and rehabilitation. The countermeasures were re-organized into the action plan, consisting of 12 actions as presented below:

Action Plan proposed by the JICA Study

Category	Action
Preparatory Work on Irrigation and WUA(s) Management	1. Public awareness of government policy amongst government officials
	2. Inventory of Irrigation Systems and WUAs
Action Plan on Irrigation Management and Turnover	3. Public awareness and capacity building at WUA level
	4. Training of WUA(s) Leaders
	5. Start-up Financial Assistance
	6. Formulation / reformulation of WUA(s) and WUAF(s)
	7. *Kabupaten* Irrigation Improvement Fund (KIIF)
	8. Improved O&M and Joint Management
	9. Collection of ISF and Government Support
	10. Rehabilitation of Irrigation System
	11. Monitoring and Evaluation
Action Plan for Irrigated Agriculture	12. Enhancement plan on agriculture (enhancement of individuals and promotion of group activities)

(2) Law and Regulation regarding Water Management, O&M and WUAs

315-14 In Indonesia, many laws and regulations concerning water management, O&M and the establishment and strengthening of WUAs have been promulgated, among which the following ones are the most important:

List of Law and Government Regulation

Laws and Regulations	Concerning (Main Contents)
Government Regulation No.22/'82	Rules for water management
Government Regulation No.23/'82	Promotion of irrigation development
Presidential Decree No.2/'84	Establishment and strengthening of WUAs
Irrigation O&M Policy (IOMP) and Irrigation Service Fee (ISF) in '87	Establishment of institutional and fiscal frame-work to enable effective and sustainable O&M of public irrigation network
Presidential Decree No.42PRT/'89	Transfer of small irrigation system to WUAs
Regulation of Minister of Home Affairs No.6/'92	Collection of ISF
Regulation of Minister of Home Affairs No.12/'92	Establishment and strengthening of WUAs
Regulation of Minister of Home Affairs No.19/'92	Collection of ISF
Government Regulation No.6/'98	Rule for repayment of construction cost by WUAs
Presidential Decree No.3/'99	Irrigation management policy reform (IMPR)
Government Regulation No.77/'01	Irrigation (amendment of Government Regulation No.23/1982 concerning irrigation)
Decree of KIMPRASWIL No. 529/KPT/'01	Guideline on transfer of authority to conduct irrigation management to WUA
Regulation of Minister of Home Affairs No.50/'01	Guideline on empowerment of WUA

(3) Governmental Organization for Empowerment of WUAs

315-15 The supervisory ministries for WUAs are the KIMPRASWIL, the MOA and the MOHA. Among these, KIMPRASWIL contains, under the DG of Water Resources, the Directorate of Water Resources Management that is in charge of planning and drafting the policies for water management, water conservation and WUAs; and the Directorate of Technical Guidance that promotes local governments to train WUAs in the technical aspect of irrigated agriculture. The MOA contains the Directorate of Water Management under the DG of Agricultural Infrastructure Development, which is in charge of guidance for water management from the plant physiological viewpoint. On the other hand, the MOHA, through the Regional Public Government and the Directorate of Regional Development, guides the institutional and structural aspects of WUAs in collaboration with regional governments.

315-16 At present, the supporting system of the central government to WUAs is being transferred to provinces and districts following Law No. 22/1999, "Regional Governance." After the decentralization is completed, the MOHA and KIMPRASWIL will take responsibility for coordination among the ministries at the central level. On the other hand, all the supporting systems to WUAs will be integrated in the management of district governments and managed in a unified manner.

315-17 Based on the above situation, a new Government Regulation, No. 77/2001, was issued to revise No. 23/1982 concerning irrigation. At the same time, other related ministerial decrees were issued from MOHA and KIMPRASWIL for effective enforce, and legal framework of local governments is presented to support the formation of WUAs. In this framework, the bottom-up participatory approach is employed for empowerment of farmers, in order to lead to the formulation of WUAs. At this moment, local governments are preparing related district regulations for implementation.

(4) Classification of Irrigation Systems and Budget for O&M

315-18 In Indonesia, the classification of irrigation systems and their budgetary arrangements are made according to the manner of construction, as follows:

Construction Manner and Budgetary Arrangement

Irrigation System	Manner of Construction	Budgetary Arrangement
Government Irrigation System	The irrigation system was constructed by the government. WUAs were organized and ISF is collected by the government. The O&M of the main and secondary systems are conducted under the responsibility of the government.	State budget (APBN) + Provincial budget (APBD) + special budget for poverty alleviation
Small-Scale Irrigation System	The irrigation system was constructed by the government. However, since the system covers less than 500 ha, the system was transferred to a WUA after completion of its construction.	O&M budget is arranged by WUAs.
Village Irrigation System	Irrigation system was constructed by village.	O&M budget is arranged by village, but APBN is allotted when necessary.

315-19 The cost for training of WUAs is included in the above budget as a lump sum. The above-mentioned budget is finally approved through review and modification by MOHA and BAPPENAS based on the application submitted from the provincial government. After completion of the decentralization, however, the authority of approval will be vested in the provincial governments.

315-20 According to the JICA Study for Improvement of Irrigation Management and Empowerment of Water Users' Association for Enhancement of Turnover Program, government budget to support for O&M came to Rp.30 trillion in FY1997/98, which is the equivalent to U.S.$64.3 million in total or U.S.$11 per ha.

(5) Evaluation of the Existing WUAs

315-21 Since 1984, the government has been examining the possibility of collection of ISF and O&M cost from WUAs in order to lessen the government's financial burden; it developed the Irrigation Operation and Maintenance Policy (IOMP) in 1987. This policy places the main emphasis on: (i) enhancement of O&M efficiency; (ii) starting the turnover of responsibility for O&M with schemes smaller than 500 ha; and (iii) farmers' responsibility for the payment of all O&M cost required even for the government's irrigation systems. Due to the following reasons, however, the result of implementation has not been to the government's satisfaction:

- The above-mentioned policy had a "top-down" approach, neglecting farmers' wishes as well as accumulated knowledge and the locally prevailing traditional approach.

- Awareness of farmers is not sufficient to ensure payment of irrigation service fees.
- Collection system of irrigation service fees has not been established.
- A WUA managerial organization has not been established.

315-22 In addition to the above performance problems, progress with the establishment of WUAs has been lower than the government's expectations. According to the interim report prepared in November 2000 for the JICA study on "Improvement of Irrigation Management and Empowerment of Water Users' Associations for Enhancement of Turnover Program", about 104,000 WUAs have been established. This is equivalent to 37% of the total goal, and of these, only 19% are active, with 1,017 WUAs legally registered. Under such circumstances, the establishment of WUAs is an urgent requirement for the promotion of the transfer of irrigation system management from the government to WUAs.

(6) Present Condition of ISF (Irrigation Service Fee) Collection

315-23 The government started to collect ISF based on the IOMP, 1987 mentioned above. After implementation of this policy, the government enforced the Regulations of MOHA No.6/1992 and No.12/1992 in 1992 in order to maintain and operate the irrigation canal systems above the tertiary canals by spending the ISF collected from farmers and to enhance the accountability of farmers towards the O&M of irrigation facilities as a whole. The responsibility for collection of ISF was placed with the local revenue service (DISPENDA). The amount to be collected was assessed based on a very complicated formula and difficulties in ISF collection were expected from the start, which brought about difficulty in managing WUAs. Other factors for the failure in ISF collection are:

- The enforcement of the "top-down" procedure for ISF collection was fraught with difficulties.
- Most of the collected ISF (U.S.$4~8/ha) was spent on office administration and very little was actually spent on O&M.
- Due to inadequate recovery of canal functions and insufficient O&M, equitable water distribution has not been made from the head to the tail of the canal system.

In addition to the failure of ISF collection mentioned above, an insufficient system of guidance from the government to WUAs and low rate of

establishment of WUAs, the stagnation of WUA activities has been observed all over the country.

315-24 According to JICA's interim report mentioned above, the ISF collection rate for the 6 years from 1994/1995 to 1999/2000 in the West Java province averaged 20% and the rates for the respective years are as shown below for reference:

Collection Rate of IFS in West Java Province

Year	Collection Rate
1994/1995	41%
1995/1996	17%
1996/1997	26%
1997/1998	20%
1998/1999	8%
1999/2000	7%
Average	20%

315-25 (7) Future Subject to be Considered

- It is necessary to train local government staff and other stakeholders, in order to improve their technical ability for O&M and WUA management.
- It is necessary to establish a mechanism for the rehabilitation of laws and regulations on irrigation development and maintenance work, capacity building and fund arrangement in order to achieve sustainable management of facilities.
- It is necessary to formulate a proper maintenance system for irrigation systems and promote the shift to water user organizations.
- It is necessary for the regional government to encourage farmers' to pay water charges and also enhance collection system of water charges as well as farmers' organizations, in addition to the establishment of a mechanism for O&M system.

3.1.6 Marketing

316-1 Summarized below is current situation on the marketing of agricultural products by commodity and constraint:

(1) Analysis by Commodity

1) Main Crops

Rice

316-2 Rice (Paddy) is distributed from farmers to consumers mainly through the private sector, while others are through the National Logistics Agency (BULOG), which plays a major role in price stabilization, rationing to soldiers and special operation for people in need of rice. Rationing of rice to government employees was replaced with cash payment equivalent. BULOG's activities are still under review with possible restructuring in the direction of it becoming a public company.

316-3 Although available data are limited, it is reported that more than 90% of rice distribution is through the private sector, which is associated with the fact that Village Cooperative Units (KUDs) are losing its organizational ability.

316-4 Market channels through the private sector in general are:

Farmers, after sun-drying, sell their produce (paddy) to collectors or directly to rice mills. Milled rice is sold to consumers through traders, wholesalers and retailers. In the wholesale market, the wholesalers usually function as commission agents between traders as sellers and retailers as buyers, conducting face-to-face negotiations. No quality standards are applied in private marketing channels. Major wholesalers and millers are mostly overseas Chinese. The majority of farmers are small-scale. In many cases, they rely on collectors for support with funds, production inputs, etc., weakening their position in terms of selling their produce. Farmers' access to market information is also very limited.

316-5 Rice distribution channels through the government sector are:

BULOG, with its regional organizations (DOLOG/SUB-DOLOG), procures rice from KUDs or the private sector. Farmers in most cases sell their produce (paddy) to the private sector mainly for two reasons: (1) Weakening KUDs have difficulty purchasing paddy due to shortages of funds and (2) Farmers are in many cases unable to meet the quality requirements set by BULOG for procurement of paddy.

316-6 Main procurement channels of the government are from private rice millers to DOLOG/SUB-DOLOG. The quality requirements set by BULOG are not utilized in the market because of no grading standards. Post-harvest losses of rice are reported to be 20% in general. However, the grounds and definitions for this are not necessarily clear.

Vegetables and Fruit

316-7 Generally, vegetables and fruit are distributed from farmers to central/regional markets through local collectors. No quality standards are applied in the market. Preparation of standards is still under way by the ministries concerned before official publication by National Standardization Agency. In recent years, direct marketing channels between collectors and large-scale consumers (hotels, supermarkets, etc.) have been established on contract basis, where the products are selected before shipment to meet the requirement of customers.

316-8 Wholesale and retail functions are generally intermingled in each market. The markets are mostly public and managed by local government or management cooperative organized by participants of the market. Most of the markets are superannuated, congested and not hygienic enough, in addition to the daily occurrence of dead stock, leading to sizable losses on the products. No license system for wholesalers, no obligation for report of dealing data, face-to-face negotiations and incomplete quality standards are constraints on transparent trade and fair price formation.

316-9 Small-scale farmers in many cases rely on local collectors for support with funds, production inputs, etc., weakening their position in selling their produce. Marketing before harvest is also often observed. Farmers' access to market information is very limited.

316-10 Market price data for vegetables and fruit are collected by government officials and publicized through the media every day. However, it is reportedly not fully utilized due to lack of volume, immediateness, practicality and accuracy. Coordination between central and local governments also does not function well on this matter.

316-11 Transportation of vegetables and fruit from farms to the markets is usually by open trucks. The shortage of markets in production areas makes the required distance to markets longer, resulting in weight loss and quality deterioration. Improper packaging, incomplete road conditions and shortage of cold storage also lead to the occurrence of losses. Post-harvest losses of vegetables and fruit are roughly estimated at 30%.

316-12 The quality of vegetables and fruit are generally inferior, making it difficult for the processors to procure the produce as raw materials that meet their requirements in terms of quality and quantity.

Estate Crop

316-13 Nearly 80% of estate crops are exported. The majority of farmers are small-scale (80% to be 0.5 – 5.0 ha including other crops). Three stages of traders are usually present between farmers and exporters. Traders at each stage select produce in order to meet the requirements of the destination countries. Usually, about 35% is rejected and sold to the domestic market at low prices. Like other commodities, many farmers rely on local traders for support with funds, production inputs, etc., weakening their position in selling their produce. The younger generations' dislike for farming and the low education level of most farmers are also pointed out as constraints.

2) Livestock

Broilers

316-14 Large-scale poultry traders including foreign capital ventures dominate 70-80% of the broiler market, exclusively supplying the mixed feed. They have slaughterhouses and cold storage facilities, and sell butchered broilers directly to large-scale consumers, after procurement of live broilers on large-lot contracts with big farmers.

316-15 The majority of farmers, who are very small in scale, often rely on small-scale, local poultry traders for support with funds, feed, chicks and medicines. They sell raised broilers back to the traders. Live broilers are usually butchered by retailers for consumption. Small traders also distribute live broilers to large-scale poultry traders on demand. Raw materials of the mixed feed are mostly imported. Large-scale poultry traders, being the importing agents, make the mixed feed market oligopoly. The majority of farmers are generally handicapped in the cost due to small lot of transactions.

Beef

316-16 Cattle traders control the beef market. Some 90% of farmers, who are small-scale, sell beef cattle to the traders. Live cattle are then turned to fresh carcasses by slaughterers and sold to consumers at retail markets. Large-scale farmers (Feed-lotters) sell fresh beef directly to large-scale consumers, after butchery in their own slaughterhouses. Like other commodities, the majority of farmers are weak positions, relying on local cattle traders for support.

Milk

316-17 Milk distribution seems to be smoother, with less marketing risk for dairy farmers than other livestock products. Milk is sold from dairy farmers through dairy cooperatives and the national dairy federation (GKSI) to dairy companies.

316-18 Distribution of livestock products apart from milk also has constraints such as improper transportation/storage/packaging, unhygienic and inefficient markets, and incomplete quality standards, as is the case with other agricultural products.

316-19 The major problems of livestock industry in Indonesia are (1) dependence on imported feed in the poultry industry and imported feeder steers in the feed-lot industry, and (2) Low quality/low productivity/non-uniformity of products in local resources based stock raising. In the process of possible solutions thereto, improvement of the marketing system of livestock products needs to be attained.

(2) Analysis by Constraint

1) Wholesale Market

316-20 Wholesale markets of agricultural products are generally old, congested, and unhygienic, in addition to the daily occurrence of dead stock, all of which increases post-harvest losses. Anyone can be a trader in the market, because of the existence of a registration system and not licensing for participation, which makes transactions in the market complicated and confused due to an excess of wholesalers. Reporting of dealing data (quantity, prices, etc.) by wholesalers to the authority is not obligatory, so the market information at the authority is incomplete. The market facilities are not partitioned by commodity, leading to non-smooth physical flow. Transaction patterns differ by market. Wholesale and retail functions are in many cases intermingled in the market. Quality standards and market regulations are not well established. All these problems are constraints to the realization of transparent trade and fair price formation.

316-21 In Indonesia, there is no comprehensive law governing the wholesale markets of agricultural products. The wholesale markets are established, owned and managed by respective local governments. Actual operation of the market is generally carried out by a public corporation, represented

by the local government officials. No basic change is reported on this situation before and after the decentralization.

316-22 The major players in the wholesale markets are usually collectors or traders as shippers, retailers as buyers and wholesalers. The wholesalers receive a part of selling price or profit at predetermined rate from the shippers on every transaction. Participation of producers (farmers) to the market is rare.

316-23 Pasar Induk Kramat Jati, a representative wholesale market for vegetables and fruit, was established in Jakarta in 1973. This market is owned by the local government of DKI Jakarta, who leases 3,879 booths (as of August, 2002) to nearly 2,000 wholesalers and others by contract for 20 years (Renewal every two years). Transference of the title to lease is possible, but unlikely. Some 90 % of the vegetables and fruit to be supplied to DKI Jakarta are reportedly distributed thorough this market. In transactions at the market, wholesalers have initiatives and advantages to both shippers and retailers in general, leading to the formation of "vertical integration" in the market channels.

316-24 Transactions and price formation systems in the markets are not transparent. The mechanism and background of price formation should be thoroughly reviewed for raising the transparency, which will lead to the realization of fair competitiveness in the markets and eventually the strengthening of farmers' bargaining power. A comprehensive study needs to be done to establish the most appropriate system of the markets in Indonesia. The produce collection system, based on collective marketing by farmers' group or equivalent, is an important prerequisite for efficient operation of the markets.

316-25 Generally, in wholesale markets located in large cities, scale of main players is bigger due to more consumption and also the marketing channels have more stages/ diversity due to longer distances from production areas, than otherwise. Two to three stages of collectors or traders are usually present between farmers and the market. Traders near the markets are mostly full-timers. Under such situation, improvement of the wholesale markets may not lead to the benefit of farmers immediately. On the other hand, local markets near production areas are small in scale and just one stage of collectors is present between farmers and the market in general. As described before, many local collectors are not full-timers

but often farmers too, and establish a sort of special relationship with farmers, depending on each other. If they can be regarded as farmers' leaders, it is possible that their benefit may extend to farmers indirectly and further facilitate the vitalization of rural economy. From this point of view, it may be important to strengthen collectors or traders who play in between farmers and the markets. Further examination needs to be carried out to clarify the situation thereof.

316-26 Wholesale markets have the important functions such as price formation, collection and subdivision of produce and transmission of market information. Roles of the markets differ from one country to another depending on development stage of the markets and the background behind it. In developed countries, the distribution of produce outside the markets is increasing under diversification of the market channels and modernization of the physical distribution system. Wholesale markets, under such situation, are pressed to review their roles to put emphasis more on the downstream area (needs of large-scale retailers, etc.) and the principle of competitiveness. However, the wholesale markets still play an important role, particularly for vegetables and fruit.

316-27 On the other hand, in Indonesia, the relevant marketing systems are not well established as yet in terms of farmers' organizations, shipment & collection, physical distribution and quality standards, in addition to incomplete market institutions, unlike developed countries. The proportion of " Through wholesale markets " to the total distribution is quite high, while there is another trend of the participation of foreign capital in the distribution and retail sectors in Indonesia, as described elsewhere. Taking such situation into account, the most appropriate system of the market in Indonesia needs to be formulated, which should lead to the vitalization of the market and the raising of farmers' income. However, in developing countries, it is generally pointed out that institutional framework is not well established and unwritten rules dominate the major part of the market. Improvement of the market, therefore, may take time with a trial-and-error method.

2) Market Information System

316-28 Market price information is regularly collected by officials of central (MOA and MOIT) and regional governments. Basis of the current system was introduced in 1978. In the specific areas of the country, staffs

of every DINAS (Service office for agriculture and industry & trade, Kabupaten /Kotamadya/Kota level) collect market prices by selected commodity of vegetables/ fruit, rice and palawija by sampling. The relevant directorates of MOA and MOIT utilize the collected prices for statistical purpose or others, in addition to the public release through the media. Mainly, DINAS agriculture is responsible for collection of farm gate prices, and DINAS industry & trade covers wholesale and retail prices.

316-29 However, the current market information system is reported to involve various constraints such as:

- Coordination between central and regional governments seems to be inefficient in connection with decentralization. Further, data collection is getting difficult due to shortage of communication tools, transportation means and staffs.
- Utilization of the system by farmers, collectors and traders is limited, because of drawbacks in the quantity, quality, promptness and practicality of the information.
- Farmers and local collectors need more precise and detail information in local areas. They are also interested in information for planting & cropping by area, prices & stock of the production inputs, trend of demand & supply by area and so on, as well as the prices of produce.
- Information transmission system is incomplete, particularly for the farmers who have no communication means.

316-30 An appropriate market information system enables a future prospect of the market trends and prices, and eventually leads to the strengthening of farmers' bargaining power. The requirements of farmers, collectors and traders on market information need to be clarified, and an effective market information system should be established based on improvement of the current system.

3) Shipment, Collection and Distribution

316-31 The majority of farmers, whose farms are very small in scale, ship their produce individually. They do not have enough money, production inputs or labors, lack market information, and even have no means of transportation in many cases. With insufficient public support, they tend to rely on traders for funds and inputs, resulting in weak bargaining power.

They usually have very limited information or none at all about how their products are sold in the market. There is no marketing activity such as sales promotion or market development.

316-32 Collective marketing by farmers' organizations may be an option for improvement. This will enable farmers to strive to attain: 1) higher and more uniform quality of agricultural products, 2) cost reduction, 3) easier access to market information, and ultimately increase their income by strengthening their bargaining power. As described before, collective marketing by farmers' group can be the basis for a produce collection system, which is an important prerequisite for efficient operation of wholesale markets. However, it should be sufficiently sustainable and indigenous in Indonesia.

316-33 On the other hand, as described before, different sides exist in the market. Many collectors and wholesalers are not full-timers but multi-players, often farmers. They are also burdened with various marketing risks. The roles and functions of the main players in the market need to be reviewed carefully.

4) Quality

316-34 The above situation makes it difficult to give farmers incentives to improve the quality of agricultural products. The lower quality of the products also works to bring down their selling prices. Lack of quality standards in many commodities leads to unclear quality judgment and price determination. Creation of incentives to improve quality needs to be studied from various aspects to prepare for a prospective expansion and diversification of demand in the future.

316-35 Basic demand of the market of agricultural products to the production side is the quality and stable supply of the produce. Traders are often forced to carry out the extra process (cleaning) in wholesale markets, as the produce is delivered to the market soon after harvest without pre-cleaning. Usually, grading of the produce is not conducted due to lack of standards. Low quality of the produce, in addition to improper transportation and packaging methods, increases post-harvest losses in terms of quality and quantity. The management of the said wholesale market (Jakarta) suggests an idea for strengthening sub-terminal markets (equipped with sorting system) to be located in between large city and production areas. Processors have difficulty in stable procurement of fresh agricultural

products as raw materials because they are often far below the requirement in terms of quality.

316-36 However, the other side is also to be pointed out that what the market should indicate to the production side is not done clearly. The requirements of the buyer (quality, quantity, prices, delivery and payment terms, etc.) are naturally clear for the export, while it is generally obscure in the domestic market of agricultural products. There is no practical standard in terms of quality and packaging to identify the value of produce. Price formation mechanism is invisible. Needs of the market are not transmitted to the production side in distinct and objective way. Improvement of all these constraints is in urgent need.

5) Post-Harvest Losses

316-37 Sizable losses, both qualitative and quantitative, occur at the marketing stage, caused by inferior raw materials, improper transportation/handling, poor packaging and a shortage of storage, in addition to dead stock at wholesale markets. Traders naturally try to make up for such loss-risk by transactions with farmers, resulting in disadvantages to farmers. Post-harvest losses on agricultural products have been one of the main issues throughout the world for a long time. However, the situation of the losses is not necessarily clear as yet. Full study needs to be conducted to clarify the situation and reduce post-harvest losses.

6) Transportation and Storage

316-38 Improper methods of transportation, together with incomplete road conditions, confines marketing to limited areas and quantity. It also leads to the occurrence of losses on the products. Transportation over long distances from the production area to the market increases weight loss and quality deterioration.

316-39 Shortage of storage facilities also makes the marketing area narrower and the quantity less, as well as causing large seasonal fluctuation in prices, since the produce is shipped soon after harvest.

316-40 Irregular taxation levied on every movement of agricultural products among provinces is another constraint on smooth distribution.

316-41 Transportation and storage systems are the basic infrastructure for marketing. It is essential to improve management aspects such as stock management and quality control, in addition to the facilities themselves.

7) Deregulation in the Market and Distribution

316-42 Revision of the investment related laws in 1994 enabled foreign capital to participate in the distribution and retail sectors in Indonesia. Some success stories have been reported under the continuation of the deregulation policy. This situation may lead to a distribution revolution with the development of a consumers' market. Improvement of the market and distribution is therefore imperative in order to respond to the prospective expansion and diversification of the demand in the future.

316-43 (3) Subjects to be Considered in the Future

- The wholesale markets of agricultural products are generally old, congested and unhygienic, in addition to the daily occurrence of dead stock, all of which increases post-harvest losses. Improvement needs to be carried out to attain hygienic and efficient management of the market.
- Many constraints exist to the realization of transparent trade and fair price formation. The effective institutional framework governing wholesale markets and relevant distribution areas needs to be thoroughly reviewed and improved. The produce collection system should also be improved to facilitate a reduction of distribution cost and efficient operation of the market.
- Farmers have difficulty in accessing market information. A wide-ranging and effective market information network should be established between producers (farmers) and consumers (users) of agricultural products, to facilitate revitalization of the market.
- Many small-scale farmers rely on traders for support with funds and inputs, weakening their bargaining power. Collective marketing by farmers' group may be an option for improvement.
- The current situation in the market makes it difficult to give farmers incentives to improve the quality of agricultural products. In addition, sizable losses occur at every marketing stage. Full study needs to be conducted to clarify the situation for reduction of losses.

3.1.7 Agricultural Extension

(1) Agricultural Extension System

317-1 It is required that an Agricultural Extension Information Center (BIPP: Balai Informasi dan Penyulunan Pertanian) be located in each district (Kabupaten) and controls BPPs in the district and Extension Office (BPP) be positioned in

each sub-district (Kecamatan) under the jurisdiction of BIPP. BIPPs are responsible for approving of action plans on extension activity to be prepared by sub-district offices, evaluating and monitoring extension activities to be conducted by BIPPs, and also training extension officers and farmers. Approximately 120 out of the entire 336 BIPPs have maintained their ordinary functions as shown in Table 3.1.18, and the others have been mostly reorganized or dissolved. Each district has an individual plan for restructuring the organization and function of its BIPPs, depending on their extension service policy and strategy. As a result, it is expected that each district have certain systems and function on extension service to be adaptable according to its regional characteristics. With regard to the extension service, the responsibility of the MOA is to formulate guidelines, conduct monitor activity, provide technical assistance for local governments, etc., while local governments are the executing agencies of the extension service. After decentralization, salary and other miscellaneous costs for extension officers are granted in a lump sum from the budget of the Ministry to local governments.

317-2 As of April 2002, BPPs have been established in 3,742 sub-districts out of the 4,126 sub-districts throughout the country (refer to Table 3.1.19). As of June 2002, 33,032 extension officers are deployed in the whole country, and each extension officer covers around 800 farm households.

317-3 As shown in Table 3.1.20, farmers in around 40% of total districts in the whole country depend on non-farm income for majority of their household income. It is against this background that proportion of landless farmer and small farmers is quite high. Under this situation, there are some disparities in terms of the degree of importance and expectation of extension activities among districts. Some local governments launched their implementation of extension activities based on their own policy and strategy rather than the guidelines of the central government. As shown in Table 3.1.19, activities of BIPP in 14 districts out of 336 districts of the whole country have been discontinued as of June 2002.

317-4 National development budget for assistance of extension service is allocated to selected local governments, which follow the national policy on extension services. The criteria for selection of suitable BIPPs are (i) BIPP should have original function of extension service, (ii) Extension officers should play a primary role and their performance should be properly reviewed, and (iii) The function of the extension service in BIPPs is independent. As of 2002, the number of BIPPs and BPPs, to which the national development budget is disbursed, came to about 100 and 500 units, respectively.

(2) Training of Extension Officers

317-5 Extension officers are required to possess at least the qualification of diploma in Agricultural Extension Academy (APP) as in the case of teacher or other kinds of technical officials based on the Presidential Decree of 1999. All incumbent extension officers as well as new officers are required to obtain that qualification. Accordingly, retraining (in-service training, correspondence courses, etc.) has been commenced for about 26,000 extension officers whose highest level of qualification is high-school graduation. Consequently, it is expected that they will become D3 holders within five years.

317-6 The Management of Agricultural Human Resources Development Centre was established in Bogor, in order to train persons concerned with agricultural education and extension at central and provincial levels. Agribusiness Training Centres are located in seven provinces in order to carry out training of relevant provincial and district staff members. While Agriculture Training Centres are located in 23 provinces in order to conduct training activities for relevant staff members of agricultural extension activities of Districts and Sub-districts. Regarding Agriculture Training Centres, the MOA covers the management cost, while local governments handle staff salaries. Training programme contents in Agriculture Training Centres may differ depending on the policy of the provincial government. The Ministry is worried about a negative influence on quality and quantity on the training programs and curriculums of those centres. Education and training are not carried out smoothly and systematically due to problems such as confusion caused by decentralization, insufficient staffing and lack of local-level budgets.

(3) Experiment and Research

317-7 The Agency for Agricultural Research Development (AARD) is a coordinating agency of research and experiment activities in the agricultural sector. 13 National Institutes are established under the umbrella of AARD as follows:

1) Research Institute for Rice in Sukamandi, West Java Province
2) Research Institute for Legume and Tuber Crop in Malang, East Java
3) Research Institute for Food Crop Biotechnology in Bogor, West Java
4) Research Institute for Maize and Cereal in Malang East Java
5) Research Institute for Swampy Food Crop in Banjar Baru, South Kalimantan
6) Research Institute for Vegetables in Lembang, West Java
7) Research Institute for Fruit in Solok West Sumatra

8) Research Institute for Ornament Plants in Cianjur, West Java
9) Research Institute for Spices and Medical Crops in Bogor, West Java
10) Research Institute for Tobacco and Fiber Crops in Malang in West Java
11) Research Institute for Coconut and Palmae
12) Research Institute for Animal Production in Ciawi, West Java
13) Research Institute for Veterinary Science

317-8 Assessment Institutes for Agricultural Technology (AIATs) are located in 26 provinces except four provinces, that is Bangka-Belitung, Gorontalo, North Molucas, and Banten. AIATs have functions such as (i) development of adequate agricultural technologies and research work for applied technology, (ii) technical support for extension activities, and (iii) promotion of agribusiness. Furthermore, AIAT is preparing a detailed map, superimposing socio-economic information with the zoning of agro-ecological zones. AIATs are managed by the Centre for Socio-Economic Research and Development of AARD.

317-9 The transfer of AIATs to relevant provinces still needs process and time due to un-readiness of the provincial government in supporting the program of AIAT as well as the shortages of provincial budget. However, the MOA has committed to transfer AIATs to the provinces, if the financial circumstances of provinces are put in order.

317-10 (4) Subjects to be Considered in the Future

- Regarding the extension service, it is important to accurately evaluate the current situation and thus systematically re-formulate the framework for overall extension activities, with consideration given to decentralization. It is necessary to strive to close the gaps in understanding concerning extension services between the central and local governments.
- It is expected that effective and efficient education and training be implemented in this situation of limited staffing and shortage of budget.
- MOA had possessed 11 Agricultural High Schools. After decentralization, some of them were transferred to local governments. However, the running costs of agricultural high schools are a financial strain for some local governments. Therefore, the quality of curriculum as well as quantity and quality of teachers, etc. might be negatively affected. Further, some APPs might be bumped up to Agricultural Colleges, but their operation and maintenance budget is still insufficient. There is controversy as to whether or not those academies to be turned into Colleges are able to maintain the

educational standard required.

- In addition to the subjects mentioned above, it is necessary to examine:
  a. extension, education, training, and research systems to promote agricultural and rural industries, including processing and marketing activities; and
  b. a mechanism to reflect needs from the village in education, extension, and research and development systems to develop sustainable agriculture in line with decentralization and other changes in rural environments.

3.1.8 Agricultural Credit

(1) Current Situation of Agricultural Credit

318-1 The Food Security Credit (Kuredit Ketahanan Pangan:KKP) programme entered its second year, and the KKP loan-deposit ratio as of May 2002 was about 30%, indicating smooth operation compared with the 4% figure of the first year of its operation, as shown in Table 3.1.21. However, the current situation on utilization of KKP is still unsatisfactory, due to severe criteria for selection of borrowers. In principle, KKP is operated for production activities in the agriculture and fisheries sector, as the name of KKP suggests, as shown in Table 3.1.22. In other words, borrowers are not allowed to apply this credit scheme for improvement of living standards. Various procedures are required for its application, and strict fulfillment of several conditions is thus required of borrowers. Consequently, it takes a considerable amount of time to complete the procedure, and cases may arise in which credit is not available in time.

318-2 The government originally had a plan to decrease the interest subsidy gradually (6% for 2002, 3% for 2003, and finally 0% for 2004). However, this reduction of the interest subsidy rate would be postponed and therefore government subsidy could thus be continued for the time being.

318-3 A typical micro finance institution is the Income Generating Project for Marginal Farmers and Landless, otherwise known as P4K (Peningkan Pendapatan Petani-Nelayan Kecil). Implementation of P4K for marginal farmers and fishermen is supported by the International Fund for Agricultural Development (IFAD) and the ADB. The Bank Rakyat Indonesia (BRI: State Owned People's Bank) has responsibility for financing as a channeling bank. P4K beneficiaries are small farmers, landless farmers, small-scale fishermen, small home industry operators, and other community members in villages.

They must be below the poverty line, which is defined as having an annual income equivalent to 320kg of white rice per capita[9]. They are obliged to organize a group with around 10 persons and carry out activities by means of group approach. The upper ceiling of credit is around 300,000 for the first year, an amount not sufficient for certain agribusiness. It is noted that more than 90% of the credit disbursed was repaid, although the borrowers are small farmers. Phase I of P4K was started in 1979, and the P4K is now in the Phase-III and scheduled to continue until March 2005. During the implementation of Phase-III (1998 to 2005), it is expected that P4K benefit about 74,000 small farmers' groups or covering around 800,000 poor families in rural area of 12 provinces. Annual interest rate of P4K is 22.15% , which is almost same as that of commercial banks. Current status on operation of P4K as of September 2001 is shown in Table 3.1.23.

318-4 (2) Subjects to be Considered in the Future

- It is expected that financial schemes for initial investment and operation funds for agribusiness to be carried out by individuals and/or corporations be urgently established, and also operation and management way be formulated. Actual performance of P4K must be referred for the formulation of the new scheme.
- It is necessary to consider the current situation of existing financial institutions as well as their constraints and countermeasures, in order to propose proper and practical credit schemes. Financial institutions to meet various needs in regional circumstances should be established, and further education and training for operation of those schemes could be indispensable, in order to aim at economic development in rural areas and improvement of the income of farmers and fishermen.

3.1.9 Farmers' Organizations

(1) Current Situation of Farmers' Organization

319-1 From 1970 to 1997, the GOI had integrated cooperatives and farmers' organizations in rural areas into unified cooperatives known as KUDs. In principle, KUDs can conduct business and service activities under the guidance of the Government. Some KUDs have fulfilled their function sufficiently and

9: Equivalent to around Rp. 600,000 per year

can be considered on a par with the international standard. However, the majority of KUDs have limited capacity and track record in the management of finance and facilities. In other words, the service level of major KUDs does not meet the needs of all peoples in a region.

319-2 Under the Habibi Administration that replaced the Soeharto Administration in July 1998, the KUD's monopolized preference was abolished by Presidential Decree No. 18 and new cooperatives with a minimum of 20 promoters could be established. In response to Presidential Decree No.18, the GOI has encouraged the establishment of new cooperatives, which are called Koptan (Koperasi Tani), derived from standard Kelompok Tani. It is estimated that approximately 3,000 Koptan cooperatives have been established in the past 3 years, while 12,000 groups are still awaiting approval. Compared with progress over the 30 years from 1970, in which 9,200 KUDs were established, the current rate of establishment of Koptans is rapid. The majority of the new cooperatives are still in the early period of establishment, and some of them have no facilities and staff members on the payroll as their management base. Since the rainy season of 1998, Farm Credit (KUT: Keredit Usaha Tani) was extensively promoted under the implementation of a three-year plan for increasing food production. Under the situation mentioned above, it seems that the reorganization of Koptan and establishment of NGOs were promoted, aiming at delivering credit (KUT) to farmers.

319-3 As mentioned above, it is possible for rural people to freely organize cooperatives. As a result, many small organizations, which are newly established, are unable to effectively take their advantages as cooperatives. For instance, many Koptan have few members, a small scale of economic activities and services, and limited management capacity, and not registered in a formal manner. Therefore, merits of scale in joint selling and joint buying, systems that commit to a quality standard, stock, etc. are not ensured. It is necessary to improve this situation.

319-4 In major KUDs, 5 to 10% of harvested products obtained from members are shipped jointly, and facilities for processing, storing, and selling are available and operated by a KUD itself. Accordingly, it seems that revitalization of cooperatives including KUDs through the bottom-up approach is one of the countermeasures for the promotion of community-based economic activities.

319-5 (2) Subjects to be Considered in the Future

- Clarification of actual features of farmers' associations such as KUDs, Koptans, Kelompok Tanis, etc.
- Clarification of the policy framework and necessary countermeasures required for the strengthening of farmers' organizations, including cooperatives. The following points should be described clearly in this policy framework:
  a. Methods for promotion of autonomous incorporation and business cooperation in consideration of economies of scale in business activities,
  b. Guidelines for appropriate financial management in the cooperatives (including introduction of exterior auditing system), and
  c. Guidelines for establishment of adequate organization and management of cooperatives as well as their business activities such as joint marketing, joint purchasing, etc.
- Promoting understanding of the necessity and merits of cooperatives as well as their fundamental rules, to promote the formation of democratic cooperatives, and the necessity for strengthening farmers' organizations and enlightening members for participation (it is necessary to raise the participation rate of cooperative members from the present 11% to more than 50% at the least).
- Striving to conduct agribusiness activities (purchasing farm input and marketing aspect including marketing information, processing and distribution of product) of cooperatives through consideration of regional characteristics and the positive participation of cooperative members.

3.1.10 Agribusiness

(1) Current situation

3110-1 Agribusiness includes all non-farm activities from input-oriented (upstream) businesses such as seed production, fertilizer and the agricultural machinery industry to output (or downstream) activities such as marketing. In terms of the relevant ministries, the MOA, MMAF, State Ministry of Cooperatives and Small & Medium Enterprises, MOIT, etc. are closely linked. The MOA and is responsible for the production of agricultural raw materials; the MMAF, fishery

raw materials; the State Ministry of Cooperatives and Small & Medium Enterprises, farmers' and fishermen' organization; and Ministry of Industry and Trade, the processing of agricultural and fishery raw materials.

3110-2 The use of revolving funds has been institutionalized by the MOIT as LPT-Indak (Lembaga Pembinaam Terpadu Industri dan Dagang Kecil), to promote small and medium enterprises (SMEs) through the industry and trade office of local government. The credit limit is from Rp.5 million to Rp.50 million, with a repayment period and annual interest rate of 2 years and 5%, respectively. The MOIT has been promoting SMEs in rural areas with the support of the German Technical Cooperation (GTZ). The major task of GTZ is to encourage small enterprises, such as those assembling and selling of hand tractors, etc. As described in Sub-section 3.1.6, the Ministry officially publishes information on retail prices by radio, which is collected by around 1,500 members of relevant staff in local governments (major provinces and districts).

(2) Subjects to be Considered in the Future

1) Intensification of Agribusiness Intelligence

3110-3 It is necessary to intensify product-based information such as market prospects both at home and abroad, price trends, quality requirement, etc. Furthermore, agribusiness information referral services to linkage among prospective clients, processors, buyers, etc. must be established.

2) Improvement of Regulatory and Business Environment

3110-4 It can be understood that preferential measures for inviting a processing company to set up a plant and develop a local industry do not exist. It is necessary to take the step of inviting companies to conduct such activities. Furthermore, tax and other incentives for upgrading plant and equipment are subjects to be considered.

3) Rehabilitation of Credit Scheme for SMEs

3110-5 Financial institutions for SMEs that need an initial start-up investment are required to promote local industry. On the other hand, regional financial institutions such as Rural BRI (BRI Unit Desa) are functioning, but it is a relatively small scheme and has little effect on SMEs. Accordingly, it is said that SMEs complain more about inadequate access to credit schemes rather than the high rates of interest on the credit.

4) Enhancement of Micro-Credit for Small Farmers and Fishermen

3110-6 Micro-credit for small farmers and fishermen is not sufficient. Ministries concerned operate their own micro-finance institute independently. They rely money sources for those finance institutes on donors. Accordingly, it seems that there are some qualms for the future. Farmers and fishermen are requested to arrange collateral, resulting in access to the micro-credit being difficult. Finance scheme, which commercial bank is able to operate as executing bank, is a subject to be considered.

5) Improvement of Education and Training System

3110-7 There are limited human resources, which possess experience and knowledge for promotion of local industries, in rural area. It is necessary to enhance capabilities of cooperatives and organizations of farmers and/or fishermen with extension system as well as capacity buildings of human resources, in order to promote local industries, in which agricultural and fisheries processing industries are centered on, considering the current status and needs of local region.

3.2 Fisheries Sector

3.2.1 Fish Consumption and Intake Volume

321-1 The fisheries sector plays an important role in food balance in Indonesia, particularly with regard to protein intake. The total fishery production in 1999 was about 48.9 million tons (National Fishery Statistics 2001), and the total fish consumption in the same year was about 36.6 million tons (Food Balance Sheet of the Ministry of Agriculture 1991-1998). The yearly fish consumption per capita was 17.76 kg in 1999 (Food Balance Sheet). By contrast, the cattle meat production in 1999 was 1.45 million tons and the consumption was 1.52 million tons (National Livestock Statistics 2001), the production of eggs was 0.794 million tons with 0.615 million tons consumed, while milk production was 0.505 million tons with 1.33 million tons consumed. The consumption of cattle meat and milk was higher than production with imports accounting for the shortfall in domestic production. The consumption per capita in 2001 was 5.1kg of meat, 3.5kg of eggs and 6.5kg of milk.

321-2 Production of fishery products increased from 3.16 million tons in 1990 to 4.89 million tons in 1999 (a 54% increase for the 10 years), while consumption increased from 2.32 million tons in 1991 to 3.66 million tons in 1999 (a 58%

increase for the 9 years) (Food Balance Sheet of the Ministry of Agriculture 1991-1998). The consumption per capita of fishery products in 1991 was 12.82 kg and it increased by 38% between 1991 and 1999 (Food Balance Sheet). For livestock products, the present production and consumption is much higher than that recorded in the 1970s, but there has not been a marked increase in the last 10 years (National Livestock Statistics 2001). The annual consumption of eggs and milk per capita increased consistently over the last 10 years, while annual per capita cattle meat consumption has fallen from a peak of 8.41 kg in 1996.

321-3 The daily food energy intake per capita in 1999 was 39 calories of fishery products, 26 calories of cattle meat and 20 calories of milk and eggs (Indonesia Food Balance Sheet 1998-1999).

321-4 These figures show that the demand and supply of fishery products is increasing and that the demand for fishery products is increasing relative to livestock products in recent years.

3.2.2 Policy and Institution for Fishery Promotion

322-1 An outline of "the Reinstra (the Strategic Plan) for Development of Marine and Fisheries" in line with "the Program for Marine Development" and other relevant programs, which are part of PROPENAS (the National Development Plan for 5 years), is described in Chapter 4 of this report. The main fisheries sector policies particularly for mid-term development are as follows:

1) To conduct fishing management to utilize fishery resources in a sustainable manner and to generate maximum economic effect
2) To promote aquaculture to respond to a high demand of fishery products
3) To promote value-added fishery products through upgrading of the quality, development of processed fish and diversification of the products

322-2 By implementing the above policies, purposes aiming at improving living standard of fishermen, aquaculture farmers and coastal villagers, contributing to Indonesian economy, enlarging people's fish consumption, protecting natural ecosystem and motivating people's consciousness as a people of oceanic culture for the national unity and so on are focused.

(1) Institutions Relevant to the Policies

322-3 The Laws and/or ministerial decrees that are the basis for policies on capture

fishery, fishery resources management, aquaculture and fish distribution, are as follows.

1) Institutions Relevant to Fishing Management

i) Article No. 141 of the Government Decree in 2000

- The central government gives a fishing license to fishing fleet with gross tonnage of 30GT or higher, the province gives a fishing license to fishing vessel with 10GT or higher up to smaller than 30GT, and the district gives a fishing license to fishing boat smaller than 10GT, respectively.
- The central government gives a fishing license to fishing fleet with engine of 90HP or higher, the province gives a fishing license with engine of 30HP or higher up to less than 90HP, and the district gives a fishing license to fishing boat with engine of less than 30HP, respectively.
- Fishing licenses issued by province and district are submitted to the DG of Capture Fishery of the MMAF and registered by the DG of Marine and Fishery Resources Controlling.

ii) Article No. 45 of minister decree of the MMAF in 2000 (Institution on Fishing Business License given by central government)

- Institution on fishing licenses given to personal or entrepreneur who engages in fishing activities or aquaculture for commercial purpose.
- This institution adapts to all commercial fishing activities and aquaculture in Indonesian Waters (9 marine zones) and Indonesian Exclusive Economic Zone (IEEZ).
- This institution regulates necessary fishing licenses for Indonesian fishing vessel and foreign vessel.
- It regulates the fishing business license (IUP) that is given to the main business entity and the fishing letter/document (SPI) that is given to the each vessel which the business entity owns. The former must be renewed every 3 years. The latter is classified into 3 categories as followings: for big pelagic fish (renewal every 3 years), for small pelagic fish (renewal every 2 years), for demersal fish (annual renewal).
- The contents described in the fishing business license are as follows:

a) Fishing operation area
b) Fishing gear used

c) Fishing port
d) Prohibited fishing method
e) Vessel identity
f) Name list and number of crew
g) Vessel identity number of the member fishing vessel group
h) Obligation of SPI owner

- The DG of Capture Fishery of the MMAF gives a penalty based on the relevant law, if the licensee offends the contents of the license.
- For the use of the Fish Aggregation Device (FAD), the applicant is required to apply for setting that when he/she applies to get a fishing business license.

iii) Institutions based on the "Decentralization Policy" Law No. 22 of 1999

- The province manages the marine territory within 12 nautical miles from shore.
- The province has a power and responsibility to manage natural resources in its marine territory and utilize, exploit, protect and control the marine resources and conduct zoning and legal enforcement.
- The power of district and municipality in the above marine territory is one thirds (1/3) or more of the provincial marine territorial area. (In fact, 4 nautical miles from shore)
- In the place where coastal community has a traditional fishing management regulation (customary law), the province and district must prepare the relevant legal basis based on that. In case coastal community does not have any, the province and district makes a new legal basis.
- If penal acts against the above provisions happen, the suspect is imposed to pay fine of Rp.5 million or less, or imprisonment of 6 months or shorter.
- Traditional fishermen (Although there is no definition of the term) are neither restricted their original fishing ground nor their operational or moving area. (In the Basic Fishing Law of 1985, fishermen whose daily livelihood depends on fishing activities are described. The MMAF advocates these fishermen should be called as traditional fishermen or artisanal fishermen. In this report, this interpretation is cited for defining the term of "artisanal fishermen".)

iv) The Regulation on Decentralization regarding Marine Area, MOHA in 1999 (The MMAF explains this regulation is still in draft and has not validated.)

- A marine border between two neighboring or facing provinces is not made.
- The province gives a fishing license to fishing vessel of 15GT or higher up to less than 60GT, and the district and municipality gives a license to fishing boat of less than 15GT. (No description about engine's HP)
- The province, district and municipality have power to levy users of marine and fishery resources in their respective managing waters
- The marine area is divided into three zones, namely "Protection Area", "Exploitation Area" and "Special Area". The regional autonomies manage those zones.
- The province has a power of law enforcement.
- Conservation of traditional fishing is respected and customary law is recognized.

v) Article No. 392 of ministerial decree of agriculture 1999 (Regulation on fishing ground)

- Fishing ground is divided into 3 categories from Area 1 to Area 3. Area 1 is a marine area within 9 nautical miles from shore, of the area within 3 nautical miles from shore is called "Coastal Area". In coastal area, only non-powered boat of the length shorter than 10m can operate fishing and only non-movable type fishing gear like "stow net" is allowed to use. In the area outside of coastal area up to 6 miles from shore, fishing boat with outboard engine and the length shorter than 12m and the weight less than 5 tons can enjoy fishing. Purse seine net shorter than 150m and drift gill net shorter than 1,000m is allowed to use in the area.
- In the Area 2 (No description about distance from the Area 1), fishing boat of 5 tons or heavier up to less than 60 tons can operate (No description about engine's HP). Purse seine net shorter than 600m, Tuna long line with 1,200 hooks or less and drift gill net shorter than 2,500m is allowed to use.
- In the Area 3 (No description about distance from the Area 2, but it can be interpreted the area is outside of 12 miles from shore, since foreign vessel is permitted to operate fishing in the same area.),

fishing vessel up to 200 tons in maximum is allowed to operate fishing. Foreign fishing vessel can also participate. There is no description about fishing gear allowed.

vi) Article No. 51 of ministerial decree of agriculture 1997

- The district has an authority to issue a license for setting artificial reef and/or floating reef in sea shallower than 200m in depth and marine area within 3 miles from shore. The province has an authority to setting artificial reef and/or floating reef in marine area within 12 miles from 3 miles line.
- Setting deep sea artificial reef which set 200m in depth or deeper, needs a license issued by the central government. Fishing company, governmental agency and research institute exclusively can apply for that. Setting points must be within 12 miles from shore. Small-scale fishermen can access freely to the points nearby the deep sea artificial reef and enjoy fishing.

vii) Article No. 15 of governmental decree and Article No. 815 of the ministerial decree of agriculture in 1990

- Fishing licenses necessary to all Indonesian and foreign fishing vessel
- The central government can give a fishing license to fishing vessel of 30GT or higher. The governor of province can issue a fishing license to fishing vessel of less than 30GT or with less than 90HP engine. (The district's fishery service can issue a fishing license to fishing boat of 5GT or higher up to less than 10GT.)

viii) The Basic Fishing Law (Article No. 9 of fishing act in 1985)

- Since this law was provided under recognition of non-deterioration of fishery resources, there are few provisions about fishery resources management. (There are almost no descriptions of data collection method for captured fish, registration of fishing boat and vessel, restriction of fishing ground, fishing gear and target fish species.)
- Ban of trawl
- Ban of dynamite and/or poison-use fishing (Penal person is imposed 10 years' imprisonment or less, or fine of Rp.100 million or less.)
- Introduction of fishing license to all fishermen (companies/individuals) who operate fishing activities in Indonesian marine areas (except traditional fishermen)

- There is no description about transfer, suspension and reissue of fishing license.
- Fishing controlling officer controls penalty against the fishing law and illegal fishing. (The officer can investigate fishing boat/vessel, document, fishing gear and the catch, but does not have a power to order to stop fishing boat/vessel and to arrest.

ix) Article No. 39 of presidential decree in 1980

- Ban of trawl fishing in marine area of western part of 125 degrees of east longitude.

x) Article No. 123 of ministerial decree of agriculture in 1975

- Regulation on mesh size of purse seine net used for pelagic fish capture fishery targeting for mackerel and flying fish etc. in coastal marine area and IEEZ

2) Movement Related to Fishing Management in Line with International Regulations

- The government of Indonesia approved "Code of Conduct for Responsible Fisheries" made by FAO in 1995, and has been continuing effort to realize the implementation since then. The government's policy prioritizes on resources management for sustainable utilization of fishery resources that have not been given a high priority before.
- The government conducts stock assessment of potential resources by main fishing target species in IEEZ following the United Nations Convention for Law of Sea (UNCLOS) held in 1982, and regards 80% of the potential as a total allowable catch (TAC). In addition, calculating average fishing efficiency by type of fishing methods, the government decides number of fishing licenses.

3) Institutions Related to Aquaculture

322-4 In PROPENAS, the expansion of domestic consumption of fishery products and generation of employment were identified as major issues and the promotion of freshwater aquaculture, which requires low capital, was given a high priority. Afterwards, the government has also prioritized export promotion due to decentralization progress based upon the law no. 22 for strengthening economic and financial base of regional autonomies. MMAF has placed a high priority on the promotion of mariculture (Strategic Plan of Ministry of Marine Affairs and Fisheries,

2002). In 2002, the Directorate General of Aquaculture of MMAF has identified new target species for aquaculture promotion, namely prawn, grouper, seaweed and tilapia. The governmental direction for aquaculture development prioritizes an increase of the production. However, there is almost nothing about institutional support and preparation for managerial and technological aspects on aquaculture such as harmonization with environment, water dimension utilization, pathologic countermeasures and quality control of cultured fish. The followings are major laws and ministerial decrees.

i) Article No. 1042 of ministerial decree of agriculture in 1999
- Regulation on certification system for seed quality

ii) Article No. 1041 of ministerial decree of agriculture in 1999
- Regulation on seed production and distribution of seed

iii) Article No. 811 of ministerial decree of agriculture in 1999
- Definition for certification of seed quality at national aquaculture development center in region

iv) Article No. 810 of ministerial decree of agriculture in 1999
- Permission by the Minister of Agriculture for aquaculture of new target species and strains

v) Article No. 26 of ministerial decree of agriculture in 1998
- Seed producers either public institute or private hatchery must make a seed production manual

vi) Law of 1950
- The central government gives a license for aquaculture business invested by foreign capital. (Pearl oyster culture, prawn culture etc.)
- Though basic law or ministerial decree can not be identified, there seems to be certain regulation that anyone who engages in prawn culture and whose ponds are more than 250ha must have a facility for waste treatment.

4) Institutions Related to Fish Trade

i) Item No. 7, Article No. 64 of law "Power of central government and regional government" in 1957 (It was lined by the Ministry of Home Affairs in 1992.)
- The regional government must implement "auction" regarding to fish trade based upon the guideline of the MOA.
- Based on the above law, the Ministry of Home Affairs notified each province and district and ordered to make acts regulate auction

implementation rules, places and organizations.

- The outline of the above notification is as follows:
- The regional government has an ownership of premises for implementing auction.
- The regional government has a role for implementing auction. But the same may consign fishermen's organization like KUD. In this case, the regional government selects capable fishermen's organization for implementing auction based upon a selective standard. The regional fisheries service directly manages the auction when the regional government judges no-availability of such a fishermen's organization.
- Basically, the auction must be implemented daily.
- After auction implementing organization selected, the local fisheries service, cooperative service, tax office and port office of the regional government monitor whether auction is implemented properly or not.
- The fishermen's organization, which is an implementing agency of auction, appoints a leader of auction and gets approval from the chief of local fisheries service and port service of the regional autonomy.
- Anyone can participate in fish trade through auction. At the every participation, buyer must be registered in the local fisheries service or fishermen's organization that is an implementing agency of the auction.
- The record of fish trade through auction must be submitted to the local fisheries service of the regional government periodically.
- The success of auction and the price must be made public announce.
- Before auction starts, the catches are sorted by species, size, quality (mainly freshness), owner (catcher) and weighed, and put into container.
- The potion of space for weighing, auction hall and packing must be 1:2:1.

ii) Item No. 19 of Article No. 9 of basic fishing law in 1985

- Improvement of income of fishermen and aquaculture farmers, and supply fishery products to consumer with reasonable price by proper fish trade and the quality improvement. (KUD and fishing companies are responsible for this role.)

5) Subjects to be Considered in the Future

i) The responsibilities of central and regional government relating to

fishery resources management following the decentralization must be clarified by law and institution. The central government needs to prepare a guideline for fishery resources management implemented by province.

ii) The district and municipality manages marine area within 4 miles from shore and the province manages the same out of 4 miles' line up to 12 miles from shore due to the decentralization. However, knowledge and ability of regional autonomies' administrators are insufficient, so that there is almost no preparation of proper institution and implementation of fishery resources management. Therefore, a guideline is important to clarify a national direction for guidance, enhance ability of regional autonomies' staff and prepare fishery resources management system in coastal communities.

iii) The existing laws and regulations relating to fishing management are old-fashioned. Therefore, revisions are necessary to realize decentralization and international sustainable utilization of fishery resources.

iv) Nobody has an ownership of fishery resources until they are caught. Basically fishery resources are in free access. Therefore, the central government has a responsibility to establish a proper resource management system, and needs to make an effort to realize common direction for resource management to some extent with regional autonomies under the decentralization.

v) Regarding fishing management, the article no. 60 of the ministerial decree of MMAF in 2001 stipulates fishing rules in IEEZ outside of 12 miles from shore. It describes types of fishing license, tonnage of fishing vessel, fishing method allowed, penalty for illegal fishing and items that foreign vessel must follow etc. in detail. However, the area for coastal capture fishery is within 12 miles from shore, and there are almost no systematic rules and regulations for fishing in this area. (As mentioned in "Institutions relevant to fishing management", there are many different management regulations and contradictions. Though MMAF recognizes Article no. 141 of the ministerial decree of MMAF in 2000 as a regulation for fishery resources management, it is urgently necessary to review these regulations based on the above laws and ministerial decrees and prepare detailed implementation rules.)

vi) Illegal fishing such as dynamite fishing, poison-use fishing and penal fishing done by foreign vessels are rampant. It is necessary to strengthen an institution and system for controlling fishing.

vii) It is necessary to establish a legal framework and regulations for measures necessary for management and technical support on the sustainable development of aquaculture. In particular, a preparation of legal framework from aspect of proper and sustainable utilization of open waters is inevitable, since rearing technology with environmental harmonization is unsettled.

viii) With regard to aquaculture which uses open waters such as lake, river and coastal area, public sector should take necessary measures such as restriction of area for the culture, number and size of setting net cage, allowable number of fish in the cage, licensing, controlling of feeding and prescribing, system for environmental monitoring and expenditure of necessary social cost. These are public sector's roles and important.

ix) As a necessity of support by public sector for aquaculture promotion as a whole, quality analysis of seed and cultured fish and conservation of bloodstock with superior genetic characteristic etc. are important. Extension service given to aquaculture farmers technological and managerial know-how enables them to produce high quality fish with low cost and preparation of guideline for aquaculture, which shows rearing techniques and reduces bad effects to natural environment, is also indispensable.

(2) *Fishery Extension System*

322-5 In July 2001, the Center for Fisheries Education and Training in the MMAF planned for the deployment of fishery extension staff. In the first plan, those who had a background in fishery education in the existing agricultural extension staff were to be separated into various specialties, such as fishing, aquaculture, processing, distribution economics, and so forth. Afterwards, the scrutiny made by the Indonesian Fishery Society was repeated several times in the Center. Furthermore, a new system of fishery extension staff will be launched individually in each district as soon as it is approved by the MMAF within this year (2002), and local governments are to gain autonomy for recruitment and their allocation in this system. This system is expected to be approved by the government as "Guidance for Fisheries Extension Activities". In this system the

extension staff are classified into the four categories shown below:

i) Functional Extension Worker (school teachers, etc., mainly prepares extension plans; assigned by the district)
ii) Non-functional Extension Worker (main extension staff at the sites)
iii) Part-time Extension Worker (temporary extension staff employed on annual contract basis)
iv) Staff of Fishery Company (company employee assigned by the district)

322-6 No. ii) above is a civil servant in the district, iii) is a part-time worker, and i) and iv) get special payment for the commission from the district. The qualification to be a fishery extension worker must be equivalent or higher than D3 (graduation from fishery higher education academy).

Subjects to be Considered in the Future

322-7 The system of the fishery extension workers will be formally initiated soon, and the workers will have to follow the policies and directions of each district since they are civil servants in the districts. Hence, the activities of fishery extension workers are dependent on the financial situation and the important issues for development in each district. It is realized, however, that it is necessary to standardize the operations guideline, the content of activities, and the level of skills to a certain degree in order to vitalize fishing villages and improve fishery techniques. Thus, the tasks of the MMAF include policy-making for the education of fishery extension workers in the district and the maintenance of practical extension systems.

(3) Fishery Education

322-8 The MMAF has jurisdiction over fishery universities, fisheries higher education academies, and fishery high-schools not under the Ministry of Education. Thus, the MMAF includes financial management of these educational institutions. Despite the trend of encouraging decentralization in Indonesia at present, the management of the above educational institutions falls directly under the MMAF, including the maintenance of training vessels and dormitories which must be handled and funded by the Ministry.

322-9 Graduates from universities belonging to the Ministry of Education have the rank of S1 (bachelor degree), S2 (master degree), and S3 (doctoral degree). However, graduates from institutions belonging to the Technical Ministry such

as MMAF are assigned different status, as follows:

Diploma 1 (D1) – from fishery high-school without general subjects
D2 – from fishery high-school with general subjects
D3 – from fishery higher education academy
D4 – from fishery university.

322-10 The educational systems of the Ministry of Education and the Technical Ministry such as MMAF differ in terms of the distribution of lessons, that is, theory and practice. In the former, the distribution of theory and practice is divided in a 3:2 ratio. In the latter, the distribution is 2:3.

322-11 When the graduates become public officials in national or local governments, those from schools belonging to the Ministry of Education tend to be researchers and administrators. On the other hand, those from the schools belonging to the Technical Ministry such as MMAF tend to be engineers. The graduates from university tend to be fisheries' staff of central or regional government, staff of port administration, quarantine officer of airport and technical staff of fishery company, and those from fishery high school tend to be fishery extension workers of the district.

322-12 Improvement of the ability of school teachers to deliver international standardized curriculums for fishery education is a major issue. Also, there are other issues, such as decrepitude of practical machinery and infrastructures.

322-13 MMAF has recently revised the curriculums in the light of decentralization process and economic globalization. Fishery university and fishery academy curriculums consist of five courses: fishing technology, machinery for fishing vessel and fish processing, fish processing technology, aquaculture and fishery resources. The fishery high school curriculums consist of four courses: fishing technology, machinery for fishing vessel and fish processing, fish processing technology and aquaculture. The curriculum for fishing technology was made based on Standard for Training and Certification of Watch-keeping Fishing Vessel Personnel (STCW-F1995), International Maritime Organization (IMO) and the Code of Conduct for Responsible Fisheries made by the FAO. The curriculum for machinery for fishing vessel and fish processing was made based on IMO, and the fish processing curriculum is based on HACCP, and the curriculum for aquaculture is based on AMDAL (Analysis for the Impact of Environment: *Analisa Mengenai Dampak Lingkungan*), a kind of national standard. Graduates of the fishing technology course can get a certificate to be a sailor based on article no. 2 of the National Education Law enacted in 1990.

Those of the fish processing technology course get a certificate of a controller of fish quality.

322-14 School teachers at both fishery university and high school levels must be graduates of fishery university or university which has a fishery faculty. Also the applicant must have an experience of having lecture at university. In case of technical instructor for navigation practice and engineer of vessel engine, the national qualification is different between fishery university and high school. The former requires "Grade I " in both navigator and engineer, and the latter requires "Grade II ".

Educational Institute managed by MMAF

	No. of Teachers	No. of Students
University		
Fisheries University of Jakarta	69	1,000
Fishery Academy		
Sidoarjo Fisheries Academy	20	210
Bitung Fisheries Academy	13	268
Sorong Fisheries Academy	10	67
Fishery High School		
Fisheries High School at Aceh	6	260
Fisheries High School at Pariaman	10	306
Fisheries High School at Pontianak	9	331
Fisheries High School at Tegal	29	366
Fisheries High School at Bone	13	260
Fisheries High School at Wachelu, Ambon	10	260
Fisheries High School at Sorong	16	341
Fishery Training Center		
Fisheries Training Center at Medan	15	-
Fisheries Training Center at Tegal, Central Java	35	-
Fisheries Training Center at Banyuwangi, East Java	20	-
Fisheries Training Center at Aertembaga, North Sulawesi	18	-
Fisheries Training Center at Ambon, Maluku	2	-

Note: As of August 2002
Source : Fishery Education Training Center 2002

Subjects to be Considered in the Future

- We recognize that sustainable development and utilization of marine and fisheries resources have the highest potential in promoting the national economy, stable food supply, and nutritional improvement. Thus, MMAF has improved curriculums for fishery education to meet social needs. The relevant topics include resources management, environmental conservation, rural development of coastal and remote islands, improvement of the quality of fishery products, and health management. However, it is a crucial issue to secure sufficient number of teachers and enhance their capability sustains the curriculums.

- It is also important to provide academic teaching materials, supplementary teaching tools and equipment for practice on implementation of the new fishery education.

3.2.3 Fishery Production and Technology

(1) Capture Fishery Production

1) Production

323-1 According to the fishery statistics published in 2001, the total yield of fishery production, which is the sum of capture fishery and aquaculture production in 1999, was approximately 4.57 million tons. Marine capture fishery production was 3.68 million tons, or 80% of the total. Inland open water capture fishery production in rivers and lakes was about 0.33 million tons, or 7.2% of the total.

323-2 As for marine fishery, in compare to the previous year (1998), the total production shows 1.11% decrease. This is mainly due to decrease of marine capture fishery production, especially drastic diminution of a kind of sardine "*Indian Oil Sardinella*"(refer to the table in the paragraph of 323-5). The total production increases 1.5 times of the 1990's.

323-3 Of the total marine fishing establishments, the number of fishing establishments "without boats" was 61,000 in 1999. This is the highest on record since 1990. "Non-powered boat" fishing establishments have increased gradually every year since 1990, reaching 230,000 in 1999. The "Outboard engine" of "Powered boat" fishing establishments category registered a 1.4-fold increase, from 69,000 in 1990 to 99,000 in 1999. "Inboard engine" fishing establishments increased from 42,000 in 1990 to 108,000 in 1999. This rate of increase is 2.6 times. These figures show an increase in marine fishing establishments and more developed motorization of fishing boats.

323-4 It is obvious that motorization of fishing boat is high in Western Java, Eastern Sumatra, Malacca Strait, South-western Kalimantan and Eastern Kalimantan, where the fishery production is high. It means fishing effort in the above areas is high. In particular, in South-western Kalimantan and Eastern Kalimantan, in-board engine vessel occupies 85% and 61% of the total number of fishing boats, respectively. In Malacca Strait and Eastern Sumatra, it occupies more than half of the total. 70% of the fishing boats are boat-without engine in Eastern Indonesia such as East and West Nusa Tenggara, Maluku and Papua. (National Fishery Statistics 2001)

2) Target Species of Capture Fishery

323-5 Of the total of 3.68 million tons produced by the marine capture fishery in 1999, scads (*Decapterus spp.*) has the highest production of 260 thousand tons, followed by skipjack (*Katsuonus spp.*) of 240 thousand tons, eastern little tuna (*Euthynus spp.*) of 240 thousand tons, prawns of 236 thousand tons, anchovies (*Stolephorus spp.*) of 160 thousand tons and tunas of 136 thousand tons (refer to the table below). The production of many other species was several tens of thousands of tons. There is year to year fluctuation in the catch volume, but it has tended to increase as a whole since 1990, except for Indian oil sardinella (*Sardinella longideps*), which fell drastically in 1999. The capture production of benthos other than finfish ranges from hundreds of tons up to 30 thousand tons. It has tended to increase slightly overall, with the exception of bivalves (National Fishery Statistics 2001).

Marine Capture Production by Species, 1990-1999

(Unit:ton)

	1990	1992	1994	1996	1998	1999
Flat fishes	4,539	5,461	7,501	10,810	13,659	17,145
Slip mouths	41,768	45,537	57,462	71,402	79,532	91,219
Goat fishes	9,712	11,332	16,770	20,724	25,207	26,252
Red snappers	46,136	49,300	58,338	60,342	66,280	66,492
Groupers	15,797	21,767	39,921	38,287	43,766	43,472
Giant seaperch	25,236	27,477	38,446	48,310	65,193	65,173
Yellow tail	16,705	21,138	28,300	32,713	34,142	37,944
Drums	29,604	34,732	37,400	45,233	50,114	56,991
Sharks and Rays	73,272	80,139	92,776	94,691	110,788	108,393
Scads	170,725	195,709	219,893	251,289	277,593	261,138
Trevallies	90,147	100,472	113,930	116,193	128,459	128,795
Mullets	21,688	26,968	30,975	35,451	35,582	35,437
Anchovies	127,797	133,910	150,568	161,779	166,808	163,117
Fringescale sardinella	134,972	139,352	166,452	157,105	174,691	162,710
Indian Oil Sardinella	113,515	137,022	128,202	88,589	153,965	89,286
Indian mackerels	145,377	177,092	194,882	188,912	204,763	201,466
Tunas	88,666	90,451	89,330	115,549	168,122	136,474
Skipjack tuna	114,168	152,038	157,663	182,147	227,068	244,847
Eastern little tuna	139,967	155,661	186,486	208,504	236,673	236,111
Other fish	627,259	722,200	859,025	974,480	1,062,646	1,083,225
Prawns	143,993	163,077	175,713	184,806	220,156	235,621
Other crustaceans	10,833	15,561	20,018	22,273	23,733	26,730
bivalves and gastropods	36,503	50,208	60,455	62,398	51,603	51,541
Cephalopods	17,906	24,017	32,199	38,165	46,842	51,375
Other molluscas	662	1,089	136	666	509	544
Jellyfish	1,346	5,826	2,803	6,740	3,861	32,652
Other invertebrates	2,538	2,770	4,086	4,355	4,476	5,142
Seaweeds	119,276	101,762	110,438	161,543	47,515	23,152
Total	2,370,107	2,692,068	3,080,168	3,383,456	3,723,746	3,682,444

Source: National Fishery Statistics 2001

323-6 Classifying into sea areas, in Eastern Sumatra, Malacca Strait and Western Java, finfish for mainly local consumption such as scads, yellow strip (*Selar spp.*), drums (*Sciamidae*), sardine, sharks, rays, squids and bivalves, and crustaceans such as crabs and shrimps are landed a lot. In Nusa Tenggara, South Sulawesi, North Sulawesi, Maluku and Papua, large quantities of tunas, skipjack, and black tiger prawn(*Penaeus monodon*), most of which are exported by the Indonesian fisheries sector, are captured. Fishing companies buy these catches and export them to foreign countries by air mainly from Bali. Groupers that are highly demanded in the market of Hong Kong, Taiwan, Malaysia and Singapore, are landed mainly Western Sumatra and Malacca Strait etc., where are closer to those foreign market. (National Fishery Statistics 2001).

3) Fishing Methods

323-7 In marine capture fishery, the number of *payang* fishing units has increased every year, from 16,000 in 1990 to 27,000 in 1999. The number of anchored *bagan* fishing units has remained at 12,000 since 1990. On the other hand, movable *bagan* fishing units continued a slight increase, from 10,000 in 1990 to 11,000 in 1999. The number of gill net fishing units that can be easily operated with relatively small capital has increased significantly from 167,000 in 1990 to 224,000 in 1999.

323-8 Skipjack pole & line fishing and tuna long line fishing are the export fishing types. The number of skipjack pole and line units reached to a peak of 2,616 in 1994 from 1,378 in 1990, then fell to 1569 in 1999. The number of tuna long line fishing units has sometimes increased, sometimes decreased, fluctuating from 879 in 1990 to 1,884 in 1999. Purse seine fishing, which was introduced from foreign countries, has increased in number from 6,715 in 1990, and reached a peak of 10,000 in 1998, before decreasing to 9,924 units in 1999.

4) Production by Type of Fishing Methods

323-9 The statistical data of the marine capture production by type of fishing methods (fishing gears) shows an increase in general for 10 years since 1990. In particular, cast net and Danish seine net, which need low capital and easy to be engaged in, have become around 5 times and 3 times increase in the 10 years, respectively. The production caught by gill nets has increased 41% in the same period. Otherwise, an increase of capture

production of payang(94%), skipjack pole & line(80%), trap fishing(72%), movable bagan(70%), tuna long line(64%), scoop nets(55%), trolling(55%) and purse seine(48%), respectively, are obvious in the table below. It is presumed that there is a particular increase in the number of cast net, Danish seine net and gill net, which is collateral increase of number of artisanal fishermen. Non-movable type bagan fishing, stow net and shell fish collection etc., have almost remained unchanged in terms of the capture production for the 10 years. Payang fishing, Danish seine net, purse seine net, gill net, tuna long line, line fishing including pole and line fishing, trolling and trap fishing etc., have increased the capture production and number of fishing units as well in the same period. The number of movable bagan fishing units has not increased, but the capture production has drastically increased in the same period. It can be said that the fishing efficiency has become high in movable bagan fishing. The numbers of non-movable bagan, guiding barriors and stow net fishing units have slightly increased or remained static, but capture production has remained on the same level or tended to decrease. In shell fish collection, the number of fishing units and also the capture production have decreased. As a whole tendency, the decrease of capture production of stow net and guiding barriors, which are negative fishing methods waiting fish entrapped naturally near shore, and decrease of number of fishing units and the capture production in shell fish collection, mean deterioration of resources in near shore. It is presumable that the capture production has increased in trap fishing, since the fishing ground has been expanded to the offshore and deeper areas. This fact is also related to the development of motorization of fishing boat. The increased capture production of payang, movable bagan, purse seine, pole and line and trolling derives from an increase of the productivity as resulted from motorization and enlargement progress of fishing boat. The capture production of purse seine, movable bagan fishing and trolling has tended to increase annually until 1998, although it has decreased in 1999. Pelagic fish, as a main target of the above fishing methods, tends to be decreased and it seems to be a serious phenomenon of the resource deterioration. (National Fishery Statistics 2001)

Marine Capture Production by type of Fishing Methods (Fishing Gears)

(Unit : Ton)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
BED equiped shrimp trawl	18,249	23,846	44,928	56,652	79,619	95,536	113,596	85,667	101,366	88,844
Payang	198,764	206,127	206,098	267,449	242,450	217,976	245,297	296,324	318,597	385,342
Danish seine (Dogol)	22,172	26,161	42,394	40,981	45,618	48,071	52,287	47,155	60,580	65,809
Beach seine	85,729	102,853	94,966	103,119	92,611	103,639	110,437	124,505	116,370	119,778
Purse seine	395,857	441,135	488,686	515,291	611,464	586,241	554,573	637,458	661,354	585,680
Gill net	539,190	579,102	593,524	636,795	685,307	708,428	748,414	813,759	833,909	818,629
Movable *bagan*	126,817	140,644	153,546	149,358	160,208	183,259	181,028	193,675	218,432	215,549
Non-movable *bagan*	93,338	87,850	87,980	96,865	88,364	81,421	85,111	104,659	94,829	93,107
Scoop net	45,751	44,820	42,640	60,666	45,527	165,503	42,076	61,111	42,908	70,833
Tuna long line	40,674	33,168	33,336	29,469	40,910	58,631	47,207	57,200	57,405	66,595
Drift long line	17,101	24,662	20,936	26,299	29,844	26,372	33,340	43,052	37,560	48,737
Set long line	52,260	53,027	50,622	56,463	78,236	69,327	73,268	74,544	76,552	75,860
Skipjack pole and line	78,529	87,596	113,370	82,991	92,968	89,611	113,272	111,618	152,497	140,974
Other pole and line	189,109	185,762	194,943	223,017	220,695	255,684	251,325	271,739	299,922	257,960
Trolling	76,750	88,799	82,306	92,774	93,131	99,466	122,043	103,525	154,532	119,026
Guiding barriers	40,574	43,915	46,641	48,688	55,200	60,437	72,038	58,599	62,479	61,473
Stow net	111,131	110,093	110,218	97,043	106,271	100,838	99,824	108,794	94,206	105,196
Traps	41,076	57,099	53,767	71,359	60,399	74,040	75,200	82,096	70,214	70,455
Shell fish collection	35,225	34,712	39,686	41,904	49,298	51,524	54,086	46,865	39,615	40,194
Seaweed collection	115,764	97,356	98,943	115,391	110,363	111,439	132,686	118,221	46,925	23,611
Muro Ami	3,705	3,563	2,774	4,430	7,319	7,541	8,733	13,318	11,904	12,600
Cast net	42,342	65,322	89,764	69,285	84,366	97,946	167,617	159,077	171,590	216,192
Total	2,370,107	2,537,612	2,692,068	2,886,289	3,080,168	3,292,930	3,383,458	3,612,961	3,723,746	3,682,444

Source: National Fishery Statistics 2001

5) Fishermen

323-10 The number of marine fishermen was approximately 2.41 million in 1999, composed of 1.18 million full-time fishermen, 0.87 million part-time fishermen who mainly spend their time fishing, and 0.365 million part-time fishermen who mainly spend their time in other occupations. On the other hand, the total number of inland open water fishermen was approximately 0.48 million, a slight increase from the 0.47 million in 1990. Of these, only 0.146 million were full-time fishermen, 0.21 million were part-time fishermen who mainly spend their time fishing, and 0.125 million were part-time fishermen who mainly spend their time in other occupations. In comparison to 1990, the sum of all types of fishermen registered a 58% increase.

323-11 The MMAF estimates that, throughout Indonesia, there are 5 million fishermen including unregistered ones who were not recorded in the statistics in 2001. Most of them are poor people who moved from large cities to find employment.

323-12 There is no statistics about fishermen's income. As a result of the Coral Reef Management Project done by DG of Coastal and Small Islands of MMAF, which surveyed fishermen household income in 10 provinces, the monthly income per household was in the range between Rp. 82,500 and 225,000. In 1996, the Bogol Agricultural University surveyed household income of artisanal fishermen of Lombok Island, and reported an income range of between Rp.17,545 and 53,626 per month. The minimum wage of laborers in Indonesia is regulated in each province. The range of monthly income is between Rp.230,000 (Maluku province) and 510,000 (Batam Special Zone in Riau province) in 2001.(Report of the Ministry of Labor and Immigration 2001). The fishermen's household income is very low compared to the minimum wage regulated by provinces.

6) Fishery infrastructure

323-13 Fishery infrastructure consists of fishing boats and fishing ports/fish landing places. In Indonesia, there were 22 fishing ports and 570 fish landing places as of 2002, as shown in the table below.

Breakdown of fishery infrastructure

Type A	Type B	Type C	Type D	Total
5	14	3	570	592

Type A: Oceanic Fishing Port (National fishing port; corresponds to pelagic fishery)

Type B: Archipelago Fishing Port (National large-scale main fishing port)

Type C: Coastal Fishing Port (Main fishing port; corresponds to coastal fishing)

Type D: Fishing Landing Place (Regional landing place)

323-14 As mentioned previously, under article 22 of the Decentralization Law of 1999, the management body of type C fishing ports was transferred to provincial governments and Type D landing bases were transferred to districts. The classification for definition of each fishing port is as follows.

Type of Fishing Port	Fishing Vessel using the Port	Number of Fishing Vessel using the Port per day	Daily Fish Landing Volume	Land Area for Fishery Facility
Oceanic Fishing Port	> 60GT	100	200MT	30 Ha
Archipelago Fishing Port	15-60GT	75	50MT	10 Ha
Coastal Fishing Port	5-15GT	50	15-20MT	5 Ha
Fish Landing Place	< 5GT	20	5 MT	1 Ha

Source : Directorate of Capture Fisheries Infrastructure, MMAF

7) Fishing controlling and surveillance

323-15 The DG of Marine and Fisheries Resources Controlling organized the Civil Office Investigator (PPNS) system in 2002 and appointed 600 members, delegating power and responsibility for the control of illegal fishing, penal regulations and arrest by the fishing law revised in 2002. The plan is to train 4,000 people in the future. The DG has 4 fishing patrol vessels, but this is not sufficient. So they cope by riding together in the patrol vessels of the navy and marine police (POLAIRUD). Out of the total 112 patrol vessels owned by the navy, 42 patrol vessels are engaged in fishing patrols. The MMAF bears the cost of fuel for the controlling operations.

323-16 The DG contributes to the budget for community-based fishing management projects to support fishermen groups' activities by establishing micro-credit institutions in 6 provinces—Aceh, South Sulawesi, West Nusa Tenggara, Bali, Maluku and Jambi.

323-17 The article no. 22 of the law of decentralization of 1999 stipulates that each province and district should prepare regional law and regulation on fishing licensing system and controlling based on the national basic policy which is shown in the 3.2.2 "Policy and Institution for Fishery Promotion" in province or district where coastal communities have customary law "*avic-avic*", and obliges to prepare new regional law and regulation newly where there is no "*avic-avic*". Fishing licensing system and controlling are necessary for the purpose of fishery resources management, but they does not function effectively without legal enforcement.

8) Fishery Resources Management and Sustainability of Capture Fishery

323-18 The Assistance Strategy Formulation Study conducted in 2001 confirmed that the development potential of fishery resources in marine capture fishery is 6.19 million tons in Indonesia, and the total allowable catch is 5 million tons per annum. The marine capture production in 1999 was 3.68 million tons, equivalent to 60% of the potential. It is politically important to reduce fishing effort, recover the resources condition and manage it in the western sea of Indonesia, where the resources are almost exhausted. And it is also necessary to utilize fishery resources in a sustainable and efficient way in the eastern sea, where fishery resources are still in good condition. Details of the potential and utilization rates are shown in the table below for each area.

Marine Fishery Resources Potential (MSY) and Capture Fishery Production

Sea Area	MSY(ton)	Capture (1999)(ton)	Utilization Rate (%)
Malacca Strait Area	238,900	537,793	225.1
South China Sea Area	1,220,800	404,528	33.1
Java Sea Area	842,500	674,834	80.1
Flores and Makassar Strait Area	663,200	609,211	91.9
Banda Sea Area	245,900	361,111	146.9
Seram Sea - Tomminy Bay Area	577,500	87,552	15.2
Pacific Sulawesi Sea Area	687,900	181,891	26.4
Arafura Sea Area	791,300	179,110	22.6
Indian Ocean Indonesian Sea Area	904,600	646,414	71.5
Total	6,172,600	3,682,444	59.7

Source : National Commission on Stock Assessment of Marine Fisheries Resources 1998, National Fishery Statistics 2001

323-19 Based upon the decentralization law, marine and fishery resources in the areas within 4 nautical miles from shore shall be managed by district and municipality, areas between 4 nautical miles and 12 nautical miles by province, and areas beyond 12 nautical miles by the central government, respectively. However, since the decentralization is still in progress, it takes more time to establish systems for fishery resources management in regional autonomies. Under the present circumstances, it is desirable that the regional and local governments should support community-based

fishery resources management. It is one of the important measures for regional autonomies to make communities' customary law *"avic-avic"* to be models of an institution for local government's fishery resources management. The provinces and districts located in the coastal areas have been seriously suffering from coral destruction, marine water pollution and deterioration of fishery resources caused by illegal fishing such as dynamite fishing and poison-use fishing, and over-fishing caused by foreign and domestic fishing fleets.

323-20 Under the decentralization policy, assistance projects supported by foreign donors, which directly go to communities, have increased. The World Bank, ADB and USAID etc., have been implementing projects to improve the livelihood of coastal communities and capacity building of regional and local governments focusing on community-based coastal resources management with consideration given to environmental protection. However, these donor agencies do not have a support program from a view of fishery development for the sustainable use of fishery resources by implementing coastal resources management. The MMAF puts high priority on appropriate fishery resources management for the sustainable development of capture fishery, which is a source of stable supply of fishery products as an important protein resource and an income resource for coastal communities.

8) Subjects to be Considered in the Future

323-21 The development subjects are as follows:

- In some areas, fishery resources' utilization is above the maximum sustainable yield, especially in Western Indonesia, because the number of artisanal fishermen and fishing efforts has been increasing. Therefore, after clarification of the powers on fishery resources management between central government and regional autonomies, which is mentioned in the subjects of "3.2.2.(1) Institutions relevant to the policies", it is necessary to prepare a guideline by central government for fishery resources management and directions for the management of regional and local governments, and to support community-based fishery resources management.
- As a result of the policy to increase of capture fishery production, some sea areas and target fish species have been suffered from the deterioration of the resources condition today. It is a transition

period for a direction to sustainable utilization of fishery resources based upon its appropriate management. Hence, it is important for regional and local governments and also communities to prepare management regulations for coastal fishery resources and to implement them.

- Around 90% of total fishermen are poor. This fact is a constraint for education and enlightenment towards them. Therefore, administrative supports are necessary in both, soft components such as informative services and financial services and hard components like infrastructure improvement of fish landing places in order to encourage fishermen to organize themselves as a group and vitalize their economic activity.
- In remote islands, the majority of residents are poor fishermen who don't have an alternative livelihood other than fishing and who have access only to a very limited market. Since, in Eastern Indonesia in particular, there are lots of small, remote islands that remain undeveloped, it is important to develop coastal communities in these areas.
- There is a lot of losses of fish catch due to fishermen's unawareness of fish quality or economic value, improper handling of fish on the fishing boats and insufficient use of ice- and fish-boxes etc. It is necessary to instruct and educate these fishermen about basic technology for on-boat fish handling, while also explaining the relationship between fish quality and sanitary improvement and economic value.

(2) Aquaculture

1) Aquaculture Production

323-22 Before 1998, fishery statistics did not contain any data on marine aquaculture; data on this have been included since 1999. (The figures and numbers mentioned hereinafter in sentences of this report are cited from the 1999 data reported in the National Fishery Statistics 2001.)

323-23 In 1999, the total production of freshwater and brackish water aquaculture and mariculture was approximately 883 thousand tons, with only 300 thousand tons from freshwater aquaculture, 410 thousand tons from brackish water aquaculture and 136 thousand tons from mariculture. As of 1999, aquaculture production occupied approximately 18% of the total fishery production of Indonesia. It has increased 1.8-fold in the 10 years

since 1990. Freshwater aquaculture production such as simple digging stagnant water pond culture, which can be conducted at low cost, tends to increase every year. Mariculture consists mainly of floating cage cultures of groupers or sea bass and seaweeds like *Eucheuma*, from which Karagenan is extracted.

2) Target Species of Aquaculture

323-24 In freshwater aquaculture, common carp has the top share, at 140 thousand tons, 46% of the total production in 1999, followed by tilapia at 17%, catfish at 9% and gourami at 6.4%. Milkfish culture had the top share of brackish water aquaculture production at 50% in 1999, followed by black tiger prawn at 22%. Since the consumer price of common carp and catfish is not expected to rise, the cost reduction is required for aquaculture production. Most mariculture consists of the framing of seaweed like *Eucheuma* etc. MMAF has a plan to construct hatcheries in 5 places in whole Indonesia to strengthen promotion of marine finfish aquaculture such as groupers. The hatcheries in Central Sulawesi and North Maluku have already been started to construct. In Bali, hatchery with super intensive method for napoleon fish and groupers etc. was newly opened by the cooperation of Denmark in May of 2002. Aquaculture production is summarized by species in the table below.

Trends of aquaculture production by target species

(Unit: tons)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Freshwater										
Common carp	89,249	84,369	93,508	131,084	135,238	152,790	178,362	146,672	109,909	139,370
Tilapia	33,874	31,488	34,064	39,964	38,025	45,324	46,691	50422	44,301	51,424
Catfishes	3,739	4,910	6,330	8,042	9,786	12,907	15,627	24,187	19,857	27,350
Gouramies	12,073	10,814	12,379	16,388	11,204	15,759	17,525	17,511	18,260	19,434
Brackish water										
Milkfish	132,432	141,024	147,032	164,448	153,093	151,256	162,127	142,709	158,666	209,758
Black tiger prawn	67,355	96,811	98,358	87,285	83,193	89,344	96,237	96,317	74,824	92,726
Seawater										
Seaweeds	-	-	-	-	-	-	-	-	-	133,720
Fish (grouper, etc.)	-	-	-	-	-	-	-	-	-	2,249

Source: National fishery statistics 2001

3) Fish farmers

323-25 The number of aquaculture business units is approximately 1.2 million, and there were 1.88 million fish farmers in 1999. Compared to 1990, this is a 1.26-fold increase of aquaculture business units and a 1.16-fold

increase in the number of fish farmers. The number of pond culture farmers and paddy field culture farmers fluctuates from year to year. The number of cage culture farmers and brackish water aquaculture farmers tends to increase every year. Most freshwater aquaculture farmers have another jobs like agriculture etc. Seed producers of freshwater aquaculture are mainly entrepreneurs who have a certain business scale, technical and managerial skills. But most producers of grow-out fish are artisanal farmers or family business entities. Constraints of artisanal farmers are very limited capital and lack of technical and managerial know-how. Aquaculture business development between 1990 and 1999 is summarized in the table below.

Trends of aquaculture business units

(Unit: number of business units)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Freshwater pond culture	658,263	696,926	714,378	789,444	816,929	816,888	821,352	790,357	735,922	736,079
Freshwater cage culture	6,536	10,817	10,487	12,316	18,071	26,355	25,815	29,397	31,434	31,676
Paddy field culture	200,886	271,536	189,854	247,421	258,910	270,066	277,157	256,039	151,373	237,423
Brackish water aquaculture	89,327	104,303	109,173	110,041	121,647	125,705	132,450	132,388	144,411	183,173
Floating cage culture	-	-	-	-	-	-	-	-	-	8,237
Marine culture	-	-	-	-	-	-	-	-	-	6,068
Total	955,012	1,086,582	1,023,892	1,159,222	1,215,557	1,239,014	1,256,774	1,208,181	1,063,140	1,202,656

Source: National fishery statistics 2001

323-26 In comparison with aquaculture farming areas, brackish water aquaculture increased 1.4-fold in the 10 years from 1990. Freshwater pond culture also increased 1.26-fold in the same period, but decreased after 1997. On the other hand, the production of each has increased, so the productivity of per unit area has generally improved. Most of fish farmers are poor, and operate extremely small-scale pond culture as well as farming such as rice cultivation. The changes in the area devoted to aquaculture since 1990 are shown in the table below.

Trends of Aquaculture area

(Units: ha)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Freshwater pond culture	44,376	46,460	48,567	43,356	52,064	56,945	57,474	60,368	56,194	56,171
Freshwater cage culture	7	11	10	18	15	46	63	130	135	34
Paddy field culture	106,074	113,731	116,294	127,482	138,277	141,363	142,482	140,404	137,789	135,057
Brackish water aquaculture	230,885	249,605	262,195	261,300	279,480	288,257	292,860	306,741	305,698	332,514
Floating cage culture	-	-	-	-	-	-	-	-	-	32,144
Marine culture	-	-	-	-	-	-	-	-	-	48,775

Source: National fishery statistics 2001

4) Comparison of Aquaculture by Region

323-27 Java had the largest share, with 79% of the total number of pond culture units in Indonesia, as shown in the table below. Sumatra had 14% of the total. Both Java and Sumatra had 94% of the total in Indonesia. Regarding brackish water aquaculture, Java had 49%, Sumatra 22.6% and Sulawesi 20.6%. 45.5% of mariculture was concentrated in Bali and Nusa tenggara, and 42.9% in Sumatra.

Number of aquaculture business units by region (1999)

(Units: number of business units)

	Freshwater pond culture	Freshwater cage culture	Paddy field culture	Brackish water aquaculture	Floating cage culture	Marine culture
Sumatra	106,333	8,649	23,176	41,402	4,381	2,607
Java	582,263	2,945	184,044	90,661	3,714	-
Bali-Nusatenggara	13,638	880	10,681	4,848	142	2,763
Kalimantan	10,819	17,805	1,130	8,016	-	-
Sulawesi	11,552	1,189	18,392	37,688	-	698
Maluku-Irianjaya	11,474	208	-	558	-	-
Total	736,079	31,676	237,423	183,173	8,237	6,068

Source: National fishery statistics 2001

323-28 In 1999, common carp had a 43% share, tawes (*Puntius gonionotus*) 14%, tilapia 20%, catfish 8%, nilam carp 12% and gourami 1% of seed production in the whole Indonesia. The majority of freshwater aquaculture species are produced in Java, followed by Kalimantan of 17%, Maluku-Irianjaya of 14%, and Sumatra of 5%. Most seeds for freshwater aquaculture were provided in Java and Sumatra before 1998. However, it can be observed that other areas have developed seed production within the year. Seed production in 1999 is summarized in the table below

Number of seeds produced by region (1999)

(Units: ×1,000)

	Common Carp	Tawes	Tilapia	Catfishes	Gouramies
Sumatra	557,839	70,610	328,387	87,585	59,001
Java	5,250,470	3,365,344	5,709,308	1,062,708	1,966,725
Bali-Nusatenggara	43,217	100,877	638,754	672	6,398
Kalimantan	920,460	1,113	361,542	757	571
Sulawesi	897,726	793	2,191	-	-
Maluku-Irianjaya	433,320	157,091	295,682	213,310	-
Total	8,103,032	3,695,828	7,335,810	1,365,032	2,032,695

Source: National fishery statistics 2001

323-29 In 1999, the production of edible sized fish (pond culture) was 178 thousand tons in Indonesia as a whole, consisting of common carp accounted for 32%, tilapia for 21%, catfishes for 14%, tawes for 9%, and other fish including Patin for 7.5%. As for characteristics by region, Sumatra and Java produce 93% of the total production of grow-out. In Java, seed production and fish aquaculture production (grow-out) are both very high. In this regard, Java can be called the center of freshwater aquaculture in Indonesia. In Sumatra, on the other hand, fish aquaculture production (grow-out) is greater than seed production. The supply of seed production in Sumatra is dependent on Java and other regions. Regional aquaculture pond production in 1999 is summarized in the table below.

Aquaculture fish production (pond culture) by region (1999)

(Unit: tons)

	Common Carp	Tawes	Tilapia	Catfishes	Gouramies
Sumatra	18,750	2,024	8,175	4,185	2,904
Java	32,773	12,941	26,355	20,116	14,229
Bali-Nusatenggara	699	158	593	219	279
Kalimantan	832	146	501	27	26
Sulawesi	3,828	237	1,288	167	372
Maluku-Irianjaya	396	127	643	277	5
Total	57,278	15,633	37,555	24,991	17,815

Source: National fishery statistics 2001

323-30 Java, Sulawesi, and Sumatra are the three main production areas for brackish water aquaculture, in that order. Those 3 areas occupy 93% of the total production in Indonesia.

323-31 Mariculture production in Indonesia accounted for 136 thousand tons: 83% in Bali-Nusatenggara, followed by Sulawesi at 15% and Sumatra at 2%. Bali-Nusatenggara is the main region for mariculture.

5) Market Value of Aquaculture Fish

323-32 In comparing the productive values of aquaculture, it is not easy to compare the productive value of freshwater species, brackish water species, and mariculture since the market price differs greatly depending on target species, size of fish and freshness etc. However, the productive value of freshwater fish for domestic consumption is relatively low compared with the production volume. In brackish water aquaculture, the productive value of prawns is relatively high compared with productive volume. Such a case is also applied to mariculture, with products like groupers and sea bass.

323-33 At a fresh fish sale corner of a supermarket in Jakarta, a August 2002 survey revealed that the retail prices (freshness kept at standard quality levels) are Rp.12,000 to 14,000 per kilogram for carp and patin (catfish) and Rp.25,000 to 30,000 per kilogram for giant gourami. In the same market, the retail prices are Rp.120,000 to 130,000 for a kilo of black tiger prawns, Rp.100,000 to 160,000 for *Macrobrachium rosenbergii*, and Rp.35,000 to 40,000 for edible frog. Generally, the price of freshwater fish, which has traditionally been eaten daily by Indonesian people, is low.

6) Sustainability of Aquaculture

323-34 It is important for securing the sustainability of aquaculture to supply species and production volume that matches market demand. At the same time, using cost-effective technology, securing or producing seed at low price and in stable condition, and the establishing and disseminating of grow-out technology are also important factors. In general, most artisanal fish farmers learn fish culture by copying neighbors who engage in aquaculture, and do not have a good technology or skill and business management. Some fish farmers get market information through extension workers and radio broadcast. However, it is relatively difficult for majority of artisanal fish farmers to select the market, since some certain middlemen directly contact them and buy fish.

323-35 Consideration of natural water environment is also an important issue. Utilizing natural waters such as lakes, rivers and coastal marine waters for aquaculture can cause water pollution and fish disease occurrence often, if improper culture methods, such as concentration of culture cages and high density of rearing fish, are to be taken.

7) Fish Disease

323-36 An unavoidable issue in fish culture is how to take a measure against fish disease. Although fish disease is a serious problem in aquaculture utilizing natural waters, it is a particularly difficult problem in artificial rearing environments such as pond and aquarium, when the water quality management and feeding amount become unbalanced. Once fish disease occurs, it infects other fish reared in the same water body and often gives destructive damages. It is difficult to identify species of virus, bacteria and parasites. Therefore, strengthening research systems for preventive measures and quarantine are urgently required.

323-37 Large numbers of common carp have died from virus in Java in 2001 and 2002, it gives serious damage to aquaculture industry. MMAF has prohibited to bring carp out of Java and to bring into Java from outside. This regulation is applied not only cultured carp but also to naturally captured one.

8) Subjects to be Considered in the Future

323-38 The following issues regarding aquaculture in Indonesia need to be *considered:*

- For freshwater aquaculture, since most fish farmers are poor artisanal farmers with limited capital and skill, it is very difficult to sustain the business constantly. Therefore, it is necessary to support for organizing fish farmers and strengthening extension system.
- Support systems for aquaculture such as extension services, micro credit etc., are limited and not well prepared: the improvement of the systems is needed.
- Since the market prices of main freshwater aquaculture fish like carp are going down and the production costs such as feed continue to rise, the profit levels continuously decrease. Therefore, it is very important to disseminate proper freshwater aquaculture techniques that enable fish farmers to reduce production costs.
- In mariculture, seaweed is a major production. But in marine finfish culture, growing-out is a main activity. Though seed production technology of groupers has been gradually secured, but there are still problems such as rearing techniques harmonizing with environment and business operational technology remain in the culture of juvenile stage up to commercial size fish. Therefore, it is necessary to

prepare legal framework for utilizing open water properly and continuously.

- The governmental objective to expand mariculture is too harsh to be realized. Sufficient analysis on economic, political, or institutional aspects such as market balance, financial supply, etc., as well as technical aspects such as aquaculture management and rearing techniques are needed.
- Along the trend of decentralization, public seed production centers for freshwater fish were transferred to provinces and districts for management. But there are lots of transferred centers not running well due to a shortage of financial and human resources. Therefore, it is necessary to review the necessities of those centers and restructure of the systems for operation and maintenance.
- It is also becoming more vital to build both capability and capacity for fish disease diagnosis and disease prevention system since a lot of freshwater fish, such as carps (in both running water and floating net cage aquaculture systems), died in 2001 and 2002 .

(3) Quality Control, Processing and Distribution of Fishery Products

1) Consumption and Utilization of Fishery Products

323-39 In 1999, of the total marine fish production of 3.68 million tons, fresh fish accounted for 2.20 million tons or 60% of the total. Dried or salted fish was 0.81 million tons (22%), boiled fish 0.137 million tons (3.7%), traditional fermented fish or fish seasoning 0.063 million tons (1.7%), smoked fish 0.054 million tons (1.5%), frozen fish 0.33 million tons (9%), canned fish 0.042 million tons (1.1%) and fish meal 6,500 tons (0.1%), respectively. In comparison with 1990, fresh fish production has shown a two-fold increase. Some processed products, such as dried or salted fish and frozen fish, have also increased, while other processed fish products declined. Although fresh fish of freshwater species showed a 1.3-fold increase in the last decade, processed fish of freshwater species tended to decrease, except for frozen fish. (National Fishery Statistics 2001)

323-40 In Indonesia, the most popular and favorite fish for consumers is fresh fish, and fresh fish distribution is the main stream. On the other hand, there is also a variety of demands for processed fish due to disadvantages such as tropical climate, preservation technology and the accessibility of commodities.

2) Constraints of Utilization and Distribution of Fishery Products

323-41 The main issues in distribution of fishery products is how to maintain freshness and improve the quality of the distribution systems. Since about 20% of fishery products across the country is not utilized and eventually ends up dumped somewhere due to rottenness and damage, MMAF has targeted a 10% reduction in fish losses by 2005. In order to achieve the above target, it is necessary to improve fish handling while fishing. Furthermore, it is very important to use fish box and sufficient ice during fishing operation hours to keep the freshness of the catch.

323-42 Since a lot of artisanal fishermen cannot use ice, the catch begins to spoil during long operations in hot weather, and catches are rendered with viscous fluid on their surfaces. There are only a few large fishing port facilities where the fishery products are handled in the relatively good condition. Most fish catches are landed on the beach in front of fishing villages or in landing places that lack proper sanitation. The catches are put directly on the ground and roads and sold. In the guideline of 1957, which was prepared by the Ministry of Home Affairs for local governments on auction of fishery products, it is described that fresh fish must be kept in refrigerator for minimum 2 hours before transportationat normal air temperature for more than 4 hours, and also must be iced during the transportation with 1:1 ratio of ice and fish. But it does not seem to be followed in many cases.

323-43 In regulation, fishery products should be sold through "auction" in the wholesale market located at the main fishing port. The main participants in the market are fishermen as sellers, middlemen as buyers, and government officials in local (district) governments as implementers of the "auction." Some districts contract the KUD, and it organizes and implements the auction. The KUD is the main body for implementing such auctions in many places on Java Island. The weight of fish caught is measured and sold at auction. The implementers of auction gain commission fees for every dealing. Although commission fees are set at 5% of the deal as per Article 64 of the Law of 1957, the actual rates of commission fees differ from district to district, ranging from 5% to 8%. Also, the fees gained by the implementers are distributed at different rates for each category, such as the district general account, district fishery department, social security for fishermen, the KUD, and so forth. Middlemen pay tax according to the amount of their purchasing price.

Catches bought by the middlemen are usually carried to the consumption places via freezer-equipped vehicles and/or vehicles with ice. The quality of the catches also depends on how the middlemen handle the catch. There are still quite a few consumption places where ice is not used and the fishery products are sold to end-consumers at normal temperature (under the blazing sun).

323-44 Most artisanal fishermen deals individually with middlemen and remains in the disadvantageous situations in terms of the sale of the fishery products. A lot of fishermen rely on the support of middlemen for equipments and financial resources. This tendency is especially applied to inconveniently remote places where the specific middlemen have already dominate the industry. Because "auction" does not always function well across Indonesia, it is necessary to organize fishermen effectively and provide direction and improvement in order to compete with the middlemen.

3) Issues of Processing and Quality Control of Fishery Products

323-45 About 24% of fishery products are processed and 74% of the processed fishery products are traditional food such as dried fish, fermented seasoning, etc., produced by small-scale food processors. Most small-scale fish processors are household manufacturers and are incapable of establishing quality control systems due to insufficient capital. The Indonesian government would like to prepare a quality control standard that can be applied to these small-scale fish processors. Further, the MMAF is studying the viability of assembling small-scale fish processors from diverse areas in order to provide them with more intensive support.

323-46 The Quality Control Center of the Processed Fishery Products in MMAF implements the training of processing techniques and quality control for the small-scale fish processors, and the JICA's in-country training program has also been implemented.

323-47 The development of processed fishery products for export and the improvement of quality have been set as priorities, and the processing industry is being encouraged to gain international quality control certification (e.g. HACCP).

4) Subjects to be Considered in the Future

- The basis of the distribution of fishery products is fresh fish. Enlightenment and education are necessary for artisanal fishermen. Simultaneously, as an incentive for carrying out the above activities, support programs that produce benefits of using the landing site and a favorable environment for the investment are recommended.
- It is also vital to promote the organizing of fishermen with the above measure.
- Enlightenment and education are necessary for the distributors, such as the middlemen, retailers, etc., and for the small-scale fish processors in order to improve the quality of fishery products.
- Artisanal fishermen and small-scale processors engage in simple processing of fishery products, such as dried or salted fish, to be able to improve the preservation and transport them to remote areas. However, their techniques and quality are low level and the price is lower than fresh fish. It is necessary to improve value-added fishery products by improving the processing techniques in order to encourage the expansion of fish consumption, nutritional improvement and raising income of artisanal fishermen, etc.
- It is essential to improve the distribution system for fishery products by reviewing the role and function of the local wholesale market.
- Sanitary conditions and environment of fish landing facilities must be improved.
- By a thorough study of the distribution issues of fishery products traced from fishing operation in the sea to the landing sites to end-consumers, measures for the improvement must be examined in order to dramatically reduce post-harvest loss and thereby improve the quality of fishery products.

(4) Fishermen's Organizations and Credit for Fishermen

323-48 The KUD was legally accredited based on the law of cooperatives, but KUD MINA, which is the cooperative relevant to fishery, is not operating actively in the sector. Fishermen's organizations supported by MMAF are the optional Kelompok and KUB (Kelompok Usaha Bersana), which has its own control management unit. The Ministry partly supports fishermen's groups by cooperating with KUD MINA.

323-49 PEMP (Economic Empowerment of Coastal Community), which is a micro credit program of the DG of Coastal and Small Islands in MMAF, was launched in 2000. As of June 2002, there is at least one KUD MINA, or fishery corporation, which acts as a local financial institution, that provides micro credit to artisanal fishermen in all 146 districts along the coast. They lend financial resources to fishermen (boat owners, employed fishermen), female fishery processors, small-scale fish middlemen, and fish retailers based on group assurance. The loan conditions differ for each financial institution. The budget of this program, funded by the Directorate General of Coastal and Small Islands in MMAF, is prepared for people in fisheries-related fields to compensate for the price increase in gasoline. A total of Rp. 90 billion was allocated with a total of 24,000 beneficiaries in 2002.

323-50 The Directorate of Service for Fishing Business under the MMAF establishes savings and financing systems for KUB. It provides funds from the budget of the Ministry to KUB to purchase fishing gear, fishing boats, engines, etc., and KUB handles the revolving fund. In 2002, Rp.1.5 million were allocated by the time of the survey implementation. To apply for the loan, KUBs are required to submit a document to the district fisheries administration designating the group's leader, business activities, and members and history of the group, through the group's leader. Provinces and districts' fishery services provide guidance to KUBs. Fishermen or fish farmers who get a loan from KUBs are not required to put up any collateral or guarantee letter.

323-51 During the Assistance Strategy Formulation Study in 2001, a system for interest subsidy for credit from the Bank BRI was planned to commence in 2001 through the budget of the Directorate General of Coastal and Small Islands in MMAF targeting KUB, Kelompok, and individual fishermen and fish farmers. However, this program has not been launched as of yet. Furthermore, the financial grant of Rp.1.4 billion called Dana Bergulir which focuses on 100 districts along the coastline of Indonesia for brackish water aquaculture and mariculture, was planned to be initiated in 2002. However, it has not started yet.

Subjects to be Considered in the Future

- Instructions for the promotion of formulating fishermen's organizations, activities of the organizations, and the management of finance are indispensable.
- An increase in the number of local financial institutions, which enable artisanal fishermen to get more financial resources, and variation of the

conditions for micro credit loans are necessary.

- Support for the diversity of measures of livelihood by fishermen's organizations and income growth of capture fishery are important not to depend on middlemen for artisanal fishermen.