The acreage of lowland paddy field has significantly increased 818 thousand ha from 1983 to 1991, with an average annual increasing rate of 103 thousand ha. The increase of paddy field during this period is obvious in Kalimantan and Sumatera. Total expanded area is 430 thousand ha (equivalent to 54 thousand ha per year) for Kalimantan and 240 thousand ha (equivalent to 30 thousand ha per year) for Sumatera, respectively. . The area increase of paddy field in the said period is, however, attributed largely to the increase in inland swamp and other area which does not much contribute to the paddy production.

Area expansion of irrigated paddy field (technical and semi technical level) during the same period has been 270 thousand ha. The expansion of irrigated field (technical and semi-technical level) is the highest in Sulawesi and Sumatera with about 100 thousand ha, followed by Jawa with 50 thousand ha. However, simple irrigation area has almost not changed. Rainfed area has slightly decreased by about 70 thousand ha while tidal swamp paddy field has not changed in area during the period.

From the above, it can be concluded that increase of lowland paddy field in the last 12 years is largely attributed to the increase of inland swamp and other area, which does not much contribute to paddy production, and irrigated paddy field, which contributes much to increase cropping intensity and make cultivation environment stable so that farmers are motivated to invest more inputs to the field.

5.3.2 Utilization of Lowland Field by Ecosystem and Type of Irrigation

When describe the cropping intensity in paddy field, we should consider not only paddy but also other crops planted in the same field. If the value of cropping intensity is discussed for a specific crop without considering cropping pattern, it will be mislead.

The planted area of paddy, palawija and estate crops in lowland paddy field as of 1989 is available, and the planted area based cropping intensity (CI_p[1]) is calculated as shown in Table 5.12 and summarized below (also refer to Table 5.13 and 5.14 for other years but data on estate crops not available):

[1]: In Indonesia, cropping intensity is expressed as the ratio of planted area to field area, although it is usually expressed as the ratio of harvested area to field area. So when describe cropping intensity in this text, planted area based cropping intensity is expressed as CIp to differentiate from harvested area based cropping intensity which is expressed as CI_H.

Cropping intensity in lowland area (CI_p) by island group as of 1989

Province/Island	Field area (1,000 ha)	Planted area (1,000 ha)			Cropping Intensity (CI_p)		
		Paddy	Palawija	Estate crops	paddy	paddy & palawija	paddy, palawija & estate crops
Sumatera	2,257.4	2,156.5	105.2	89.2	0.96	1.00	1.04
Jawa	3,445.7	4,695.7	1,381.3	444.1	1.36	1.76	1.89
Bali & Nusa Tenggara*	409.9	484.4	180.3	15.0	1.18	1.62	1.66
Kalimantan	1,282.3	608.9	9.1	11.3	0.48	0.48	0.49
Sulawesi	831.3	931.7	86.5	21.5	1.12	1.23	1.25
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	8,226.6	8,877.1	1,793.4	580.8	1.20	1.30	1.37

Remarks: *: Data on Timor Timur not available; n.a.: data not available.
Source: Agricultural Survey land area by utilization 1989, CBS; Production of cereals in Indonesia 1989, CBS. Data of DGFCA, MOA

The total CI_p in lowland paddy field is the highest in Jawa, followed by Bali and Nusa Tenggara, Sulawesi and Sumatera, while Kalimantan shows the lowest CI_p. The CI_p value for paddy is in the same order among the island groups as the total CI_p, although the difference in the value is not so big. Rather higher CI_p values for palawija crops in Jawa and Bali and Nusa Tenggara explains crop diversification has already been progressed in these areas. This implies two possible interpretation: one is diversified crops are more profitable; and the other is water is critical for paddy planting.

The difference in CI_p among island groups may be explained by the difference in the area ratio of irrigated paddy field to total paddy field, because irrigation makes double cropping (sometimes even triple cropping) a year possible. The area ratio of irrigated paddy field to the total field is the highest in Jawa and Bali and Nusa Tenggara and the lowest in Kalimantan, as shown below:

Area ratio of irrigated field to total paddy field (%) as of 1991

	Sumatera	Jawa	Bali & NT	Kalimantan	Sulawesi	Indonesia
Ratio	41.0	74.5	75.3	10.8	61.0	54.0

Source: Agricultural Survey Land Area by Utilization 1991, CBS,

Since there is no available data on the CI_p of lowland field by eco-type, the CI_p of lowland field under different eco-type is estimated by regression method. The result is shown in Tables 5.15 to 5.17 and summarized below.

Planted area based Paddy Cropping Intensity (CI_p) by Ecosyste (average 1989-1991)

Unit: 1,000ha

Province/Island	Irrigated		Rainfed		Others		Total	
	Field area	CI_p	Field area	CI_p	Field area	CI_p	Field area	CI_p
Sumatera	893.5	1.31	595.3	1.07	741.6	0.48	2,230.4	0.99
Jawa	2,538.8	1.55	866.5	1.21	23.3	0.45	3,428.6	1.44
Bali & Nusa Tenggara	308.2	1.40	71.0	0.72	31.3	0.15	410.5	1.19
Kalimantan	178.2	0.76	372.6	0.59	746.8	0.37	1,297.7	0.49
Sulawesi	503.9	1.41	273.3	0.92	60.7	0.29	837.9	1.14
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	4,422.6	1.45	2,178.7	0.99	1,603.7	0.41	8,205.1	1.12

Source: Team calculation by regression method based on Agricultural Survey Land Area by Utilization 1989,1990 and1991, CBS; Production of cereals 1989, 1990 and 1991, CBS
Numerals show the average value of 1989 to 1991.

The table suggests that by constructing irrigation system in the rainfed area, CI_p can be increased 0.99 to 1.45. There seems a little difference in CI_p under irrigated field among the island groups., except Kalimantan. This tendency is also observed in rainfed area among the islands.

5.3.3 Paddy Yield by Type of Irrigation

In order to know the difference in the yield of lowland paddy among different irrigation types and eco-types, statistical analysis was carried out using some 9,000 crop cutting data in the whole Indonesia conducted by CBS in the first season of 1991. Since the amount of fertilizer application is another important factor to affect the yield, the effect of fertilizer level on the paddy yield as well as irrigation type was also analyzed by using factorial analysis of variance method. Data screening and processing methods are detailed in the appendix of ANNEX B. The results of the analysis is shown below.

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Probability>F
Model	49	10,392.8	212.1	111.0	0.0000
Irrigation level	4	598.3	149.6	78.3	0.0000
Fertilizer level	7	1,693.4	241.9	126.48	0.0000
Irrigation * Fertilizer	28	202.6	7.234	3.782	0.0000
Others	10	7,898.6			
Error	8,931	17,067.8	1.91		
C Total	8,980	27,460.7			

Source: JICA-FIDP team calculation based on the crop cutting data by CBS

When the yield difference is considered to be significant, F-value at more than 95% probability should be required. The result of the analysis indicates that the effect of both irrigation and fertilizer to the paddy yield is significant and the interaction effect of these two factors on the yield is also significant. For comparison the relative yield of paddy under different irrigation type is shown below:

Relative Yield of Paddy under Different Type of Irrigation

Level of Irrigation	Technical	Semi-technical	Simple	Village
Non-irrigated=100	145	136	123	115

Note: Yield difference among irrigation type is statistically significant at more than 95% probability.
Source: JICA-FIDP team calculation based on the crop cutting data by CBS, 1992

The above table also suggest that when irrigation is facilitated to non-irrigated paddy field, yield is expected to increase by 15% to 45% depending on the irrigation level. Effect of upgrading of irrigation facilities on paddy yield is then obvious. However, this difference comes from combined effect of irrigation level and applied amount of fertilizer.

Then the effect of irrigation and fertilizer on paddy yield was analyzed individually. The results are shown below (also refer to ANNEX B):

Result of Statistical Analysis (t-test) on the Yield of Paddy under Different Type of Irrigation

Level of Irrigation	Technical	Semi-technical	Simple	Village	Non-irrigated
Technical	1.000				
Semi-technical	0.298[n]	1.000			
Simple	0.001	0.006	1.000		
Local	0.000	0.000	0.000	1.000	
Non-irrigated	0.000	0.000	0.000	0.024	1.000

Note: Numerals show the probability of hypothesis in which there is no difference in the yield between two different fertilizer level. When the value is less than 0.05, there is a significant difference between the two different fertilizer level.
Source: JICA-FIDP team calculation based on the crop cutting data by CBS

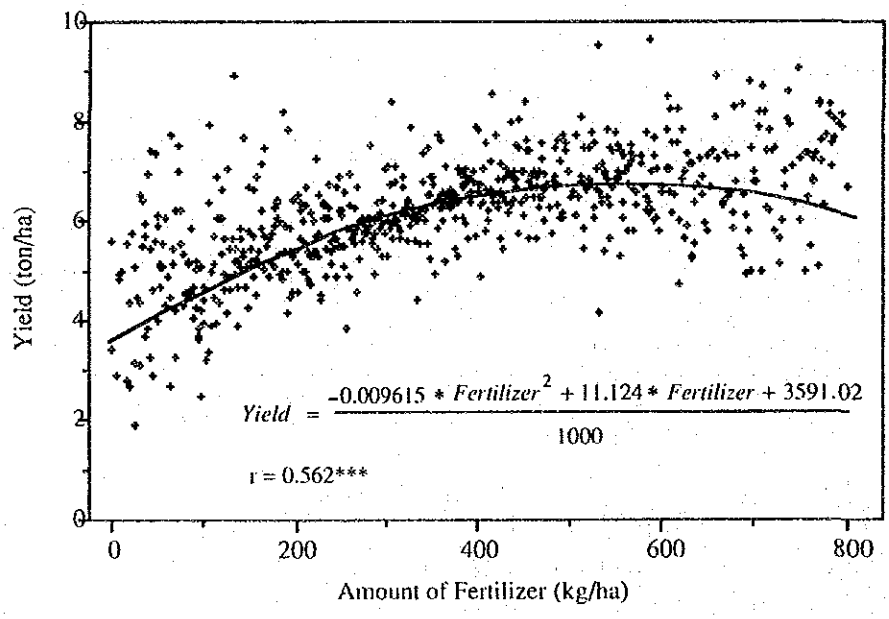
Significant difference are confirmed among level of irrigation except between semi-techinical and technical levels. The higher the irrigation level, the higher the yield is found. That is; the yield increases with upgrading of irrigation facility. It suggests that water is one of the limiting factors for paddy yield in Indonesia.

Result of Statistical Analysis (t-test) on the Yield of Paddy under Different Fertilizer Level

	Fertilizer level (kg/ha)	1	2	3	4	5	6	7	8	Yield (ton/ha)
1	0	1.000								3.41
2	1 - 150	0.000	1.000							4.89
3	151 - 250	0.000	0.000	1.000						5.48
4	251 - 350	0.000	0.000	0.000	1.000					5.95
5	351 - 450	0.000	0.000	0.000	0.000	1.000				6.52
6	451 - 550	0.000	0.000	0.000	0.000	0.022	1.000			6.73
7	551 - 650	0.000	0.000	0.000	0.0001	0.070	0.001	1.000		6.57
8	651 - 800	0.000	0.000	0.000	0.000	0.089	0.690	0.009	1.000	6.80

Note: Numerals show the probability of hypothesis in which there is no difference in the yield between two different fertilizer level. When the value is less than 0.05, there is a significant difference between the two different fertilizer level.
Source: JICA-FIDP team calculation based on crop cutting data by CBS

From the above, with the increase of fertilizer application up to 351 ~ 450 kg per ha, the yield increases proportionally. When the level of fertilizer application exceed the level 5, more than 351 kg per ha, yield response become moderate, and more than 550 kg/ha of fertilizer level, yield seems to be no increase with an increase of fertilizer application. Based on the correlation analysis, the yield increases with an increase of fertilizer application up to around 570 kg per ha, as shown below:



Amount of Fertilizer vs Paddy Yield

Considering the share of urea in total amount of fertilizer (about 60 to 70% of total amount) and recent diffusion of ammonium sulfate in Indonesia, in general, the maximum yield level may be attained at nitrogen application level of about 180 to 200 kg-N/ha, which coincides with the past experimental data at international institutions such as International Rice Research Institute (IRRI). From farmers' economical point of view, however, fertilizer application level of about 450 kg/ha is optimum, level of which have already almost been attained in Jawa and Bali.

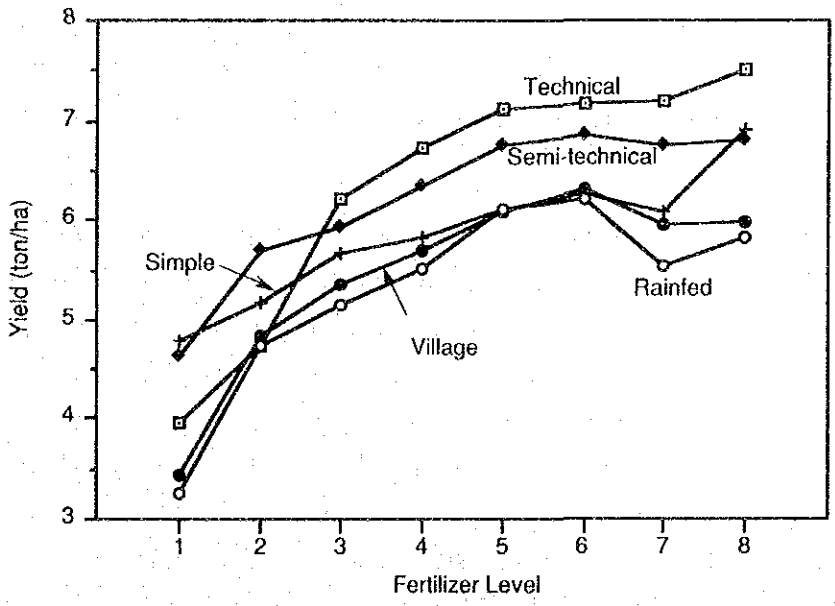
As seen above, single effect of irrigation and fertilizer on paddy yield increase is proved. However, contribution extent of each factor to yield is not known. Fertilizer application level is also different among irrigation level as shown below:

Fertilizer Application Rate under Different Type of Irrigation

Level of Irrigation	Technical	Semi-technical	Simple	Village	Non-irrigated
Fertilizer (kg/ha)	423	380	336	300	202

Note: Fertilizer application rate among irrigation type is statistically significant at more than 95% probability.
Source: JICA-FIDP team calculation based on the crop cutting data by CBS,

Irrigation development is always accompanied by the increase of fertilizer application, which helps to maximize the effect of irrigation. Irrigation investment is a necessary cost for farmers to invest more farm input for production increase. The interaction effect of irrigation type and fertilizer application on the paddy yield is also found. Result is shown in following figure.



Note: Fertilizer level is shown in the table in page5-10.

Effect of interaction irrigation and fertilizer on paddy yield

In the case of the amount of fertilizer application exceeding 250 kg per ha (higher than level 3), a significant difference in paddy yield is found among technical, semi-technical, simple and village irrigation systems, and non irrigation. Paddy yield between technical and semi-technical is not significantly different if not considering fertilizer application. The yield is statistically increased with an upgrading of irrigation facility. When the amount of fertilizer application is less than 250 kg per ha (lower than level 3), there is no definite relationship between the yield and the different type of irrigation. In the case of fertilizer application being 251 to 550 kg per ha, no significant difference in the paddy yield is found among rainfed, village irrigation and simple irrigation. The effect of irrigation facility is obvious only under higher fertilizer level.

5.3.4 Comparison of Paddy Yield by Eco-system

The yield of paddy plant grown under different ecosystem by province is determined by regression analysis. The results are shown in 5.18 and summarized below:

Paddy Yield under Different Ecosystem 1991

Unit : ton/ha

Province/Island	Irrigated	Rainfed	Others	Whole Area
Sumatera	4.33	3.92	2.81	3.92
Jawa	5.39	4.47	2.25	5.19
Bali & Nusa Tenggara	4.63	3.27	2.53	4.46
Kalimantan	3.06	2.65	2.46	2.67
Sulawesi	4.22	3.95	2.94	4.13
Maluku & Irian Jaya	-	-	-	-
Indonesia	4.96	4.04	2.67	4.57

Source: Team calculation based on Agricultural Survey Production of Cereals 1991 CBS
Others: Tidal swamp, inland swamp and other area

Paddy yield differs among island groups as well as eco-system. Paddy yield under irrigated field is higher than under rainfed condition and others. Although cultural practice is different, yield differences among the different eco-systems are 0.9 ton per ha between irrigated and rainfed field and 1.4 ton per ha between rainfed and other field. Even under the irrigated field condition there is a significant difference in the yield among island groups. The highest yield is attained in Jawa while the lowest in Kalimantan. This may due to the difference in the level of farming practice as well as level of farm input such as fertilizer. There are considerable difference in the level of fertilizer between Jawa and Kalimantan as mentioned later. The yield of paddy grown under other eco-system area is extremely low. The difference in the yield under other ecosystem among island groups is not as big as that

under irrigated and rainfed field. Farmers will not invest with farm inputs unless environment on production is stable.

5.3.5 BIMAS Program and Its Contribution to Paddy Production

As mentioned before, an increase of paddy yield has been made through irrigation development and an increase of fertilizer application. The increase of fertilizer, application however, might not be attained without the effort of the Government through Mass Guidance Program, or BIMAS program. Besides irrigation, diffusion of modern high yielding varieties, improved pest management and other improved farming practices contributed much to yield increase, although indirectly. The past yield increase of paddy by type of BIMAS program is shown below (also refer to Table 5.19):

Historical change of yield under the intensification program by type

Unit: ton/ha

Type of Intensification	1982	1983	1984	1985	1986	1987	1988	1989
Supra-Insus	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.28
Insus	4.77	4.86	4.87	4.83	4.87	4.81	4.86	4.76
Inmum	4.00	4.01	4.01	3.98	3.86	3.91	3.78	3.65
Intensification Total	4.36	4.45	4.45	4.44	4.44	4.48	4.54	4.63
Non-intensification	2.77	2.80	2.76	2.74	2.64	2.60	2.65	2.67

Source: BIMAS

Under each category of BIMAS program, an increase of the yield does not occur, while the amount of fertilizer application also increases year by year as shown in Table 5.20. It is rather curious that increased dosage of fertilizer did not contribute to the yield increase. It can be explained by the change in the coverage area of each category of the program as shown on Table 5.21. Increase in Insus area as to Inmum leads to the increase in fertilizer application as well as yield increase. The extent of the intensification program differs much among provinces as shown on Table 5.22. It seems there will be a relationship between the extent of intensification program and irrigation development. In provinces where intensification program is not expanded, irrigation development has also not been progressed.

The yield of paddy under intensification program by provinces and the island groups as of 1989 are shown on Table 5.23 and summarized as below:

Area and Yields of Lowland Paddy under Intensification and Non-intensification Program in 1989

Province/Island	Area ('000 ha)		Yield (ton/ha)	
	Intensification	Non-intensification	Intensification	Non-intensification
Sumatera	2,113	188	4.01	2.88
Jawa	5,446	6	5.14	2.98
Bali & Nusa Tenggara	470	58	4.58	2.91
Kalimantan	534	125	2.78	2.18
Sulawesi	974	45	4.17	2.60
Maluku & Irian Jaya	-	-	-	-
Indonesia	9,546	423	4.63	2.67

Source: Cost Structure of Farms Paddy and Palawija, 1989, CBS
Statistik Intensifikasi Pertanian (1990), BIMAS, MOA

The effect of intensification program is obvious. However, one should remember that intensification program is always applied to the area where paddy cultivation environment is preferable; i.e., irrigated condition.

The total paddy field area and the harvested area under intensification in 1988/89 and 1989 is summarized below.

Lowland area under intensification program by type (1988/89 and 1989)

Province/Islands	Type of Intensification ('000 ha)				Field area ('000 ha)				Area Ratio
	Supra Insus	Insus	Inmum	Total	Irrigated	Rainfed	others	Total	
Sumatera	429	1,155	529	2,113	870	608	779	2,257	0.94
Jawa	1,510	3,318	541	5,446	2,535	888	23	3,446	1.50
Bali & Nusa Tenggara	97	235	138	470	309	67	34	410	1.15
Kalimantan	0	221	313	534	188	380	714	1,283	0.42
Sulawesi	226	446	301	974	486	283	62	831	1.17
Maluku & Irian Jaya	0	7	1	8	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	2,261	5,382	1,825	9,546	4,387	2,262	1613	82,26	1.16

Remarks: Area ratio is the ratio of total intensification area to total field area.
Source: BIMAS and DGFCA, MOA

When Supra Insus program started, total coverage of intensification program increased by more than one million hectare. The target area of intensification of paddy by type of intensification for 1992 and 1992/93 cropping seasons are summarized as below:

Target area under intensification program by type (1992 and 1992/93)

Province/Islands	Wetland paddy ('000 ha)				Upland paddy ('000 ha)			Grand
	Supra Insus	Insus	Inmum	Total	Insus	Inmum	Total	Total
Sumatera	751	1,032	348	2,131	201	123	324	2,455
Jawa	2,320	2,628	129	5,077	127	123	249	5,326
Bali & Nusa Tenggara	205	242	66	513	10	12	22	535
Kalimantan	22	367	299	688	14	60	74	762
Sulawesi	277	528	176	981	8	21	29	1,010
Maluku & Irian Jaya	0	11	16	27	0	18	18	45
Indonesia	3,575	4,808	1,034	9,417	360	357	716	10,133

Source: BIMAS

Although the total area under the intensification program does not increase so much as compared with that of 1989, level of intensification is much improved in 1992 and 1992/93 plans. Supra Insus program is increased by 1.3 million ha from 2.26 million ha in 1988/89 and 1989 to 3.58 million ha in 1992 and 1992/93 program. Jawa (increased by 0.8 million ha) and Sumatera (0.3 million ha) contribute much to this grade up of the program. With the increase in the objective area for Supra Insus, the area for Insus and Inmum decrease.

However, as seen above, since other environment of paddy field has not been improved (e.g. irrigation facilities), the effect of intensification program may not be appeared so clear as before. Wasteful use of chemical products such as fertilizers and pesticides often caused environmental pollution. Creation of environment so that crops can perform expected growth under intensive management such as Supra Insus and Insus will keenly be required.

5.3.6 Change in Variety

Introduction of modern variety (or high yielding variety; HYV) leads to the drastic increase of paddy productivity in the tropics. As is the case in Indonesia, about 70 HYVs are widely cultivated in Indonesia as of 1988. The characteristics of recent HYVs are summarized in Table 5.24. The acreage of planted area of major varieties is shown in the following table.

Area of Leading Varieties in 1988/89

Unit : 1,000 ha

Province/Island	PB 36	Cisadane	IR 64	Kr.Aceh	PB 42	Semuru	IR 46	Others	Traditional	Total
Sumatera	76.6	58.0	109.6	24.1	42.6	13.5	155.8	309.1	289.9	1,079.2
Jawa	561.5	793.4	967.1	187.6	6.6	166.3	0.8	355.0	210.5	3,248.8
Bali & NT	82.5	2.5	13.7	77.8	0	14.1	0	25.0	7.7	223.4
Kalimantan	17.5	19.0	6.6	9.1	42.9	0.1	3.4	103.4	206.3	408.3
Sulawesi	37.9	50.2	36.2	2.7	158.5	3.6	23.3	140.5	36.9	489.8
Maluku & Irian Jaya	0.0	0.0	0.3	0.1	0.0	0.0	0.2	1.9	0.5	3.0
Indonesia	775.9	923.1	1,133.6	301.4	250.7	197.6	183.4	934.9	751.9	5,452.4

Source: Laporan Hasil Inventarisasi Penyebaran Varietas Padi Musim Tanam (1988/89), Directorat Bina Produksi, MOA

PB 36, Cisadane and IR 64 are the major three varieties in Indonesia, each of which occupies as large area as more than 700 thousand ha. Other important varieties are, Kreung Aceh, PB 42, Semuru and IR 46, which exceeds planted area of 100 thousand ha each. The planted area of improved varieties is larger than that of the local traditional varieties except Kalimantan. Planted area under improved varieties accounts for about 86 % of the total planted area in Indonesia. Kalimantan shows about 50% of planted area is still occupied by traditional varieties. Also in Sumatera traditional varieties are planted with significant ratio (27% of total paddy planted area). Improved varieties may not be extended in those islands, due to wide swamp area. One of the reason for low yield in Kalimantan, therefore, may be due to the planted varieties. Infrastructure development such as irrigation facilities are indispensable for introducing modern varieties, and thereby increasing productivity. There is a little difference in the distribution pattern of varieties in dry season. Change in planted area of leading varieties in recent several years is shown below:

Seasonal Changes in the Area of Leading Varieties

Unit : 1,000 ha

Variety	Year Introduced	1985	1985/86	1986	1986/87	1987	1987/88	1988	1988/89
PB 36	1977	733	1,518	846	1,456	590	1,081	330	776
Cisadane	1980	788	1,352	880	1,181	721	839	415	923
IR 64	1986	0	0	0	7	130	629	997	1,134
Kreung Ache	1981	147	321	191	276	117	270	92	301
PB42	1980	187	274	128	251	165	242	103	251
Semuru	1980	66	144	80	174	84	174	59	198
IR 46	1983	161	109	134	211	172	155	132	183
IR48	1986	7	0	18	28	76	102	67	80
Citanduy	1983	10	3	33	115	67	67	47	53
Sadang	1983	40	50	50	73	24	55	14	14
Cisokan	1985	0	0	5	21	17	63	37	61
IR 54	1981	83	96	70	120	66	43	26	43
Barito	1981	34	37	38	39	57	40	28	26
Kelara	1983	20	53	68	72	66	40	48	31
Cikapundung	1984	1	6	20	48	31	35	23	40
Bahbolon	1983	35	42	63	70	52	22	36	18
Leading Varieties Total		2,312	4,005	2,624	4,142	2,396	3,871	2,454	4,132
Traditional		460	916	451	905	475	1,007	379	752

Source: Laporan Hasil Inventarisasi Penyebaran Varietas Padi Musim Tanam (1985-1989), Directorat Bina Produksi, MOA

The planted area of relatively old varieties, PB36, Cisadane, Kreung Aceh, etc., show a decreasing tendency. On the other hand, that of newly bred or introduced varieties, IR 64, IR 48, Cisokan, etc. show an increasing tendency. These newly introduced varieties are resistant or tolerant to diseases and pests, and show no distinct yield difference as compared with formerly introduced ones.

5.3.7 Damage by Pests and Diseases

Recently many varieties, with resistant or tolerant to pests and diseases, are released and farmers employ these varieties. Hence, damage of pests and diseases has decreased. According to the CBS statistics, the damage of paddy production by pests and diseases accounts for 0.85% and 0.5% of total harvested area in 1990 and 1987, respectively. Major pests are stem borer, brown plant hopper (BPH), gallmidge, army worm, leaf folder and rodent. Major diseases are blast, sheath rot, brown leaf spot, bacterial leaf blight (BLB), virus diseases such as rice tungro virus disease (RTV) and yellow dwarf disease. The damage by diseases is much less than that of pests. The damages is mainly occurred in January to March.

5.4. Direction of Paddy Production Increase

5.4.1 Analysis of Contribution Factor to Production Increase

(1) Contribution Factors to Increase Production

As stated before, the amount of paddy production in Indonesia has significantly increased during the last 12 years from 1980 to 1991 at a yearly rate of 1.4 million ton. The production of crops (P) is presented by the product of the harvested area (A) and the yield (Y). As for paddy in Indonesia, both of the harvested area and the yield have significantly increased. The extent of contribution of the harvested area and the yield to the increase of paddy production is determined by following calculation:

$$\text{Log } P_n/P_o = \text{Log } A_n/A_o + \text{Log } Y_n/Y_o$$

Where P_n, A_n and Y_n are the amount of production, harvested area and yield of paddy at nth years after starting year, respectively, and P_o, A_o and Y_o are the production, harvested area and yield of paddy at a base year.

The values of Log A_n/A_o and of Log Y_n/Y_o indicate the contribution of the change in the harvested area and in the yield to the change in the amount of production. The larger the value, the higher the contribution to the paddy production is presented. When the value of Log A_n/A_o is larger than that of Log Y_n/Y_o, the contribution of the change in the harvested area to the change in the amount of production is higher than that in the yield.

The contribution of the change in the harvested area and yield on the increase of paddy production is shown in Table 5.25, and summarized as below.

Contribution of The Change in The Harvested Area
and Yield on The Increase of Paddy Production

Province/Island	Log P_{1991}/P_{1980}	Log A_{1991}/A_{1980}	Log Y_{1991}/Y_{1980}
Sumatera	4.241	2.137	2.104
Jawa	4.152	2.030	2.122
Bali & Nusa Tenggara	4.166	2.058	2.108
Kalimantan	4.129	2.058	2.071
Sulawesi	4.270	2.134	2.136
Maluku & Irian Jaya	5.178	3.040	2.138
Indonesia	4.179	2.068	2.111

Source: developed from Production of cereals 1980 and 1991, CBS, by JICA FIDP Team

As for the whole Indonesia, the contribution of the harvested area is slightly less than that of yield to the paddy production in the past 12 years. However, the extent of the contribution of the change in the harvested area and the yield to the change in the production differs among provinces. In all provinces in Jawa, Sumatera Barat, Jambi, Bali, NTB, Kalimantan Barat, Kalimantan Timur and Sulawesi Selatan, yield increase contributed more to increase production than area expansion, while other provinces increase in harvested area was a major contributor to production increase.

(2) Contribution Factor to Increase of Harvested Area

In the same manner, the harvested area (H) is presented by the product of the field area (F) and cropping intensity (CI_H). The extent of the contribution of field area increase and cropping intensity change to the harvested area is presented a following formula:

$$\text{Log } H_n/H_o = \text{Log } F_n/F_o + \text{Log } CI_{Hn}/CI_{Ho}$$

Where H_n, F_n and CI_{Hn} are the harvested area, the field area and cropping intensity at nth year after the base year, respectively, and H_o, F_o and CI_{Ho} are the harvested area, field area and CI_{Ho} at a base year.

Contribution of field area and cropping intensity to the harvested area of lowland paddy is calculated as shown on Table 5.26 and summarized below:

Contribution of field area and cropping intensity to the harvested area of lowland paddy

Province/Island	Log H_{1991}/H_{1983}	Log F_{1991}/F_{1983}	Log CI_{H1991}/CI_{H1983}
Sumatera	4.088	2.050	2.038
Jawa	4.033	1.998	2.035
Bali & Nusa Tenggara	4.037	2.047	1.991
Kalimantan	4.072	2.174	1.898
Sulawesi	4.129	2.064	2.065
Maluku & Irian Jaya	n.a.	n.a.	n.a.
Indonesia	4.058	2.046	2.013

Source: developed from Production of cereals and Land area utilization 1986 and 1990; CBS, by JICA-FIDP team

The increase of field area is the major contributor to the increase of harvested area in the past eight years for whole Indonesia. In the provinces of Jambi, Lampung, Jawa Timur, Nusa Tenggara Timur, Kalimantan Tengah, Kalimantan Timur, Sulawesi Utara, Sulawesi Tengah and Sulawesi Tenggara, field area expansion contributed more to harvested area increase than cropping intensity increase, while in most of other provinces cropping intensity is the main contributor.

5.4.2 Analysis of Production Increase Potential

Through the above-mentioned examination and present situation, provinces are classified into three groups according to the various potential factors for increasing paddy production. The characteristics of each group is shown in Table 5.27 and Table 5.28.

The first group (Group I) is characterized by high yield, high yearly increasing rate of yield, higher contribution of the yield increase to the increase of paddy production, the lower contribution of the increase in field area to the increase of harvested area and no or very low increasing rate of field area. In the area, since there is a very limited space for the increment of paddy field, it is important to increase yield by employing more intensive paddy cultivation practices, although there is a limited potential for further paddy production.

The third group (Group III) is characterized by the low yield, a low annual increasing rate of yield, higher contribution of the increase of harvested area to the increase of paddy production, the higher contribution of the increase in the field area to the increase of harvested area and the higher increasing rate of field area. In the area, by employing the new high yielding varieties, intensive cultural practice, training the farmers for farming practice and the improvement of water supply system, the yield, CI_H and the harvested area will be able to increase, and then the production of paddy will also increase. There is a big potential

in this group for paddy production in future. However, there is some barrier for the increasing the yield due to the shortage of knowledge of farmers for paddy cultivation and of farm input, and unfavorable paddy eco-system, at present.

The characteristics of the second group (Group II) is intermediate between the first group and the third group. At present, there is a high potential in the area for paddy production, because, there is a some space for increasing paddy field ,the yield and the increasing rate of yield is also relatively high and the ecosystem of paddy field is relatively favorable for paddy production.

As a result of ranking for production increase potential, each province is ranked as Group I to Group III as follows .

Categorization of Provinces by Production and Environment of Paddy

Group I	Group II	Group III
13. Sumatera Barat	11. DI Aceh	14. Riau
31. DKI Jakarta	12. Sumatera Utara	15. Jambi
32. Jawa Barat	18. Lampung	16. Sumatera Selatan
33. Jawa Tengah	52 Nusa Tenggara Barat	17. Bengkulu
34. DI Yogyakarta	71. Sulawesi Utara	53. Nusa Tenggara Timur
35. Jawa Timur	72. Sulawesi Tengah	61. Kalimantan Barat
51. Bali	73. Sulawesi Selatan	62. Kalimantan Tengah
	74. Sulawesi Tenggara	63. Kalimantan Selatan
		64. Kalimantan Timur

Table 5.1 Historical Change in Harvested Area of Lowland Paddy by Province 1980-1992

Unit: ha

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	208,423	245,705	244,208	255,972	258,775	247,105	281,264	260,950	272,494	292,550	291,598	299,903	318,834
12. Sumatera Utara	445,323	448,443	474,086	453,702	496,252	525,431	505,937	569,454	592,775	599,523	618,657	645,898	672,915
13. Sumatera Barat	291,246	274,606	287,179	312,843	327,701	325,378	334,442	334,323	335,433	341,461	351,857	361,831	374,077
14. Riau	81,770	85,319	83,738	83,504	89,165	90,171	98,943	70,621	99,038	96,126	102,705	112,487	106,815
15. Jambi	131,680	132,054	135,403	142,519	144,456	150,075	140,047	134,831	139,536	136,241	145,214	138,328	147,839
16. Sumatera Selatan	242,944	269,948	265,366	296,142	290,400	301,597	334,579	331,848	343,626	341,750	353,218	304,780	372,530
17. Bengkulu	48,178	46,461	50,603	57,060	60,960	62,271	65,752	68,216	67,934	68,055	65,933	75,490	86,442
18. Lampung	151,049	167,055	174,807	190,487	211,123	204,070	218,250	249,667	245,628	248,264	264,062	254,008	314,274
Sumatera	**1,600,613**	**1,669,591**	**1,715,390**	**1,792,229**	**1,878,832**	**1,906,098**	**1,979,214**	**2,019,910**	**2,096,464**	**2,123,970**	**2,193,244**	**2,192,725**	**2,393,726**
31. D.K.I.Jakarta	20,519	16,284	13,874	9,545	9,699	10,424	9,518	8,946	8,501	8,385	8,255	5,776	6,569
32. Jawa Barat	1,743,937	1,835,181	1,702,504	1,702,192	1,850,178	1,931,698	1,937,836	1,904,624	1,890,770	1,973,743	1,969,214	1,836,954	1,998,429
33. Jawa Tengah	1,296,298	1,371,855	1,281,641	1,268,062	1,413,024	1,433,932	1,437,736	1,407,704	1,407,559	1,494,238	1,484,953	1,425,609	1,517,244
34. D.I.Yogyakarta	99,679	108,347	100,369	102,765	109,844	103,393	104,189	96,973	97,605	101,551	98,331	98,939	96,883
35. Jawa Timur	1,368,504	1,447,825	1,403,046	1,405,868	1,478,811	1,493,539	1,507,989	1,455,494	1,455,413	1,520,975	1,502,708	1,480,801	1,539,843
Jawa	**4,528,937**	**4,779,492**	**4,501,434**	**4,488,432**	**4,861,556**	**4,972,986**	**4,997,268**	**4,873,741**	**4,859,848**	**5,098,892**	**5,063,461**	**4,848,079**	**5,158,968**
51. Bali	174,900	166,726	165,483	164,239	164,816	164,197	163,966	167,370	160,266	172,558	165,033	156,303	158,890
52. Nusa Tenggara Barat	199,624	221,805	229,872	216,462	232,598	234,823	231,798	230,331	233,511	250,509	250,995	246,860	245,844
53. Nusa Tenggara Timur	48,243	53,273	59,149	62,338	57,491	58,384	61,682	57,646	62,439	67,622	68,042	79,797	80,113
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	18,440	16,583	15,635	17,706	24,226	19,381
Bali & Nusa Tenggara	**422,767**	**441,804**	**454,504**	**443,039**	**454,905**	**457,404**	**457,446**	**473,787**	**472,799**	**506,324**	**501,776**	**507,186**	**504,228**
61. Kalimantan Barat	187,842	194,540	184,791	169,119	170,756	179,934	174,979	164,260	176,501	200,126	185,333	179,971	194,202
62. Kalimantan Tengah	72,116	72,955	74,004	75,484	75,482	75,976	77,597	80,507	81,526	87,800	100,736	89,027	94,062
63. Kalimantan Selatan	268,582	288,126	268,422	275,581	290,150	299,392	300,484	298,481	302,468	313,007	330,859	331,892	364,686
64. Kalimantan Timur	36,321	40,281	43,251	27,320	34,199	39,761	39,374	41,694	40,405	39,314	40,332	44,999	43,951
Kalimantan	**564,861**	**595,902**	**570,468**	**547,504**	**570,587**	**595,063**	**592,434**	**584,942**	**600,900**	**640,247**	**657,260**	**645,889**	**696,901**
71. Sulawesi Utara	55,771	50,184	60,160	62,884	59,042	62,549	72,748	76,413	69,688	71,657	76,223	82,125	67,157
72. Sulawesi Tengah	70,248	67,558	69,806	77,946	73,459	74,114	89,338	94,291	103,110	107,618	111,817	129,044	126,149
73. Sulawesi Selatan	564,896	570,758	486,530	555,348	624,950	663,300	666,410	639,952	681,093	771,493	725,066	706,058	786,816
74. Sulawesi Tenggara	14,151	13,954	12,297	17,027	21,459	21,330	28,117	28,494	30,701	40,377	39,913	42,698	54,847
Sulawesi	**705,066**	**702,454**	**628,793**	**713,205**	**778,910**	**821,293**	**856,613**	**839,150**	**884,592**	**991,145**	**953,019**	**959,925**	**1,034,969**
81. Maluku	516	509	616	1,067	860	1,136	3,167	3,142	3,862	3,448	2,968	5,074	841
82. Irian Jaya	1,286	1,268	1,395	1,433	1,475	1,741	1,870	1,649	6,909	10,930	5,786	9,624	9,474
Maluku &Irian Jaya	**1,802**	**1,777**	**2,011**	**2,500**	**2,335**	**2,877**	**5,037**	**4,791**	**10,771**	**14,378**	**8,754**	**14,698**	**10,315**
Indonesia	**7,824,046**	**8,191,020**	**7,872,600**	**7,986,909**	**8,547,125**	**8,755,721**	**8,888,012**	**8,796,321**	**8,925,374**	**9,374,956**	**9,377,514**	**9,168,502**	**9,799,107**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBS and Unpublished data of CBS.
n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.2 Historical Change in Yield of Lowland Paddy by Province 1980-1992

Unit: ton/ha

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	3.12	3.32	3.47	3.60	3.46	3.62	3.64	3.74	3.79	3.87	3.96	4.03	4.06
12. Sumatera Utara	3.16	3.34	3.51	3.62	3.71	3.76	3.78	3.78	3.91	3.95	4.01	4.00	4.04
13. Sumatera Barat	3.57	3.72	3.86	4.06	4.08	4.16	4.18	4.28	4.42	4.52	4.60	4.64	4.65
14. Riau	2.34	2.34	2.75	2.87	2.90	2.94	2.95	2.87	2.99	3.19	3.22	3.23	3.28
15. Jambi	2.80	2.83	2.94	2.88	2.90	2.92	2.96	3.13	3.20	3.23	3.27	3.29	3.39
16. Sumatera Selatan	2.90	2.96	3.06	3.10	3.17	3.24	3.22	3.21	3.23	3.35	3.41	3.49	3.49
17. Bengkulu	2.94	2.87	3.38	3.56	3.48	3.40	3.53	3.10	3.28	3.46	3.55	3.61	3.62
18. Lampung	3.33	3.57	3.81	3.92	3.96	4.04	4.05	4.02	4.05	4.16	4.20	4.29	4.31
Sumatera	**3.13**	**3.26**	**3.44**	**3.54**	**3.58**	**3.64**	**3.66**	**3.70**	**3.77**	**3.86**	**3.92**	**3.97**	**4.00**
31. D.K.I.Jakarta	2.99	3.21	3.52	3.45	3.57	3.60	4.34	4.29	4.54	4.67	4.75	4.76	4.79
32. Jawa Barat	3.68	3.87	4.26	4.42	4.43	4.50	4.53	4.71	4.87	5.03	5.09	5.19	5.21
33. Jawa Tengah	3.94	4.14	4.45	4.74	4.79	4.77	4.78	4.93	5.01	5.13	5.18	5.24	5.25
34. D.I.Yogyakarta	4.27	4.44	4.76	4.97	5.01	5.01	5.04	5.09	5.19	5.32	5.42	5.47	5.49
35. Jawa Timur	4.40	4.66	4.93	4.97	5.01	4.96	4.97	5.08	5.15	5.26	5.33	5.39	5.41
Jawa	**3.98**	**4.20**	**4.53**	**4.69**	**4.72**	**4.73**	**4.75**	**4.89**	**5.00**	**5.13**	**5.19**	**5.27**	**5.29**
51. Bali	4.10	4.43	4.40	4.46	4.57	4.62	4.71	4.80	4.93	5.05	5.14	5.24	5.26
52. Nusa Tenggara Barat	3.22	3.61	3.74	3.91	3.96	3.89	3.91	4.02	4.20	4.31	4.39	4.48	4.51
53. Nusa Tenggara Timur	2.51	2.65	3.02	3.19	3.11	3.13	3.12	2.89	2.97	3.02	3.10	3.11	3.11
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2.20	2.20	2.59	2.60	2.67	2.72
Bali & Nusa Tenggara	**3.50**	**3.81**	**3.89**	**4.01**	**4.07**	**4.06**	**4.09**	**4.09**	**4.22**	**4.34**	**4.40**	**4.41**	**4.46**
61. Kalimantan Barat	2.21	2.38	2.57	2.71	2.58	2.46	2.56	2.56	2.57	2.63	2.67	2.72	2.73
62. Kalimantan Tengah	1.98	2.19	2.22	2.12	2.01	2.15	2.11	2.04	2.06	2.13	2.15	2.38	2.37
63. Kalimantan Selatan	2.59	2.57	2.55	2.58	2.69	2.72	2.72	2.74	2.84	2.81	2.82	2.90	2.98
64. Kalimantan Timur	2.09	2.33	2.52	2.43	2.32	2.36	2.44	2.51	2.51	2.65	2.70	2.75	2.77
Kalimantan	**2.36**	**2.44**	**2.51**	**2.55**	**2.55**	**2.55**	**2.58**	**2.57**	**2.63**	**2.65**	**2.67**	**2.77**	**2.82**
71. Sulawesi Utara	3.32	3.32	3.82	3.96	4.12	4.13	4.18	3.95	4.03	4.17	4.18	4.23	4.25
72. Sulawesi Tengah	2.41	2.55	2.82	2.95	2.94	2.99	3.01	3.12	3.20	3.25	3.30	3.31	3.34
73. Sulawesi Selatan	3.12	3.47	3.74	3.92	4.00	4.01	4.06	3.96	4.13	4.25	4.29	4.35	4.37
74. Sulawesi Tenggara	2.25	2.41	2.94	3.14	3.09	3.06	3.12	3.18	3.25	3.35	3.40	3.43	3.41
Sulawesi	**3.04**	**3.35**	**3.63**	**3.80**	**3.88**	**3.90**	**3.93**	**3.84**	**3.98**	**4.10**	**4.13**	**4.16**	**4.19**
81. Maluku	2.25	2.38	2.42	2.53	2.51	2.40	2.54	2.75	2.72	2.56	2.76	2.89	2.99
82. Irian Jaya	1.96	2.07	2.37	2.48	2.39	2.30	2.42	2.38	2.68	2.65	2.66	2.72	2.74
Maluku &Irian Jaya	**2.04**	**2.16**	**2.38**	**2.50**	**2.43**	**2.34**	**2.50**	**2.62**	**2.70**	**2.63**	**2.69**	**2.78**	**2.76**
IndonesiaA	**3.58**	**3.78**	**4.04**	**4.17**	**4.21**	**4.23**	**4.25**	**4.32**	**4.40**	**4.52**	**4.57**	**4.62**	**4.63**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBS and Unpublished data of CBS.
n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.3 Historical Change in Production of Lowland Paddy by Province 1980-1992

Unit: ton

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	649,464	816,935	847,932	920,475	895,103	893,677	1,023,749	976,401	1,032,740	1,132,663	1,154,225	1,209,390	1,293,314
12. Sumatera Utara	1,406,457	1,497,379	1,661,931	1,641,763	1,843,080	1,977,867	1,913,325	2,152,146	2,318,139	2,369,841	2,478,460	2,584,678	2,715,280
13. Sumatera Barat	1,040,520	1,020,478	1,109,641	1,269,764	1,335,382	1,354,137	1,397,822	1,432,029	1,483,001	1,543,593	1,619,420	1,677,776	1,737,665
14. Riau	190,988	200,062	230,161	239,312	258,148	264,971	292,319	202,450	295,677	307,090	330,877	363,578	350,610
15. Jambi	368,281	374,140	398,706	410,786	418,735	437,679	414,679	421,758	447,072	439,941	475,243	455,229	501,002
16. Sumatera Selatan	705,217	799,365	812,897	918,877	921,648	977,454	1,078,733	1,066,349	1,110,557	1,145,831	1,203,163	1,062,638	1,300,278
17. Bengkulu	141,772	133,530	171,291	202,895	212,263	211,784	232,295	211,376	222,518	235,248	234,082	272,614	312,719
18. Lampung	502,824	596,427	666,628	745,781	836,680	823,770	883,891	1,002,483	995,526	1,034,001	1,110,246	1,088,578	1,354,692
Sumatera	**5,005,523**	**5,438,316**	**5,899,187**	**6,349,653**	**6,721,039**	**6,941,339**	**7,236,813**	**7,464,992**	**7,905,230**	**8,208,208**	**8,605,716**	**8,714,481**	**9,565,560**
31. D.K.I.Jakarta	61,394	52,192	48,840	32,903	34,661	37,557	41,273	38,384	38,631	39,173	39,174	27,474	31,433
32. Jawa Barat	6,411,939	7,098,144	7,255,749	7,524,938	8,196,289	8,701,023	8,787,958	8,972,982	9,202,168	9,925,207	10,024,554	9,529,451	10,406,341
33. Jawa Tengah	5,105,702	5,682,587	5,698,223	6,005,988	6,774,037	6,836,637	6,877,211	6,934,395	7,048,022	7,662,364	7,693,200	7,471,111	7,970,148
34. D.I.Yogyakarta	425,808	481,494	478,141	511,132	550,428	517,821	525,099	493,516	506,338	540,596	533,271	540,927	532,312
35. Jawa Timur	6,020,254	6,740,333	6,910,243	6,983,702	7,405,885	7,413,865	7,493,434	7,388,793	7,489,029	8,004,326	8,011,535	7,985,794	8,338,060
Jawa	**18,025,097**	**20,054,750**	**20,391,196**	**21,058,663**	**22,961,300**	**23,506,903**	**23,724,975**	**23,828,070**	**24,284,188**	**26,171,666**	**26,301,734**	**25,554,757**	**27,278,294**
51. Bali	717,187	739,375	728,188	733,057	753,018	758,463	771,515	804,036	790,128	871,405	848,414	818,338	836,071
52. Nusa Tenggara Barat	643,471	801,808	859,389	846,388	920,390	913,770	907,191	925,908	981,657	1,078,900	1,100,757	1,106,439	1,108,783
53. Nusa Tenggara Timur	121,090	141,067	178,872	198,780	178,855	182,975	192,706	166,646	185,485	204,281	210,772	247,916	249,475
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	40,494	36,416	40,452	46,109	64,590	52,657
Bali & Nusa Tenggara	**1,481,748**	**1,682,250**	**1,766,449**	**1,778,225**	**1,852,263**	**1,855,208**	**1,871,412**	**1,937,084**	**1,993,686**	**2,195,038**	**2,206,052**	**2,237,283**	**2,246,986**
61. Kalimantan Barat	414,755	462,811	474,474	458,038	439,867	442,998	447,844	420,452	453,545	526,738	495,487	490,392	529,336
62. Kalimantan Tengah	142,790	160,063	163,964	159,701	151,643	163,728	163,447	164,430	168,310	187,089	216,568	211,475	222,747
63. Kalimantan Selatan	696,723	739,872	683,921	709,831	781,664	814,862	818,441	816,432	859,354	879,921	934,670	963,936	1,088,242
64. Kalimantan Timur	76,020	93,976	109,093	66,256	79,410	93,836	95,876	104,566	101,217	104,004	108,763	123,666	121,849
Kalimantan	**1,330,288**	**1,456,722**	**1,431,452**	**1,393,826**	**1,452,584**	**1,515,424**	**1,525,608**	**1,505,880**	**1,582,426**	**1,697,752**	**1,755,488**	**1,789,469**	**1,962,174**
71. Sulawesi Utara	185,271	166,661	229,837	249,126	243,194	258,265	304,014	301,584	280,573	298,466	318,315	347,580	285,676
72. Sulawesi Tengah	169,579	172,340	196,623	229,785	215,676	221,453	268,997	294,590	330,162	350,221	368,808	426,817	421,746
73. Sulawesi Selatan	1,760,036	1,980,299	1,819,972	2,175,336	2,499,175	2,656,825	2,707,626	2,534,218	2,810,973	3,277,101	3,109,850	3,073,423	3,437,594
74. Sulawesi Tenggara	31,868	33,629	36,115	53,397	66,394	65,291	87,585	90,610	99,790	135,120	135,728	146,324	187,159
Sulawesi	**2,146,754**	**2,352,929**	**2,282,547**	**2,707,644**	**3,024,439**	**3,201,834**	**3,368,222**	**3,221,002**	**3,521,498**	**4,060,908**	**3,932,701**	**3,994,144**	**4,332,175**
81. Maluku	1,161	1,211	1,490	2,701	2,156	2,729	8,056	8,640	10,513	8,836	8,185	14,645	2,513
82. Irian Jaya	2,517	2,623	3,303	3,551	3,528	4,006	4,534	3,923	18,531	28,916	15,391	26,155	25,946
Maluku &Irian Jaya	**3,678**	**3,834**	**4,793**	**6,252**	**5,684**	**6,735**	**12,590**	**12,563**	**29,044**	**37,752**	**23,576**	**40,800**	**28,459**
Indonesia	**27,993,088**	**30,988,801**	**31,775,624**	**33,294,263**	**36,017,309**	**37,027,443**	**37,739,620**	**37,969,591**	**39,316,072**	**42,371,324**	**42,825,267**	**42,330,934**	**45,413,648**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBS and Unpublished data of CBS.

n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.4 Historical Change in Harvested Area of Upland Paddy by Province 1980-1992

Unit: ha

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	11,857	11,688	11,437	14,260	11,329	7,281	8,205	7,931	7,161	7,343	7,353	6,211	11,208
12. Sumatera Utara	117,318	102,350	92,050	98,082	86,812	86,919	76,519	87,200	80,110	79,900	63,141	67,162	79,721
13. Sumatera Barat	7,065	5,941	12,723	12,036	9,116	12,113	12,170	11,184	14,789	13,504	11,615	12,948	12,257
14. Riau	40,881	47,595	44,457	51,846	52,683	50,531	48,898	42,574	53,475	42,065	44,283	33,634	58,738
15. Jambi	19,177	17,671	18,704	20,770	21,158	22,587	31,719	30,375	40,076	46,314	38,036	42,910	47,053
16. Sumatera Selatan	108,396	95,462	96,461	124,117	101,243	104,461	85,521	95,082	100,204	100,831	101,262	80,571	121,615
17. Bengkulu	22,330	22,324	25,823	28,067	23,261	19,169	18,421	22,238	26,350	20,170	19,339	24,331	19,764
18. Lampung	121,651	123,359	124,956	134,135	150,247	131,534	96,808	119,941	119,138	110,845	98,987	99,662	133,153
Sumatera	**448,675**	**426,390**	**426,611**	**483,313**	**455,849**	**434,595**	**378,261**	**416,525**	**441,303**	**420,972**	**384,016**	**367,429**	**483,509**
31. D.K.I.Jakarta	489	274	232	56	39	0	0	0	0	0	0	0	0
32. Jawa Barat	115,302	109,350	95,241	129,918	162,424	153,495	144,202	132,085	153,073	155,064	164,143	151,511	187,269
33. Jawa Tengah	42,347	43,594	39,622	48,294	60,099	61,259	67,297	57,249	65,870	62,358	64,790	61,124	64,443
34. D.I.Yogyakarta	29,751	43,587	41,675	34,083	41,950	35,969	36,352	40,516	40,070	40,684	39,678	38,371	39,942
35. Jawa Timur	60,313	69,678	70,869	78,372	85,531	77,698	85,441	81,547	88,918	91,550	86,752	84,862	101,943
Jawa	**248,202**	**266,483**	**247,639**	**290,723**	**350,043**	**328,421**	**333,292**	**311,397**	**347,931**	**349,656**	**355,363**	**335,868**	**393,597**
51. Bali	6,542	5,798	4,278	4,220	3,705	2,770	2,864	2,494	2,292	2,384	2,685	2,039	2,154
52. Nusa Tenggara Barat	20,788	18,140	15,229	15,303	18,538	16,445	14,898	13,958	16,224	17,101	14,630	13,921	15,571
53. Nusa Tenggara Timur	82,555	85,129	73,411	70,949	58,680	55,206	55,826	54,626	57,297	57,510	64,819	61,781	64,473
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,299	691	n.a.	n.a.	1,269	0
Bali & Nusa Tenggara	**109,885**	**109,067**	**92,918**	**90,472**	**80,923**	**74,421**	**73,588**	**72,377**	**76,504**	**76,995**	**82,134**	**79,010**	**82,198**
61. Kalimantan Barat	116,300	116,245	114,992	111,156	104,727	95,335	119,424	122,610	124,282	102,050	102,375	116,923	119,514
62. Kalimantan Tengah	50,123	47,655	43,090	41,708	40,921	40,459	44,389	44,790	48,881	52,488	47,651	55,679	58,327
63. Kalimantan Selatan	29,113	32,477	34,711	31,788	38,406	37,979	32,357	27,789	32,636	22,708	24,079	31,008	42,573
64. Kalimantan Timur	45,064	57,020	48,693	17,709	40,071	42,430	43,150	59,271	57,704	62,712	67,401	65,757	58,242
Kalimantan	**240,600**	**253,397**	**241,486**	**202,361**	**224,125**	**216,203**	**239,320**	**254,460**	**263,503**	**239,958**	**241,506**	**269,367**	**278,656**
71. Sulawesi Utara	10,249	14,018	16,639	10,894	11,553	13,316	13,891	16,031	14,105	9,677	11,310	10,874	11,232
72. Sulawesi Tengah	48,256	44,420	29,180	33,064	30,921	26,301	17,892	14,039	21,572	22,230	20,823	16,635	16,864
73. Sulawesi Selatan	28,654	27,606	22,753	25,105	22,807	18,960	19,525	16,690	15,348	15,344	10,765	14,538	16,061
74. Sulawesi Tenggara	21,620	22,987	24,444	25,123	24,079	20,527	19,448	16,137	20,557	11,429	11,861	12,156	17,282
SulawesiI	**108,779**	**109,031**	**93,016**	**94,186**	**89,360**	**79,104**	**70,756**	**62,897**	**71,582**	**58,680**	**54,759**	**54,203**	**61,439**
81. Maluku	24,130	25,656	13,468	13,776	15,416	12,927	4,273	7,502	9,913	6,822	5,395	5,607	2,966
82. Irian Jaya	748	795	717	729	739	901	951	1,115	2,045	3,168	1,670	1,533	1,845
Maluku &Irian Jaya	**24,878**	**26,451**	**14,185**	**14,505**	**16,155**	**13,828**	**5,224**	**8,617**	**11,958**	**9,990**	**7,065**	**7,140**	**4,811**
Indonesia	**1,181,019**	**1,190,819**	**1,115,855**	**1,175,560**	**1,216,455**	**1,146,572**	**1,100,441**	**1,126,273**	**1,212,781**	**1,156,251**	**1,124,843**	**1,113,017**	**1,304,210**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBS and Unpublished data of CBS.
n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.5 Historical Change in Yield of Upland Paddy by Province 1980-1992

Unit: ton/ha

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	1.44	1.54	1.71	1.76	1.77	1.75	1.83	1.78	1.94	2.10	2.13	2.08	2.25
12. Sumatera Utara	1.61	1.61	1.88	1.94	2.06	1.97	2.02	1.92	2.06	2.14	2.21	2.17	2.26
13. Sumatera Barat	1.50	1.59	1.71	1.92	2.02	1.96	2.02	2.18	2.23	2.27	2.28	2.31	2.37
14. Riau	1.30	1.36	1.51	1.59	1.34	1.42	1.51	1.70	1.83	1.92	1.99	2.00	2.10
15. Jambi	1.11	1.25	1.50	1.68	1.71	1.42	1.63	1.59	1.70	1.81	1.87	1.90	1.89
16. Sumatera Selatan	1.54	1.52	1.61	1.71	1.69	1.61	1.74	1.60	1.72	1.90	1.97	2.06	2.06
17. Bengkulu	1.40	1.57	1.67	1.70	1.49	1.52	1.62	1.67	1.75	1.74	1.82	1.88	1.88
18. Lampung	1.51	1.52	1.67	1.60	1.63	1.63	1.67	2.02	2.13	2.25	2.35	2.40	2.42
Sumatera	**1.50**	**1.52**	**1.68**	**1.72**	**1.70**	**1.66**	**1.74**	**1.82**	**1.93**	**2.04**	**2.11**	**2.15**	**2.18**
31. D.K.I.Jakarta	1.50	1.50	1.70	1.57	1.62	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.00
32. Jawa Barat	1.58	1.73	1.85	1.89	2.04	2.10	2.09	2.19	2.19	2.31	2.38	2.40	2.44
33. Jawa Tengah	1.72	1.81	1.91	1.97	2.16	2.20	2.22	2.36	2.41	2.51	2.51	2.57	2.59
34. D.I.Yogyakarta	1.60	1.58	1.70	1.94	2.15	2.23	2.24	2.27	2.31	2.38	2.49	2.53	2.59
35. Jawa Timur	1.52	1.99	1.99	2.08	2.19	2.34	2.36	2.44	2.44	2.50	2.57	2.59	2.64
Jawa	**1.59**	**1.78**	**1.87**	**1.96**	**2.11**	**2.19**	**2.20**	**2.30**	**2.31**	**2.40**	**2.46**	**2.49**	**2.53**
51. Bali	1.33	1.20	1.54	1.39	1.57	1.57	1.62	1.75	1.82	1.95	1.95	2.01	2.00
52. Nusa Tenggara Barat	1.35	1.54	1.63	1.69	1.71	1.68	1.71	1.69	1.77	1.85	2.01	2.05	2.09
53. Nusa Tenggara Timur	1.13	1.25	1.32	1.45	1.35	1.23	1.38	1.65	1.79	1.83	1.85	1.92	1.91
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.20	1.20	n.a.	n.a.	1.81	n.a.
Bali & Nusa Tenggara	**1.18**	**1.29**	**1.38**	**1.49**	**1.44**	**1.34**	**1.45**	**1.65**	**1.78**	**1.84**	**1.88**	**1.94**	**1.95**
61. Kalimantan Barat	1.14	1.28	1.38	1.53	1.40	1.42	1.46	1.54	1.56	1.59	1.61	1.61	1.62
62. Kalimantan Tengah	1.27	1.25	1.36	1.35	1.42	1.48	1.50	1.50	1.52	1.53	1.56	1.62	1.67
63. Kalimantan Selatan	1.32	1.43	1.59	1.51	1.57	1.59	1.60	1.85	1.90	1.96	1.97	2.07	2.09
64. Kalimantan Timur	1.39	1.50	1.56	1.63	1.55	1.56	1.64	1.67	1.79	1.77	1.80	1.86	1.91
Kalimantan	**1.24**	**1.34**	**1.44**	**1.50**	**1.46**	**1.49**	**1.52**	**1.60**	**1.65**	**1.66**	**1.69**	**1.73**	**1.76**
71. Sulawesi Utara	1.45	1.60	1.65	1.71	1.68	1.68	1.73	1.46	1.57	1.70	1.80	1.88	1.96
72. Sulawesi Tengah	1.22	1.40	1.40	1.46	1.42	1.44	1.47	1.38	1.52	1.56	1.59	1.66	1.67
73. Sulawesi Selatan	1.32	1.39	1.52	1.76	1.76	1.74	1.79	1.70	1.88	2.00	2.09	2.15	2.17
74. Sulawesi Tenggara	1.26	1.36	1.45	1.69	1.62	1.56	1.67	1.59	1.69	1.69	1.64	1.71	1.72
Sulawesi	**1.28**	**1.41**	**1.49**	**1.63**	**1.60**	**1.58**	**1.66**	**1.54**	**1.66**	**1.72**	**1.74**	**1.85**	**1.87**
81. Maluku	0.96	1.03	0.92	1.18	1.15	1.22	1.14	1.37	1.50	1.54	1.65	1.74	1.82
82. Irian Jaya	1.27	1.36	1.30	1.43	1.44	1.37	1.37	1.32	1.39	1.73	1.80	1.83	1.71
Maluku & Irian Jaya	**0.97**	**1.04**	**0.94**	**1.19**	**1.16**	**1.23**	**1.18**	**1.37**	**1.48**	**1.60**	**1.69**	**1.76**	**1.78**
INDONESIA	**1.40**	**1.50**	**1.62**	**1.71**	**1.74**	**1.75**	**1.81**	**1.87**	**1.95**	**2.04**	**2.09**	**2.12**	**2.17**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBS and Unpublished data of CBS.
n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.6 Historical Change in Production of Upland Paddy by Province 1980-1992

Unit: ton

Province	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
11. D.I.Aceh	17,074	17,953	19,534	25,112	20,030	12,713	15,015	14,122	13,871	15,385	15,640	12,921	25183
12. Sumatera Utara	188,999	165,295	172,778	190,769	178,920	171,057	154,497	167,047	164,799	171,033	139,294	145,715	179914
13. Sumatera Barat	10,590	9,434	21,807	23,121	18,396	23,802	24,547	24,403	32,966	30,705	26,482	29,954	29100
14. Riau	53,145	64,634	67,308	82,176	70,648	71,956	73,738	72,518	97,676	80,767	88,079	67,257	123122
15. Jambi	21,210	22,106	27,981	34,997	36,180	32,051	51,575	48,354	68,200	83,716	71,118	81,688	88838
16. Sumatera Selatan	167,363	144,720	155,399	212,364	171,303	167,869	148,379	152,513	171,926	192,036	199,964	166,240	250659
17. Bengkulu	31,195	35,071	43,228	47,658	34,775	29,079	29,897	37,081	46,091	35,008	35,219	45,769	37156
18. Lampung	183,571	187,506	208,427	214,884	244,752	214,532	161,379	241,978	254,081	249,386	232,666	238,966	322176
Sumatera	**673,147**	**646,719**	**716,462**	**831,081**	**775,004**	**723,059**	**659,027**	**758,016**	**849,610**	**858,036**	**808,462**	**788,510**	**1,056,148**
31. D.K.I.Jakarta	732	412	395	88	63	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32. Jawa Barat	182,575	189,052	175,748	245,308	331,345	321,922	300,918	289,535	335,827	357,756	390,832	363,628	457052
33. Jawa Tengah	72,684	78,853	75,841	95,271	129,578	134,698	149,423	135,067	158,582	156,265	162,812	157,068	166630
34. D.I.Yogyakarta	47,735	68,785	70,843	66,077	90,318	80,248	81,387	92,097	92,427	96,746	98,865	97,013	103649
35. Jawa Timur	91,683	138,458	141,015	162,890	187,722	181,509	201,751	198,757	217,255	228,824	223,179	220,086	268796
Jawa	**395,409**	**475,560**	**463,842**	**569,634**	**739,026**	**718,377**	**733,479**	**715,456**	**804,091**	**839,591**	**875,688**	**837,795**	**996,127**
51. Bali	8,688	6,969	6,567	5,849	5,813	4,349	4,639	4,354	4,166	4,640	5,229	4,106	4303
52. Nusa Tenggara Barat	27,981	27,954	24,884	25,858	31,700	27,628	25,490	23,646	28,677	31,658	29,417	28,501	32518
53. Nusa Tenggara Timur	92,957	106,156	96,903	103,160	78,925	67,848	76,761	89,920	102,387	105,252	119,818	118,721	123331
54. Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,560	830	n.a.	n.a.	2,300	n.a.
Bali & Nusa Tenggara	**129,626**	**141,079**	**128,354**	**134,867**	**116,438**	**99,825**	**106,890**	**119,480**	**136,060**	**141,550**	**154,464**	**153,628**	**160,152**
61. Kalimantan Barat	132,815	149,026	158,344	169,624	147,141	135,757	174,359	189,398	194,428	162,311	164,371	188,371	193053
62. Kalimantan Tengah	63,506	59,569	58,559	56,222	57,944	59,879	66,720	67,215	74,122	80,288	74,285	90,049	97196
63. Kalimantan Selatan	38,371	46,312	55,052	47,968	60,336	60,235	51,804	51,307	62,129	44,524	47,497	64,061	88979
64. Kalimantan Timur	62,819	85,587	75,912	28,813	61,910	66,148	70,949	99,076	103,429	110,777	121,340	122,292	111399
Kalimantan	**297,511**	**340,494**	**347,867**	**302,627**	**327,331**	**322,019**	**363,832**	**406,996**	**434,108**	**397,900**	**407,493**	**464,773**	**490,627**
71. Sulawesi Utara	14,861	22,401	27,421	18,607	19,444	22,344	24,059	23,418	22,078	16,497	20,318	20,431	21980
72. Sulawesi Tengah	59,065	62,099	40,969	48,174	43,877	37,900	26,373	19,406	32,865	34,686	33,094	27,570	28119
73. Sulawesi Selatan	37,823	38,294	34,494	44,135	40,232	33,009	34,891	28,436	28,848	30,706	22,528	31,279	34862
74. Sulawesi Tenggara	27,263	31,170	35,322	42,396	39,056	32,002	32,400	25,618	34,686	19,316	19,510	20,770	29784
Sulawesi	**139,012**	**153,964**	**138,206**	**153,312**	**142,609**	**125,255**	**117,723**	**96,878**	**118,477**	**101,205**	**95,450**	**100,050**	**114,745**
81. Maluku	23,165	26,477	12,391	16,283	17,667	15,732	4,887	10,308	14,908	10,502	8,921	9,744	5398
82. Irian Jaya	947	1,082	931	1,039	1,062	1,235	1,303	1,470	2,844	5,474	3,006	2,813	3164
Maluku & Irian Jaya	**24,112**	**27,559**	**13,322**	**17,322**	**18,729**	**16,967**	**6,190**	**11,778**	**17,752**	**15,976**	**11,927**	**12,557**	**8,562**
INDONESIA	**1,658,817**	**1,785,375**	**1,808,053**	**2,008,843**	**2,119,137**	**2,005,502**	**1,987,141**	**2,108,604**	**2,360,098**	**2,354,258**	**2,353,484**	**2,357,313**	**2,826,361**

Source: Agricultural survey Production of Cereals in Indonesia 1980-1991, CBSand Unpublished data of CBS.
n.a. : no data in database because data not available, not applicable, negligible, nil or not yet entered

Table 5.7 Change in Harvested Area of Lowland Paddy by Province during 1980-1992

unit: ha

Province	Area '80-'82	Area '85-'87	Area '90-'92	hange first h	aange second h	Change Total	nc. Rate (%)	First half %	econd half %
Sumatera	**1,661,865**	**1,968,407**	**2,259,898**	**306,543**	**291,491**	**598,034**	**3.41%**	**3.44%**	**2.80%**
11. D.I.Aceh	232,779	263,106	303,445	30,328	40,339	70,666	3.61%	2.48%	2.89%
12. Sumatera Utara	455,951	533,607	645,823	77,657	112,216	189,873	3.50%	3.20%	3.89%
13. Sumatera Barat	284,344	331,381	362,588	47,037	31,207	78,245	2.11%	3.11%	1.82%
14. Riau	83,609	86,578	107,336	2,969	20,757	23,727	2.25%	0.70%	4.39%
15. Jambi	133,046	141,651	143,794	8,605	2,143	10,748	0.97%	1.26%	0.30%
16. Sumatera Selatan	259,419	322,675	343,509	63,255	20,835	84,090	3.63%	4.46%	1.26%
17. Bengkulu	48,414	65,413	75,955	16,999	10,542	27,541	4.99%	6.20%	3.03%
18. Lampung	164,304	223,996	277,448	59,692	53,452	113,144	6.30%	6.39%	4.37%
Jawa	**4,603,288**	**4,947,998**	**5,023,503**	**344,711**	**75,504**	**420,215**	**1.09%**	**1.45%**	**0.30%**
31. D.K.I.Jakarta	16,892	9,629	6,867	-7,263	-2,763	-10,026	-9.06%	-10.63%	-6.54%
32. Jawa Barat	1,760,541	1,924,719	1,934,866	164,179	10,146	174,325	1.14%	1.80%	0.11%
33. Jawa Tengah	1,316,598	1,426,457	1,475,935	109,859	49,478	159,337	1.32%	1.62%	0.68%
34. D.I.Yogyakarta	102,798	101,518	98,051	-1,280	-3,467	-4,747	-0.24%	-0.25%	-0.69%
35. Jawa Timur	1,406,458	1,485,674	1,507,784	79,216	22,110	101,326	0.99%	1.10%	0.30%
Bali & Nusa Tenggara	**439,692**	**462,879**	**504,397**	**23,187**	**41,518**	**64,705**	**1.48%**	**1.03%**	**1.73%**
51. Bali	169,036	165,178	160,075	-3,859	-5,102	-8,961	-0.80%	-0.46%	-0.63%
52. Nusa Tenggara Barat	217,100	232,317	247,900	15,217	15,582	30,799	1.75%	1.36%	1.31%
53. Nusa Tenggara Timur	53,555	59,237	75,984	5,682	16,747	22,429	4.32%	2.04%	5.11%
54. Timor Timur	na.	na.	20,438	na.	na.	na.	na.	na.	na.
Kalimantan	**577,077**	**590,813**	**666,683**	**13,736**	**75,870**	**89,606**	**1.77%**	**0.47%**	**2.45%**
61. Kalimantan Barat	189,058	173,058	186,502	-16,000	13,444	-2,556	0.28%	-1.75%	1.51%
62. Kalimantan Tengah	73,025	78,027	94,608	5,002	16,582	21,583	2.24%	1.33%	3.93%
63. Kalimantan Selatan	275,043	299,452	342,479	24,409	43,027	67,436	2.58%	1.72%	2.72%
64. Kalimantan Timur	39,951	40,276	43,094	325	2,818	3,143	1.60%	0.16%	1.36%
Sulawesi	**678,771**	**839,019**	**982,638**	**160,248**	**143,619**	**303,867**	**3.25%**	**4.33%**	**3.21%**
71. Sulawesi Utara	55,372	70,570	75,168	15,198	4,598	19,797	1.56%	4.97%	1.27%
72. Sulawesi Tengah	69,204	85,914	122,337	16,710	36,422	53,133	5.00%	4.42%	7.32%
73. Sulawesi Selatan	540,728	656,554	739,313	115,826	82,759	198,585	2.80%	3.96%	2.40%
74. Sulawesi Tenggara	13,467	25,980	45,819	12,513	19,839	32,352	11.95%	14.04%	12.02%
Maluku &Irian Jaya	**1,863**	**4,235**	**11,256**	**2,372**	**7,021**	**9,392**	**15.65%**	**17.85%**	**21.59%**
81. Maluku	547	2,482	2,961	1,935	479	2,414	4.15%	35.32%	3.60%
82. Irian Jaya	1,316	1,753	8,295	437	6,541	6,978	18.11%	5.90%	36.45%
Indonesia	**7,962,555**	**8,813,351**	**9,448,374**	**850,796**	**635,023**	**1,485,819**	**1.89%**	**2.05%**	**1.40%**

Source: Team calculation based on the data from Central Bureau of Statistics

Table 5.8 Change in Yield of Lowland Paddy by Province during 1980-1992

unit: ton/ha

Province	Yield '80-'82	Yield '85-'87	Yield '90-'92	hange first haange second h	Change Total Inc.	Rate (%)	First half %	econd half %
Sumatera	**3.28**	**3.66**	**3.96**	**0.39**	**0.30**	**0.69**	**2.06%**	**2.25%**	**1.59%**
11. D.I.Aceh	3.31	3.67	4.02	0.35	0.35	0.70	2.22%	2.04%	1.84%
12. Sumatera Utara	3.34	3.78	4.01	0.44	0.24	0.68	2.06%	2.49%	1.24%
13. Sumatera Barat	3.72	4.21	4.63	0.49	0.42	0.91	2.21%	2.51%	1.92%
14. Riau	2.48	2.92	3.25	0.44	0.33	0.77	2.88%	3.35%	2.14%
15. Jambi	2.86	3.00	3.32	0.14	0.32	0.46	1.61%	0.98%	2.02%
16. Sumatera Selatan	2.98	3.23	3.46	0.25	0.23	0.48	1.55%	1.62%	1.42%
17. Bengkulu	3.07	3.34	3.59	0.27	0.25	0.52	1.74%	1.69%	1.45%
18. Lampung	3.58	4.03	4.27	0.45	0.23	0.68	2.18%	2.40%	1.13%
Jawa	**4.23**	**4.79**	**5.25**	**0.55**	**0.46**	**1.02**	**2.40%**	**2.49%**	**1.86%**
31. D.K.I.Jakarta	3.21	4.08	4.76	0.87	0.69	1.56	3.99%	4.93%	3.16%
32. Jawa Barat	3.93	4.58	5.16	0.65	0.58	1.23	2.94%	3.12%	2.41%
33. Jawa Tengah	4.17	4.83	5.22	0.65	0.40	1.05	2.43%	2.94%	1.60%
34. D.I.Yogyakarta	4.49	5.05	5.46	0.55	0.42	0.97	2.12%	2.35%	1.60%
35. Jawa Timur	4.66	5.00	5.38	0.34	0.38	0.72	1.75%	1.42%	1.46%
Bali & Nusa Tenggara	**3.74**	**4.08**	**4.42**	**0.34**	**0.34**	**0.68**	**2.02%**	**1.76%**	**1.63%**
51. Bali	4.31	4.71	5.21	0.40	0.50	0.90	2.10%	1.80%	2.05%
52. Nusa Tenggara Barat	3.54	3.94	4.46	0.40	0.52	0.92	2.84%	2.18%	2.50%
53. Nusa Tenggara Timur	2.75	3.05	3.11	0.30	0.06	0.36	1.81%	2.13%	0.37%
54. Timor Timur	na.	2.20	2.66	na.	0.47	na.	na.	na.	3.93%
Kalimantan	**2.44**	**2.57**	**2.75**	**0.13**	**0.19**	**0.32**	**1.50%**	**1.03%**	**1.42%**
61. Kalimantan Barat	2.38	2.53	2.71	0.14	0.18	0.32	1.77%	1.17%	1.39%
62. Kalimantan Tengah	2.13	2.10	2.30	-0.03	0.20	0.17	1.50%	-0.28%	1.80%
63. Kalimantan Selatan	2.57	2.73	2.90	0.16	0.18	0.33	1.17%	1.19%	1.27%
64. Kalimantan Timur	2.33	2.43	2.74	0.11	0.30	0.41	2.37%	0.89%	2.39%
Sulawesi	**3.33**	**3.89**	**4.16**	**0.56**	**0.27**	**0.83**	**2.70%**	**3.15%**	**1.35%**
71. Sulawesi Utara	3.50	4.08	4.22	0.58	0.14	0.72	2.08%	3.13%	0.66%
72. Sulawesi Tengah	2.59	3.04	3.32	0.45	0.28	0.72	2.75%	3.23%	1.75%
73. Sulawesi Selatan	3.43	4.01	4.34	0.58	0.33	0.91	2.86%	3.19%	1.58%
74. Sulawesi Tenggara	2.52	3.12	3.41	0.60	0.29	0.90	3.52%	4.40%	1.82%
Maluku & Irian Jaya	**2.20**	**2.49**	**2.74**	**0.29**	**0.26**	**0.54**	**2.54%**	**2.48%**	**1.97%**
81. Maluku	2.35	2.57	2.88	0.21	0.31	0.52	2.39%	1.74%	2.32%
82. Irian Jaya	2.14	2.37	2.71	0.23	0.34	0.57	2.84%	2.07%	2.70%
Indonesia	**3.80**	**4.26**	**4.61**	**0.46**	**0.34**	**0.81**	**2.18%**	**2.33%**	**1.56%**

Source: Team calculation based on the data from Central Bureau of Statistics

Table 5.9 Change in Production of Lowland Paddy by Province during 1980-1992

unit: ton

Province	Prod.'80-'82	Prod.'85-'87	Prod.'90-'92	hange first ha	ange second h	Change total	Inc. rate (%)	First half %	econd half %
Sumatera	**5,447,675**	**7,214,381**	**8,961,919**	**1,766,706**	**1,747,538**	**3,514,244**	**5.55%**	**5.78%**	**4.43%**
11. D.I.Aceh	771,444	964,609	1,218,976	193,165	254,367	447,533	5.91%	4.57%	4.79%
12. Sumatera Utara	1,521,922	2,014,446	2,592,806	492,524	578,360	1,070,884	5.63%	5.77%	5.18%
13. Sumatera Barat	1,056,880	1,394,663	1,678,287	337,783	283,624	621,407	4.37%	5.70%	3.77%
14. Riau	207,070	253,247	348,355	46,176	95,108	141,285	5.19%	4.11%	6.58%
15. Jambi	380,376	424,705	477,158	44,330	52,453	96,782	2.60%	2.23%	2.36%
16. Sumatera Selatan	772,493	1,040,845	1,188,693	268,352	147,848	416,200	5.23%	6.14%	2.69%
17. Bengkulu	148,864	218,485	273,138	69,621	54,653	124,274	6.81%	7.98%	4.57%
18. Lampung	588,626	903,381	1,184,505	314,755	281,124	595,879	8.61%	8.94%	5.57%
Jawa	**19,490,348**	**23,686,649**	**26,378,262**	**4,196,302**	**2,691,612**	**6,887,914**	**3.51%**	**3.98%**	**2.18%**
31. D.K.I.Jakarta	54,142	39,071	32,694	-15,071	-6,378	-21,448	-5.43%	-6.32%	-3.50%
32. Jawa Barat	6,921,944	8,820,654	9,986,782	1,898,710	1,166,128	3,064,838	4.12%	4.97%	2.51%
33. Jawa Tengah	5,495,504	6,882,748	7,711,486	1,387,244	828,739	2,215,982	3.78%	4.60%	2.30%
34. D.I.Yogyakarta	461,814	512,145	535,503	50,331	23,358	73,689	1.88%	2.09%	0.90%
35. Jawa Timur	6,556,943	7,432,031	8,111,796	875,087	679,766	1,554,853	2.75%	2.54%	1.77%
Bali & Nusa Tenggara	**1,643,482**	**1,887,901**	**2,230,107**	**244,419**	**342,206**	**586,625**	**3.53%**	**2.81%**	**3.39%**
51. Bali	728,250	778,005	834,274	49,755	56,270	106,024	1.29%	1.33%	1.41%
52. Nusa Tenggara Barat	768,223	915,623	1,105,326	147,400	189,703	337,104	4.64%	3.57%	3.84%
53. Nusa Tenggara Timur	147,010	180,776	236,054	33,766	55,279	89,045	6.21%	4.22%	5.48%
54. Timor Timur	na.	40,494	54,452	na.	13,958	na.	na.	na.	6.10%
Kalimantan	**1,406,154**	**1,515,637**	**1,835,710**	**109,483**	**320,073**	**429,556**	**3.29%**	**1.51%**	**3.91%**
61. Kalimantan Barat	450,680	437,098	505,072	-13,582	67,974	54,392	2.05%	-0.61%	2.93%
62. Kalimantan Tengah	155,606	163,868	216,930	8,263	53,062	61,324	3.78%	1.04%	5.77%
63. Kalimantan Selatan	706,839	816,578	995,616	109,740	179,038	288,777	3.79%	2.93%	4.04%
64. Kalimantan Timur	93,030	98,093	118,093	5,063	20,000	25,063	4.01%	1.07%	3.78%
Sulawesi	**2,260,743**	**3,263,686**	**4,086,340**	**1,002,943**	**822,654**	**1,825,597**	**6.03%**	**7.62%**	**4.60%**
71. Sulawesi Utara	193,923	287,954	317,190	94,031	29,236	123,267	3.67%	8.23%	1.95%
72. Sulawesi Tengah	179,514	261,680	405,790	82,166	144,110	226,276	7.89%	7.83%	9.17%
73. Sulawesi Selatan	1,853,436	2,632,890	3,206,956	779,454	574,066	1,353,520	5.74%	7.27%	4.02%
74. Sulawesi Tenggara	33,871	81,162	156,404	47,291	75,242	122,533	15.90%	19.10%	14.02%
Maluku & Irian Jaya	**4,102**	**10,629**	**30,945**	**6,528**	**20,316**	**26,843**	**18.59%**	**20.98%**	**23.83%**
81. Maluku	1,287	6,475	8,448	5,188	1,973	7,160	6.65%	38.14%	5.46%
82. Irian Jaya	2,814	4,154	22,497	1,340	18,343	19,683	21.46%	8.10%	40.19%
Indonesia	**30,252,504**	**37,578,885**	**43,523,283**	**7,326,380**	**5,944,398**	**13,270,779**	**4.11%**	**4.43%**	**2.98%**

Source: Team calculation based on the data from Central Bureau of Statistics

Table 5.10 Acreage of Paddy Field by Water Regime 1991

Unit: ha

Province	Technical Irrigation	Semi-technica Irrigation	Simple Irrigation	Irrigated Area	Rainfed	Tidal Swamp	Others	Tidal Swamp and Others	Total
11. D. I. Aceh	0	36,813	113,076	149,889	130,098	2,247	34,196	36,443	316,430
12. Sumatera Utara	47,579	69,770	156,978	274,327	204,590	10,631	41,291	51,922	530,839
13. Sumatera Barat	10,066	57,113	99,173	166,352	65,777	405	1,611	2,016	234,145
14. Riau	0	2,207	24,066	26,273	55,760	39,639	84,099	123,738	205,771
15. Jambi	0	9,204	18,957	28,161	27,030	72,916	70,392	143,308	198,499
16. Sumatera Selatan	14,547	8,524	44,578	67,649	53,572	72,751	228,090	300,841	422,062
17. Benkulu	8,390	21,067	20,852	50,309	12,026	3,781	6,468	10,249	72,584
18. Lampung	87,294	23,343	36,486	147,123	57,696	13,749	20,362	34,111	238,930
Sumatera	**167,876**	**228,041**	**514,166**	**910,083**	**606,549**	**216,119**	**486,509**	**702,628**	**2,219,260**
31. D.K.I. Jakarta	1,860	994	960	3,814	1,405	0	110	110	5,329
32. Jawa Barat	439,939	134,578	318,646	893,163	267,231	26	17,121	17,147	1,177,541
33. Jawa Tengah	342,443	135,396	219,935	697,774	308,567	56	2,828	2,884	1,009,225
34. D.I. Yogyakarta	6,534	37,283	8,523	52,340	9,506	0	116	116	61,962
35. Jawa Timur	635,025	130,489	133,518	899,032	260,745	413	5,288	5,701	1,165,478
Jawa	**1,425,801**	**438,740**	**681,582**	**2,546,123**	**847,454**	**495**	**25,463**	**25,958**	**3,419,535**
51. Bali	0	66,646	24,250	90,896	821	0	486	486	92,203
52. Nusatenggara Barat	39,734	85,616	32,356	157,706	40,029	0	0	0	197,735
53. Nusatenggara Timur	6,120	18,365	34,374	58,859	29,979	15	29,496	29,511	118,349
54. Timor Timur	na	na	na	na	na	na	na	na	na
Bali & Nusa Tenggara	**45,854**	**170,627**	**90,980**	**307,461**	**70,829**	**15**	**29,982**	**29,997**	**408,287**
61. Kalimantan Barat	1,801	5,410	55,088	62,299	133,245	60,655	134,072	194,727	390,271
62. Kalimantan Tengah	2,897	3,438	36,330	42,665	55,053	84,772	118,020	202,792	300,510
63. Kalalimantan Selatan	7,642	4,095	14,790	26,527	137,073	132,416	177,078	309,494	473,094
64. Kalimantan Timur	127	427	7,865	8,419	43,770	5,389	80,979	86,368	138,557
Kalimantan	**12,467**	**13,370**	**114,073**	**139,910**	**369,141**	**283,232**	**510,149**	**793,381**	**1,302,432**
71. Sulawesi Utara	20,227	19,206	11,757	51,190	10,224	182	5,904	6,086	67,500
72. Sulawesi Tengah	28,535	25,958	59,709	114,202	10,279	575	21,931	22,506	146,987
73 Sulawesi Selatan	130,491	41,585	155,914	327,990	245,924	775	18,899	19,674	593,588
74. Sulawesi Tenggara	3,806	12,489	18,913	35,208	4,721	312	17,148	17,460	57,389
Sulawesi	**183,059**	**99,238**	**246,293**	**528,590**	**271,148**	**1,844**	**63,882**	**65,726**	**865,464**
81. Maluku	na	na	na	na	na	na	na	na	na
82. Irian Jaya	na	na	na	na	na	na	na	na	na
Maluku & Irian Jaya	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**
Indonesia	**1,835,057.0**	**950,016.0**	**1,647,094.0**	**4,432,167.0**	**2,165,121.0**	**501,705.0**	**1,115,985.0**	**1,617,690.0**	**8,214,978**

Source: Agriculturai Survey Land Area by Utilization 1991, CBS
Note: Others include swapm, polders and temporarily fallowland. na: data not available

Table 5.11 Changes in the Area of Lowland Paddy Field by Water Regime and Irrigation Type

Unit: 000ha

	Irrigated				Rainfed	Tidal Swamp	Others*1	Total
	Technical	Semi tech.	Simple	Sub total				
Sumatera								
1983	133.9	164.6	534.5	833.0	533.0	243.3	370.3	1,979.7
1984	130.4	159.2	506.6	796.2	538.0	220.1	430.3	1,984.7
1985	129.7	169.3	504.1	803.1	490.5	252.5	376.9	1,922.9
1986	136.6	190.4	481.7	808.6	533.1	213.7	438.9	1,994.4
1987	143.9	141.6	558.1	843.6	630.4	278.2	606.0	2,358.2
1988	146.9	192.5	521.2	860.6	619.0	228.3	520.6	2,228.6
1989	159.4	195.6	515.3	870.3	607.7	196.4	582.9	2,257.4
1990	167.0	209.6	523.4	899.9	571.7	223.5	519.4	2,214.5
Jawa								
1983	1,341.2	473.8	679.9	2,494.8	911.4	3.4	22.4	3,432.1
1984	1,342.3	471.0	688.0	2,501.3	937.0	1.6	16.1	3,456.0
1985	1,344.5	460.0	678.0	2,482.4	940.3	0.8	29.6	3,453.1
1986	1,353.9	472.3	653.0	2,479.3	933.1	3.1	29.1	3,444.5
1987	1,363.2	466.8	357.9	2,187.9	898.1	4.5	357.2	3,447.6
1988	1,369.7	455.0	698.4	2,523.2	893.6	1.2	25.4	3,443.4
1989	1,382.9	461.0	690.5	2,534.5	888.4	0.5	22.1	3,445.6
1990	1,389.1	458.6	688.0	2,535.7	863.5	3.6	17.8	3,420.5
B & NT								
1983	56.2	131.7	102.6	290.5	73.5	0.0	2.7	366.7
1984	41.4	146.4	108.3	296.1	77.1	0.0	0.0	373.2
1985	43.2	138.4	105.9	287.4	73.7	0.0	11.0	372.2
1986	39.4	159.1	103.8	302.3	74.2	0.0	23.6	400.1
1987	50.7	152.3	66.4	269.4	73.2	0.0	48.4	390.9
1988	45.1	159.6	100.7	305.4	73.2	0.1	33.1	411.8
1989	44.6	160.5	103.5	308.7	67.0	5.4	28.8	409.9
1990	43.3	167.4	97.7	308.4	75.3	0.0	29.7	413.4
Kalimantan								
1983	9.9	8.8	138.8	157.5	393.9	233.8	87.1	872.4
1984	5.9	10.8	138.3	155.0	419.6	242.9	122.6	940.1
1985	5.7	8.4	130.4	144.5	384.1	232.3	212.4	973.2
1986	10.6	12.2	146.6	169.4	334.3	247.6	395.0	1,146.4
1987	8.3	13.6	100.4	122.3	342.1	264.6	452.2	1,181.2
1988	9.4	24.0	140.6	174.0	351.0	264.7	445.5	1,235.3
1989	9.6	26.4	151.9	187.8	380.1	258.2	456.2	1,282.3
1990	29.2	34.5	143.2	206.9	410.7	249.9	482.8	1,350.2
Sulawesi								
1983	110.4	75.0	226.4	411.8	321.4	5.7	7.2	746.1
1984	113.5	60.7	235.7	409.9	300.4	1.8	12.0	724.2
1985	126.6	74.5	235.1	436.2	283.5	1.5	50.6	771.7
1986	127.6	75.5	230.3	433.4	292.8	2.3	55.2	783.7
1987	141.2	87.4	213.9	442.4	278.7	1.7	75.9	798.8
1988	143.8	82.8	225.6	452.2	278.4	1.4	49.7	781.6
1989	164.3	95.8	226.1	486.1	283.0	2.3	59.9	831.3
1990	174.0	95.0	227.9	496.9	265.9	4.1	50.0	817.0
Indonesia								
1983	1,651.7	853.9	1,682.1	4,187.7	2,233.3	486.3	489.7	7,396.9
1984	1,633.4	848.1	1,676.9	4,158.5	2,272.1	466.5	581.1	7,478.2
1985	1,649.6	850.5	1,653.5	4,153.6	2,172.1	487.1	680.4	7,493.2
1986	1,668.2	909.4	1,615.4	4,193.0	2,167.5	466.8	941.9	7,769.1
1987	1,707.3	861.7	1,296.6	3,865.6	2,222.5	549.0	1,539.7	8,176.9
1988	1,715.0	913.8	1,686.5	4,315.3	2,215.2	495.7	1,074.4	8,100.7
1989	1,760.8	939.4	1,687.3	4,387.4	2,226.2	462.8	1,150.0	8,226.4
1990	1,802.6	965.1	1,680.1	4,447.8	2,187.0	481.1	1,099.7	8,215.6

Remarks: *1: Others include fresh water swamps, polders, etc. and temporarily fallow lanc
Note: Timor Timur, Maluku and Irian Jaya are not included
Source: DGFCA, MOA, various years.

Table 5.12 Cropping Intensity (CIp) of Lowland Field by Province in 1989

Province	Field Area (1,000ha)	Planted Area (1,000ha) Paddy	Palawija	Estate Crops	CIp for Paddy	CIp for Palawija	CIp for Estate	CIp for Total
11 D.I. Aceh	323.1	260.5	16.0	8.7	0.81	0.05	0.03	0.88
12 Sumatera Utara	541.8	616.4	45.5	27.4	1.14	0.08	0.05	1.27
13 Sumatera Barat	222.6	357.7	5.6	9.2	1.61	0.03	0.04	1.67
14 Riau	212.0	99.0	0.0	0.5	0.47	0.00	0.00	0.47
15 Jambi	212.8	155.8	0.5	1.7	0.73	0.00	0.01	0.74
16 Sumatera Selatan	457.9	355.3	16.3	12.8	0.78	0.04	0.03	0.84
17 Bengkulu	71.5	68.1	5.7	0.1	0.95	0.08	0.00	1.03
18 Lampung	215.7	243.7	15.6	29.0	1.13	0.07	0.13	1.34
Sumatera	2,257.4	2,156.5	105.2	89.2	0.96	0.05	0.04	1.04
31 D.K.I. Jakarta	6.7	9.1	0.0	0.0	1.36	0.00	0.00	1.36
32 Jawa Barat	1,194.5	1,689.1	240.6	38.3	1.41	0.20	0.03	1.65
33 Jawa Tengah	1,010.5	1,423.6	415.78	129.1	1.41	0.41	0.13	1.95
34 Yoguyakarta	62.6	98.1	67.27	8.6	1.57	1.08	0.14	2.78
35 Jawa Timur	1,171.3	1,475.8	657.79	268.0	1.26	0.56	0.23	2.05
Jawa	3,445.6	4,695.7	1,381.5	444.1	1.36	0.40	0.13	1.89
51 Bali	94.1	168.0	37.38	0.9	1.79	0.40	0.01	2.19
52 N.T.B.	197.2	229.8	141.11	10.7	1.16	0.72	0.05	1.93
53 N.T.T.	118.6	86.6	1.76	2.8	0.73	0.01	0.02	0.77
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali, NT, Timtim	409.9	484.4	180.3	15.0	1.18	0.44	0.04	1.66
61 Kalimantan Barat	431.5	158.6	2.16	0.5	0.37	0.01	0.00	0.37
62 Kalimantan Tengal	222.2	93.8	4.24	0.0	0.42	0.02	0.00	0.44
63 Kalimantan Selatar	467.0	313.7	2.72	10.7	0.67	0.01	0.02	0.70
64 Kalimantan Timur	161.5	42.8	0.01	0.0	0.26	0.00	0.00	0.27
Kalimantan	1,282.3	608.9	9.1	11.3	0.47	0.01	0.01	0.49
71 Sulawesi Utara	66.7	77.3	0.53	0.0	1.16	0.01	0.00	1.17
72 Sulawesi Tengah	118.4	126.1	28.43	0.0	1.07	0.24	0.00	1.31
73 Sulawesi Selatan	589.3	688.6	57.53	20.9	1.17	0.10	0.04	1.30
74 Sulawesi Tenggara	57.0	39.6	0.00	0.6	0.70	0.00	0.01	0.71
Sulawesi	831.3	931.7	86.5	21.5	1.12	0.10	0.03	1.25
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
aluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Outside Jawa	4,780.8	4,181.5	381.1	137.0	0.87	0.08	0.03	0.98
Indonesia	8,226.4	8,877.1	1,762.6	580.8	1.08	0.21	0.07	1.36

Remarks: -: data not available
Source: JICA-FIDP Team calculation based on the data from the DGFCA, MOA

Table5.13 Cropping Intensity (CIp) of Lowland Field by Province in 1988

Province	Field Area (1,000ha)	Planted Area (1,000ha)		CIp for Paddy	CIp for Palawija	CIp for Total
		Paddy	Palawija			
11 D.I. Aceh	299.7	275.3	18.8	0.92	0.06	0.98
12 Sumatera Utara	538.6	583.3	35.5	1.08	0.07	1.15
13 Sumatera Barat	222.4	323.2	5.5	1.45	0.02	1.48
14 Riau	207.0	82.1	0.0	0.40	0.00	0.40
15 Jambi	247.1	112.8	0.7	0.46	0.00	0.46
16 Sumatera Selatan	411.3	344.4	2.7	0.84	0.01	0.84
17 Bengkulu	84.2	67.8	2.5	0.81	0.03	0.84
18 Lampung	218.3	286.9	9.2	1.31	0.04	1.36
Sumatera	2,228.6	2,075.9	74.9	0.93	0.03	0.97
31 D.K.I. Jakarta	7.8	10.1	0.0	1.29	0.00	1.29
32 Jawa Barat	1,191.4	2,208.0	102.5	1.85	0.09	1.94
33 Jawa Tengah	1,016.5	1,597.7	444.36	1.57	0.44	2.01
34 Yoguyakarta	61.9	104.2	28.26	1.68	0.46	2.14
35 Jawa Timur	1,165.8	1,620.9	713.78	1.39	0.61	2.00
Jawa	3,443.4	5,540.8	1,288.9	1.61	0.37	1.98
51 Bali	95.1	167.2	16.08	1.76	0.17	1.93
52 Nusa Tenggara Barat	243.2	269.8	119.75	1.11	0.49	1.60
53 Nusa Tenggara Timur	145.3	62.4	2.70	0.43	0.02	0.45
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	483.5	499.4	138.5	1.03	0.29	1.32
61 Kalimantan Barat	427.7	189.3	0.09	0.44	0.00	0.44
62 Kalimantan Tengah	211.9	79.1	5.76	0.37	0.03	0.40
63 Kalimantan Selatan	462.2	99.6	1.47	0.22	0.00	0.22
64 Kalimantan Timur	133.5	2.3	0.05	0.02	0.00	0.02
Kalimantan	1,235.3	370.3	7.4	0.30	0.01	0.31
71 Sulawesi Utara	59.6	73.3	1.50	1.23	0.03	1.26
72 Sulawesi Tengah	108.6	125.7	51.24	1.16	0.47	1.63
73 Sulawesi Selatan	564.8	822.9	53.72	1.46	0.10	1.55
74 Sulawesi Tenggara	48.7	35.0	0.00	0.72	0.00	0.72
Sulawesi	781.6	1,056.9	106.5	1.35	0.14	1.49
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Outside Jawa	4,729.0	4,002.5	327.2	0.85	0.07	0.92
Indonesia	8,172.4	9,543.3	1,616.1	1.17	0.20	1.37

Remarks:n.a.: data not available

Source: JICA-FIDP team calculation based on the data from the DGFCA, MOA

Table 5.14 Cropping Intensity (CIp) of Lowland Field by Province in 1990

Province	Field Area (1,000ha)	Planted Area (1,000ha Paddy	Palawija	CIp for Paddy	CIp for Palawija	CIp for Total
11 D.I. Aceh	326.5	294.3	39.9	0.90	0.12	1.02
12 Sumatera Utara	526.6	639.7	20.0	1.21	0.04	1.25
13 Sumatera Barat	225.6	337.0	7.6	1.49	0.03	1.53
14 Riau	203.2	100.3	0.4	0.49	0.00	0.50
15 Jambi	207.5	104.5	2.5	0.50	0.01	0.52
16 Sumatera Selatan	429.9	341.0	3.1	0.79	0.01	0.80
17 Bengkulu	71.9	78.2	16.5	1.09	0.23	1.32
18 Lampung	223.3	259.9	32.3	1.16	0.14	1.31
Sumatera	2,214.5	2,154.9	122.2	0.97	0.06	1.03
31 D.K.I. Jakarta	5.6	5.9	0.0	1.06	0.00	1.06
32 Jawa Barat	1,174.2	1,804.4	122.2	1.54	0.10	1.64
33 Jawa Tengah	1,007.5	1,465.3	457.95	1.45	0.45	1.91
34 Yoguyakarta	62.2	90.9	26.76	1.46	0.43	1.89
35 Jawa Timur	1,171.0	1,403.8	660.15	1.20	0.56	1.76
Jawa	3,420.5	4,770.3	1,267.1	1.39	0.37	1.77
51 Bali	93.1	157.2	40.00	1.69	0.43	2.12
52 Nusa Tenggara Barat	197.4	223.5	121.79	1.13	0.62	1.75
53 Nusa Tenggara Timur	122.9	80.1	12.73	0.65	0.10	0.76
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	413.4	460.8	174.5	1.11	0.42	1.54
61 Kalimantan Barat	442.3	178.5	3.73	0.40	0.01	0.41
62 Kalimantan Tengah	279.7	92.1	1.62	0.33	0.01	0.33
63 Kalimantan Selatan	463.3	272.2	4.05	0.59	0.01	0.60
64 Kalimantan Timur	164.8	44.6	0.19	0.27	0.00	0.27
Kalimantan	1,350.2	587.4	9.6	0.44	0.01	0.44
71 Sulawesi Utara	69.0	72.0	2.77	1.04	0.04	1.08
72 Sulawesi Tengah	115.9	132.7	17.02	1.14	0.15	1.29
73 Sulawesi Selatan	577.2	720.2	127.76	1.25	0.22	1.47
74 Sulawesi Tenggara	54.8	41.1	0.14	0.75	0.00	0.75
Sulawesi	817.0	966.0	147.7	1.18	0.18	1.36
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Outside Jawa	4,795.0	4,169.2	454.0	0.87	0.09	0.96
Indonesia	8,215.5	8,939.5	1,721.1	1.09	0.21	1.30

Remarks: n.a. : data not available.
Source: JICA-FIDP team calculation based on the data from the DGFCA, MOA

Table 5.15 Planted Area and Cropping Intensity (CIp) of Paddy by Different Ecosystem 1989

unit: 000ha

Province	Whole area			Irrigated area			Rainfed area			Other area		
	Field area	Planted area	CIp	Field area	Planted area	CIp	Field area	Planted area	CIp	Field area	Planted area	CIp
11 D.I. Aceh	323.1	260.5	0.806	145.4	134.5	0.925	138.9	110.7	0.797	38.8	15.3	0.395
12 Sumatera Utara	541.8	616.4	1.138	273.2	447.4	1.638	209.5	152.0	0.726	59.1	17.0	0.287
13 Sumatera Barat	222.6	357.7	1.607	156.1	285.3	1.828	64.2	71.7	1.117	2.2	0.7	0.310
14 Riau	212.0	99.0	0.467	23.1	38.1	1.649	40.6	24.5	0.603	148.2	36.4	0.246
15 Jambi	212.8	155.8	0.732	40.9	70.9	1.733	31.2	25.2	0.808	140.7	59.7	0.424
16 Sumatera Selatan	457.9	355.3	0.776	59.2	98.8	1.669	48.1	46.6	0.969	350.7	209.9	0.599
17 Bengkulu	71.5	68.1	0.953	44.3	57.6	1.300	13.3	6.5	0.489	13.9	4.0	0.288
18 Lampung	215.7	243.7	1.130	128.3	175.5	1.368	61.8	60.3	0.976	25.6	7.9	0.310
Sumatera	2,257.4	2,156.5	0.955	870.5	1,308.1	1.503	607.6	497.5	0.819	779.2	350.9	0.450
31 D.K.I. Jakarta	6.9	9.1	1.326	3.6	7.1	1.979	3.0	1.9	0.627	0.3	0.1	0.369
32 Jawa Barat	1,194.5	1,689.1	1.414	902.7	1,351.3	1.497	276.7	333.7	1.206	15.1	4.1	0.271
33 Jawa Tengah	1,010.5	1,423.6	1.409	677.3	1,005.0	1.484	329.4	415.1	1.260	3.8	3.5	0.936
34 Yoguyakarta	62.6	98.1	1.568	52.4	82.5	1.575	10.2	15.6	1.532	0.0	0.0	0.000
35 Jawa Timur	1,171.3	1,475.8	1.260	898.6	1,219.1	1.357	269.2	255.5	0.949	3.5	1.2	0.343
Jawa	3,445.7	4,695.7	1.363	2,534.7	3,665.0	1.446	888.4	1,021.8	1.150	22.6	8.9	0.394
51 Bali	94.1	168.0	1.786	92.8	166.6	1.795	0.8	0.9	1.150	0.5	0.5	1.000
52 Nusatenggara Barat	197.2	229.8	1.165	152.5	186.7	1.224	39.3	40.9	1.041	5.4	2.2	0.402
53 Nusatenggara Timur	118.6	86.6	0.731	63.3	59.7	0.943	26.9	19.8	0.736	28.4	7.1	0.251
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	409.9	484.4	1.182	308.6	413.0	1.338	67.0	61.6	0.920	34.3	9.8	0.286
61 Kalimantan Barat	431.5	158.6	0.367	97.4	71.6	0.735	173.1	54.6	0.315	160.9	32.4	0.201
62 Kalimantan Tengah	222.2	93.8	0.422	46.7	25.9	0.555	41.5	20.2	0.487	133.9	47.7	0.356
63 Kalimantan Selatan	467.0	313.7	0.672	37.5	48.9	1.304	112.9	81.1	0.718	316.6	183.7	0.580
64 Kalimantan Timur	161.5	42.8	0.265	6.1	5.8	0.958	52.5	22.3	0.425	102.9	14.6	0.142
Kalimantan	1,282.3	608.9	0.475	187.7	167.2	0.891	380.0	178.2	0.469	714.3	263.5	0.369
71 Sulawesi Utara	66.7	77.3	1.159	44.4	62.1	1.399	11.1	9.6	0.865	11.1	5.6	0.503
72 Sulawesi Tengah	118.4	126.1	1.065	95.8	109.7	1.145	9.6	8.7	0.906	12.9	7.7	0.597
73 Sulawesi Selatan	589.3	688.6	1.169	316.1	423.1	1.339	256.7	257.9	1.005	16.5	7.6	0.463
74 Sulawesi Tenggara	57.0	39.6	0.696	29.8	32.5	1.091	5.6	3.2	0.571	21.7	3.9	0.180
Sulawesi	831.3	931.7	1.121	486.1	627.4	1.291	283.0	279.4	0.987	62.2	24.9	0.400
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	8,226.6	8,877.2	1.079	4,387.6	6,180.7	1.409	2,226.0	2,038.5	0.916	1,612.6	658.0	0.408

Source: JICA-FIDP team calculation by regression method based on Agricultural Survey Land Area by Utilization 1989, and Production of Cereals 1989, CBS
CIh; Cropping intensity based on harvested area

Table 5.16 Planted Area and Cropping Intensity of Paddy Field by Different Ecosystem 1990

unit: 000ha

Province	Whole Area			Irrigated Area			Rainfed Area			Other Area		
	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp
11. D. I. Aceh	326.5	294.3	0.901	167.2	162.1	0.969	122.0	117.9	0.967	37.3	14.3	0.383
12. Sumatera Utara	526.6	639.7	1.215	269.8	366.2	1.357	196.2	249.4	1.271	60.5	24.1	0.398
13. Sumatera Barat	225.6	337.0	1.494	159.9	256.7	1.605	63.1	79.0	1.253	2.6	1.3	0.498
14. Riau	203.2	100.3	0.494	23.3	16.9	0.727	45.4	29.2	0.644	134.5	54.1	0.402
15. Jambi	207.5	104.5	0.504	28.2	22.5	0.800	29.3	20.4	0.698	150.0	61.5	0.410
16. Sumatera Selatan	429.9	341.0	0.793	69.4	64.7	0.932	46.2	68.5	1.483	314.2	207.8	0.661
17. Benkulu	71.9	78.2	1.087	46.7	56.0	1.198	11.3	13.6	1.199	13.9	8.6	0.623
18. Lampung	223.3	259.9	1.164	135.3	183.0	1.352	58.1	70.9	1.219	29.9	6.1	0.204
Sumatera	2,214.5	2,154.9	0.973	899.91	1,128.1	1.254	571.7	649.0	1.135	742.9	377.8	0.509
31. D.K.I. Jakarta	5.6	5.9	1.105	3.7	4.2	1.145	1.7	1.6	1.053	0.2	0.1	0.389
32. Jawa Barat	1,174.2	1,804.4	1.532	902.3	1,518.7	1.683	260.0	282.0	1.107	12.0	3.7	0.307
33. Jawa Tengah	1,007.5	1,465.3	1.452	680.5	1,037.5	1.525	323.2	425.7	1.294	3.8	2.1	0.740
34. D.I. Yogyakarta	62.2	90.9	1.467	51.9	80.9	1.559	10.4	10.0	0.426	0.0	0.0	0.000
35. Jawa Timur	1,171.0	1,403.8	1.205	897.3	1,134.2	1.264	268.3	267.9	1.019	5.3	1.8	0.332
Jawa	3,420.5	4,770.3	1.395	2,535.7	3,775.5	1.489	863.5	987.2	1.132	21.4	7.6	0.356
51. Bali	93.1	157.2	1.689	91.4	155.4	1.701	1.1	1.5	1.339	0.6	0.3	0.476
52. Nusatenggara Barat	197.4	223.5	1.132	153.9	187.4	1.218	43.5	36.1	0.828	0.0	0.0	0.000
53. Nusatenggara Timur	122.9	80.1	0.652	63.2	63.3	1.002	30.7	13.1	0.426	29.1	3.8	0.129
54. Timor Timur	na	na	na	na	na	na	na	na	na	na	na	na
Bali & Nusatenggara	413.4	460.8	1.115	308.414	406.1	1.317	75.3	50.6	0.672	29.7	4.0	0.136
61. Kalimantan Barat	442.4	178.5	0.404	86.9	75.7	0.871	184.8	59.6	0.323	170.6	43.2	0.253
62. Kalimantan Tengah	279.8	92.1	0.329	85.2	53.3	0.625	55.0	13.9	0.254	139.6	24.9	0.178
63. Kalalimantan Selatan	463.3	272.2	0.588	25.3	21.1	0.832	124.4	107.4	0.864	313.7	143.8	0.458
64. Kalimantan Timur	123.0	44.6	0.362	9.7	4.8	0.490	4.6	2.2	0.478	108.8	37.6	0.346
Kalimantan	1,308.5	587.4	0.449	207.079	154.7	0.747	368.8	183.2	0.497	732.6	249.5	0.341
71. Sulawesi Utara	69.0	72.0	1.043	48.9	62.8	1.284	10.5	7.6	0.725	9.7	1.6	0.166
72. Sulawesi Tengah	115.9	132.7	1.145	97.7	126.3	1.292	8.7	4.4	0.509	9.4	1.9	0.205
73 Sulawesi Selatan	577.2	720.2	1.248	317.8	480.8	1.513	240.5	230.3	0.958	18.9	9.1	0.482
74. Sulawesi Tenggara	54.8	41.1	0.750	32.5	34.9	1.073	6.2	4.0	0.644	16.2	2.3	0.142
Sulawesi	817.0	966.0	1.182	496.94	704.8	1.418	265.9	246.3	0.926	54.2	14.9	0.275
81. Maluku	na	na	na	na	na	na	na	na	na	na	na	na
82. Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Maluku & Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Indonesia	8,172.9	8,939.5	1.094	4,448.0	6,169.2	1.387	2,145.1	2,116.3	0.987	1,580.8	653.9	0.414

Source: FIDP team calculation by regression method based on Agricultural Survey Land Area by utilization, 1990 and Production of Cereals, 1990, CBS.
CIp: Cropping intensity based on planted area

Table 5.17 Planted Area and Cropping Intensity of Paddy Field by Different Ecosystem 1991

unit: 000ha

Province	Whole area			Irrigated area			Rainfed area			Other area		
	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp	Field Area	Planted Area	CIp
11. D. I. Aceh	316.4	302.8	0.957	150.0	164.3	1.095	130.1	127.4	0.979	36.4	11.1	0.304
12. Sumatera Utara	530.8	666.9	1.256	274.3	415.2	1.514	204.6	240.5	1.175	51.9	11.2	0.216
13. Sumatera Barat	234.1	349.5	1.493	166.4	271.6	1.633	65.8	77.5	1.179	2.0	0.4	0.202
14. Riau	205.8	109.4	0.532	26.3	23.0	0.875	55.8	43.6	0.781	123.7	42.9	0.346
15. Jambi	198.5	130.1	0.655	28.2	34.4	1.220	27.0	29.8	1.101	143.3	66.0	0.460
16. Sumatera Selatan	422.1	340.8	0.807	67.6	91.9	1.358	53.6	57.8	1.079	300.8	191.1	0.635
17. Benkulu	72.6	67.6	0.932	50.3	62.3	1.239	12.0	3.4	0.282	10.2	1.9	0.186
18. Lampung	238.9	321.9	1.347	147.1	260.1	1.768	57.7	44.5	0.772	34.1	17.3	0.507
Sumatera	2,219.3	2,289.0	1.031	910.1	1322.8	1.454	606.5	624.5	1.030	702.6	341.8	0.486
31. D.K.I. Jakarta	5.3	6.7	1.255	3.8	6.5	1.705	1.4	0.2	0.110	0.1	0.0	0.263
32. Jawa Barat	1,177.5	2,122.1	1.802	893.2	1,697.0	1.900	267.2	412.3	1.543	17.1	12.7	0.741
33. Jawa Tengah	1,009.2	1,516.3	1.502	697.8	1,080.9	1.549	308.6	434.3	1.407	2.9	1.2	0.411
34. D.I. Yogyakarta	62.0	99.9	1.612	52.3	86.4	1.650	9.5	13.5	1.420	0.1	0.0	0.277
35. Jawa Timur	1,165.5	1,624.5	1.394	899.0	1,352.2	1.504	260.7	270.8	1.038	5.7	1.6	0.272
Jawa	3,419.5	5,369.4	1.570	2546.1	4222.9	1.659	847.5	1131.0	1.335	26.0	15.5	0.597
51. Bali	92.2	157.6	1.709	90.9	155.8	1.714	0.8	1.4	1.711	0.5	0.4	0.803
52. Nusatenggara Barat	197.7	280.6	1.419	157.7	248.2	1.574	40.0	32.3	0.807	0.0	0.0	0.000
53. Nusatenggara Timur	118.3	82.2	0.695	58.9	74.8	1.271	30.0	7.2	0.239	29.5	0.3	0.010
54. Timor Timur	na	na	na	na	na	na	na	na	na	na	na	na
Bali & Nusatenggara	408.3	520.4	1.275	307.5	478.8	1.557	70.8	40.9	0.577	30.0	0.7	0.024
61. Kalimantan Barat	390.3	200.8	0.514	62.3	52.1	0.837	133.2	111.3	0.835	194.7	37.4	0.192
62. Kalimantan Tengah	300.5	97.0	0.323	42.7	14.9	0.349	55.1	19.1	0.348	202.8	63.0	0.310
63. Kalalimantan Selatan	473.1	379.6	0.802	26.5	30.8	1.161	137.1	154.8	1.129	309.5	194.0	0.627
64. Kalimantan Timur	138.6	45.8	0.331	8.4	11.1	1.318	43.8	16.8	0.383	86.4	17.9	0.208
Kalimantan	1,302.4	723.1	0.555	139.9	108.9	0.778	369.1	302.0	0.818	793.4	312.2	0.394
71. Sulawesi Utara	67.5	74.7	1.107	51.2	62.5	1.220	10.2	12.0	1.179	6.1	0.2	0.036
72. Sulawesi Tengah	147.0	145.1	0.987	114.2	141.3	1.237	10.3	3.5	0.340	22.5	0.4	0.017
73 Sulawesi Selatan	593.6	709.4	1.195	328.0	490.4	1.495	245.9	209.6	0.852	19.7	9.5	0.481
74. Sulawesi Tenggara	57.4	43.6	0.760	35.2	40.4	1.146	4.7	0.4	0.087	17.5	2.9	0.163
Sulawesi	865.5	972.9	1.124	528.6	734.5	1.390	271.1	225.5	0.832	65.7	12.9	0.197
81. Maluku	na	na	na	na	na	na	na	na	na	na	na	na
82. Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Maluku & Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Indonesia	8,215.0	9,874.9	1.202	4,432.2	6,867.9	1.550	2,165.1	2,323.9	1.073	1,617.7	683.1	0.422

Source: JICA-FIDP team calculation by regression method based on Agricultural Survey Land Area by Utilization 1991 and Production of Cereals 1991, CBS.
na: Data not available CIp: Cropping intensity based on planted area

Table 5.18 Harvested area, Yield and Production of lowland paddy by different ecosystem 1991

Province	Whole Area			Irrigated Aerea			Rainfed Area			Other Area		
	Harvested Area(000ha)	Yield (t/ha)	Production (000t)	Harvested Area(000ha)	Yield (t/ha)	Production (000t)	Harvested Area(000ha)	Yield (t/ha)	Production (000t)	Harvested Area(000ha)	Yield (t/ha)	Production (000t)
11. D. I. Aceh	299.9	4.03	1,209.4	162.7	4.42	719.1	126.2	3.60	454.1	11.0	3.29	36.1
12. Sumatera Utara	645.9	4.00	2,584.7	402.2	4.18	1,681.4	232.9	3.74	871.6	10.9	2.92	31.7
13. Sumatera Barat	361.8	4.64	1,677.8	281.1	5.08	1,426.8	80.3	3.11	249.8	0.4	2.96	1.2
14. Riau	112.5	3.23	363.6	23.6	3.86	91.4	44.8	3.13	140.4	44.1	2.99	131.8
15. Jambi	138.3	3.29	455.2	36.6	4.06	148.7	31.6	3.70	117.0	70.1	2.70	189.5
16. Sumatera Selatan	304.8	3.49	1,062.6	82.2	4.13	339.5	51.7	4.29	222.1	170.9	2.93	501.0
17. Benkulu	75.5	3.61	272.6	69.6	3.61	250.9	3.8	4.17	15.8	2.1	2.79	5.9
18. Lampung	254.0	4.29	1,088.6	205.2	4.51	925.8	35.1	3.59	126.3	13.6	2.67	36.5
Sumatera	2,192.7	3.97	8,714.5	1,263.3	4.42	5,583.7	606.4	3.62	2,197.0	323.0	2.89	933.8
31. D.K.I. Jakarta	5.8	4.76	27.3	5.6	4.78	26.8	0.1	2.85	0.4	0.0	2.33	0.1
32. Jawa Barat	1,837.0	5.19	9,529.7	1,534.8	5.43	8,326.4	295.6	4.00	1,182.7	6.6	3.13	20.6
33. Jawa Tengah	1,425.6	5.24	7,471.1	1,014.6	5.57	5,650.1	408.3	4.44	1,814.1	2.7	2.53	6.9
34. D.I. Yogyakarta	98.9	5.47	540.9	85.6	5.72	489.6	13.4	3.84	51.3	0.0	0.00	0.0
35. Jawa Timur	1,480.8	5.39	7,985.8	1,232.6	5.51	6,789.0	246.8	4.83	1,193.2	1.4	2.51	3.6
Jawa	4,848.1	5.27	25,554.8	3,873.1	5.49	21,281.9	964.2	4.40	4,241.6	10.8	2.89	31.1
51. Bali	156.3	5.24	818.3	154.5	5.26	812.9	1.4	3.17	4.4	0.4	2.51	1.0
52. Nusatenggara Barat	246.9	4.48	1,106.4	218.4	4.58	1,000.8	28.4	3.71	105.6	0.0	0.00	0.0
53. Nusatenggara Timur	79.8	3.11	247.9	72.6	3.17	230.1	6.9	2.48	17.2	0.3	2.07	0.6
54. Timor Timur	na	na	na	na	na	na	na	na	na	na	na	na
Bali & Nusa Tenggara	483.0	4.50	2,172.7	445.5	4.59	2,043.9	36.8	3.46	127.2	0.7	2.32	1.6
61. Kalimantan Barat	180.0	2.73	490.4	46.7	4.55	212.4	99.8	2.14	213.7	33.5	1.92	64.3
62. Kalimantan Tengah	89.0	2.38	211.5	13.7	0.72	9.8	17.6	1.36	24.0	57.8	3.08	177.7
63. Kalalimantan Selatan	331.9	2.90	963.9	26.9	5.71	153.7	135.4	2.78	376.0	169.6	2.56	434.2
64. Kalimantan Timur	45.0	2.75	123.7	10.9	2.77	30.2	16.5	2.56	42.1	17.6	2.91	51.3
Kalimantan	645.9	2.77	1,789.5	98.2	4.14	406.1	269.2	2.44	655.9	278.5	2.61	727.5
71. Sulawesi Utara	82.1	4.23	347.6	68.6	4.43	303.8	13.2	3.26	43.1	0.2	2.98	0.7
72. Sulawesi Tengah	129.0	3.31	426.8	125.9	3.33	418.7	3.1	2.55	7.9	0.1	2.23	0.2
73 Sulawesi Selatan	706.1	4.35	3,073.4	488.0	4.62	2,255.3	208.6	3.81	794.1	9.4	2.56	24.1
74. Sulawesi Tenggara	42.7	3.43	146.3	39.5	3.49	137.9	0.4	2.82	1.1	2.8	2.62	7.3
Sulawesi	959.9	4.16	3,994.1	722.0	4.31	3,115.6	225.3	3.76	846.2	12.5	2.58	32.3
81. Maluku	na	na	na	na	na	na	na	na	na	na	na	na
82. Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Maluku & Irian Jaya	na	na	na	na	na	na	na	na	na	na	na	na
Indonesia	9,129.6	4.62	42,225.5	6,402.2	5.07	32,431.1	2,101.9	3.84	8,067.9	625.5	2.76	1,726.3

Source: JICA- FIDP team calculation by regression method based on Agricultural Survey Production of Cereals in Indonesia 1991, CBS
na: data not available CIp: Cropping intensity based on planted area

Table 5.19 Change in Paddy Yield under Intensification Program

Unit : ton/ha

	Province	1982	1983	1984	1985	1986	1987	1988
11	D.I. Aceh	3.81	3.94	3.67	3.88	3.99	3.96	4.03
12	Sumatera Utara	3.83	3.89	3.89	3.94	3.89	3.89	4.00
13	Sumatera Barat	3.98	4.11	4.11	4.19	4.19	4.29	4.43
14	Riau	3.10	3.23	3.09	3.14	3.12	2.99	3.06
15	Jambi	3.20	3.12	3.11	3.08	3.14	3.36	3.42
16	Sumatera Selatan	3.63	3.67	3.58	3.58	3.64	3.45	3.34
17	Bengkulu	3.52	3.67	3.51	3.44	3.60	3.22	3.34
18	Lampung	4.07	4.14	4.14	4.14	4.12	4.04	4.04
	Sumatera	3.82	3.91	3.86	3.90	3.89	3.86	3.90
31	D.K.I. Jakarta	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32	Jawa Barat	4.30	4.45	4.45	4.51	4.53	4.71	4.87
33	Jawa Tengah	4.52	4.79	4.83	4.80	4.80	4.94	5.01
34	Yoguyakarta	4.76	4.97	5.01	5.01	5.04	5.09	5.19
35	Jawa Timur	0.97	5.00	5.04	4.99	4.98	5.09	5.15
	Jawa	4.58	4.73	4.75	4.75	4.75	4.90	5.00
51	Bali	4.42	4.45	4.59	4.63	4.72	4.81	4.91
52	N.T.B.	3.89	4.01	4.04	3.95	3.96	4.06	4.24
53	N.T.T.	3.30	3.37	3.12	3.23	3.42	3.23	3.29
54	Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Bali & Nusa Tenggara	4.08	4.16	4.24	4.20	4.25	4.32	4.47
61	Kalimantan Barat	3.18	3.07	3.14	2.80	3.03	2.85	2.83
62	Kalimantan Tengah	2.31	2.25	2.20	2.31	2.42	2.11	2.16
63	Kalimantan Selatan	2.74	2.77	2.89	2.94	3.00	2.86	2.94
64	Kalimantan Timur	2.84	2.89	2.75	2.82	2.98	2.75	2.74
	Kalimantan	2.85	2.81	2.88	2.85	2.96	2.77	2.83
71	Sulawesi Utara	4.11	4.08	4.27	4.32	4.27	4.02	4.09
72	Sulawesi Tengah	3.28	3.34	3.36	3.31	3.33	3.41	3.59
73	Sulawesi Selatan	4.15	4.16	4.21	4.20	4.21	4.04	4.17
74	Sulawesi Tenggara	3.25	3.53	3.30	3.11	3.15	3.22	3.23
	Sulawesi	4.08	4.10	4.17	4.14	4.10	3.96	4.08
81	Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82	Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	M & IJ	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Indonesia	4.34	4.43	4.44	4.44	4.43	4.47	4.54

Remarks: n.a.: data not available.
Source: Statistik Intensifikasi Pertanian 1990, CBS

Table 5.20 Change in Average Amount of Fertilizer Application per Ha by Province under Intensification Programme

Province	Urea (kg/ha)							Total amount (kg/ha)						
	1980	1982	1985	1986	1987	1988	1989	1980	1982	1985	1986	1987	1988	1989
11 D.I. Aceh	57.3	94.6	80.1	69.3	91.2	113.7	108.1	80.0	133.4	109.4	98.9	132.1	167.3	162.4
12 Sumatera Utara	84.8	108.4	134.0	131.5	127.2	146.4	150.6	145.1	180.6	250.3	247.2	235.0	273.6	287.0
13 Sumatera Barat	132.8	138.0	140.8	136.9	119.2	126.0	141.1	192.5	223.3	234.5	231.8	227.6	284.3	367.4
14 Riau	37.5	41.4	42.9	94.3	83.6	67.2	81.9	48.4	53.7	75.2	138.6	164.7	128.9	156.7
15 Jambi	0.0	10.7	11.8	20.1	95.6	65.9	21.0	0.0	17.1	13.6	37.8	153.8	83.4	77.5
16 Sumatera Selatan	9.2	42.4	37.0	69.8	92.8	139.0	126.1	12.7	65.2	62.7	120.8	166.5	249.0	238.2
17 Bengkulu	0.0	40.2	48.9	59.2	52.8	92.5	100.6	0.0	82.4	80.4	103.3	99.4	174.9	173.2
18 Lampung	68.7	137.2	147.9	168.5	186.8	186.2	164.8	97.2	225.6	264.5	283.4	355.9	385.5	356.3
Sumatera	73.4	92.5	97.6	105.6	116.8	131.5	128.0	111.2	148.3	168.7	182.5	211.8	248.2	250.4
31 D.K.I. Jakarta	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
32 Jawa Barat	180.5	200.4	211.3	207.0	200.2	229.9	228.0	254.7	288.8	314.8	317.0	322.5	402.7	434.0
33 Jawa Tengah	199.6	225.9	239.1	227.4	233.9	243.5	236.9	254.7	309.1	326.8	328.5	330.9	393.4	388.7
34 Yoguyakarta	262.2	294.2	298.4	287.3	304.9	314.4	249.1	304.7	347.4	369.0	354.2	386.1	418.1	365.1
35 Jawa Timur	267.7	267.2	295.6	297.0	284.0	297.9	291.3	327.4	339.6	392.1	393.8	365.2	440.7	426.3
Jawa	213.5	230.6	246.5	276.0	237.1	255.9	249.9	277.2	311.8	342.6	378.1	347.4	411.7	417.7
51 Bali	192.0	221.7	204.7	207.9	212.4	202.8	247.8	217.0	264.0	254.9	256.5	271.9	270.8	358.9
52 Nusa Tenggara Barat.	180.9	196.0	204.3	112.7	212.2	240.6	291.6	212.1	234.7	245.4	118.6	272.6	338.5	382.1
53 Nusa Tenggara Yimur	26.7	61.5	30.8	30.3	32.8	31.9	15.3	39.1	91.3	46.7	46.3	51.3	57.5	25.8
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	179.9	187.6	182.3	138.9	189.6	198.8	217.2	207.8	226.5	223.5	163.1	227.8	276.3	305.4
61 Kalimantan Barat	27.1	65.8	45.1	39.9	107.0	68.9	74.0	37.7	97.7	75.3	62.1	132.2	81.9	148.4
62 Kalimantan Tengah	2.0	12.8	12.2	22.1	236.6	13.2	45.7	2.0	18.6	21.8	35.4	269.4	13.2	45.7
63 Kalimantan Selatan	23.4	43.7	42.7	48.6	86.0	41.2	103.4	32.1	73.1	72.6	72.9	135.9	88.5	182.3
64 Kalimantan Timur	20.9	3.2	23.4	23.6	41.2	18.7	29.2	33.3	4.1	38.4	34.5	56.3	34.8	57.6
Kalimantan	21.9	46.7	38.2	41.4	109.4	44.0	61.5	30.5	73.4	64.7	63.1	161.6	72.8	119.3
71 Sulawesi Utara	117.0	148.0	110.8	68.7	119.6	139.7	172.6	149.0	206.0	161.3	102.4	169.1	203.0	279.4
72 Sulawesi Tengah	39.0	51.8	37.1	88.9	102.5	75.2	124.3	50.2	62.0	44.8	121.1	152.8	102.7	165.2
73 Sulawesi Selatan	63.9	103.3	132.4	142.5	139.5	151.6	164.5	88.1	157.8	175.9	197.1	202.3	228.5	254.8
74 Sulawesi Tenggara	19.4	38.1	90.4	152.5	40.6	151.0	48.6	25.8	53.3	129.2	230.7	104.7	261.4	118.8
Sulawesi	65.4	101.0	121.1	132.6	130.2	141.7	157.0	89.0	150.4	161.8	184.7	190.4	213.8	242.4
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	154.6	201.4	184.7	201.4	188.0	198.0	200.7	203.2	283.7	262.4	283.7	283.3	328.9	337.9

Remarks: n.a.: data not available.

Source:BIMAS

Table 5.21 Change in Area under Insus Program and Its Share in Whole Intensification Area

Province	Insus Program Area (000ha)								Insus rate (%)							
	1981	1982	1983	1984	1985	1986	1987	1988	1981	1982	1983	1984	1985	1986	1987	1988
D.I. Aceh	16.1	29.0	35.6	33.4	31.9	36.3	28.1	41.3	17.7	27.9	28.7	20.7	21.4	21.4	16.0	20.9
Sumatera Utara	92.8	180.4	201.1	255.7	288.4	273.9	328.7	343.2	29.1	52.0	57.0	61.8	64.1	59.9	63.7	62.8
Sumatera Barat	43.2	113.8	178.5	203.0	227.3	263.4	263.2	302.7	18.5	44.4	60.0	64.4	71.5	79.5	79.4	90.7
Riau	0.2	0.2	0.2	5.8	7.8	8.5	17.1	24.0	0.5	0.5	0.5	9.8	11.8	11.8	31.4	31.4
Jambi	0.7	0.7	0.8	0.8	0.8	5.3	10.8	17.7	2.4	2.4	2.4	2.4	2.4	6.6	15.4	21.6
Sumatera Selatan	11.5	11.4	51.4	38.4	36.5	40.5	65.4	173.8	19.3	19.0	45.0	31.0	26.1	26.1	27.7	58.3
Bengkulu	1.2	7.4	15.5	5.5	4.7	4.8	10.8	10.7	7.0	29.1	42.9	17.2	11.8	10.0	19.9	19.9
Lampung	41.8	65.7	73.8	90.4	78.8	117.0	196.7	190.6	35.8	50.6	48.8	49.5	42.1	56.5	80.2	78.6
Sumatera	**207.5**	**408.6**	**556.9**	**632.9**	**676.2**	**749.6**	**920.8**	**1,103.9**	**23.0**	**41.3**	**48.6**	**47.9**	**48.8**	**49.3**	**54.7**	**60.3**
D.K.I. Jakarta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Jawa Barat	386.5	824.3	875.8	1,018.3	1,165.5	1,328.6	1,356.6	1,551.6	23.4	49.9	52.7	55.8	60.7	68.6	71.2	82.1
Jawa Tengah	302.7	408.8	565.9	674.0	748.7	783.4	864.8	995.2	24.4	33.6	46.2	48.7	53.0	54.9	61.7	70.8
Yoguyakarta	35.3	49.2	58.8	57.8	63.3	70.6	68.7	86.1	32.9	49.0	57.2	52.6	61.2	67.7	70.9	88.2
Jawa Timur	572.6	945.6	1,014.1	1,062.2	1,042.3	1,116.9	1,149.3	1,269.4	41.6	68.9	73.3	73.0	70.6	74.6	79.6	87.5
Jawa	**1,297.1**	**2,227.9**	**2,514.6**	**2,812.3**	**3,019.8**	**3,299.5**	**3,439.3**	**3,902.3**	**29.6**	**51.3**	**57.5**	**58.9**	**61.5**	**66.5**	**71.0**	**80.5**
Bali	69.2	72.3	66.5	53.7	60.6	60.5	115.2	135.1	42.7	44.4	40.9	33.1	37.2	37.2	68.9	84.3
Nusa Tenggara Barat	14.0	17.8	37.5	43.6	39.8	39.3	76.8	110.0	9.0	9.4	20.0	21.2	18.5	18.5	34.9	48.8
Nusa Tenggara Timu	2.6	5.8	7.1	1.6	2.3	2.4	1.5	1.6	19.2	24.1	24.1	11.8	13.3	13.3	7.6	7.6
Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Teng	**85.8**	**95.9**	**111.0**	**98.9**	**102.7**	**102.2**	**193.4**	**246.6**	**25.9**	**25.5**	**29.3**	**25.9**	**26.0**	**26.0**	**47.6**	**60.7**
Kalimantan Barat	0.0	48.4	51.7	52.2	55.0	28.1	4.5	16.1	0.0	62.5	58.1	58.1	58.1	30.6	5.5	17.2
Kalimantan Tengah	0.0	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.0	0.5	0.3	0.3	0.3	0.3	1.4	1.4
Kalimantan Selatan	4.6	3.9	10.5	19.7	23.5	23.6	47.2	55.1	5.1	3.5	7.7	12.5	13.9	13.9	21.7	23.4
Kalimantan Timur	0.0	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.0	1.0	3.0	3.0	3.0	3.0	3.0	3.0
Kalimantan	**4.6**	**52.7**	**62.5**	**72.2**	**78.9**	**52.1**	**52.6**	**72.0**	**2.5**	**22.1**	**23.6**	**25.0**	**25.7**	**17.1**	**15.1**	**19.1**
Sulawesi Utara	11.2	12.8	20.1	13.4	16.5	26.1	31.9	28.4	30.7	30.2	36.1	26.7	30.8	38.6	46.4	43.8
Sulawesi Tengah	2.2	2.3	2.7	2.5	2.6	14.6	28.1	34.6	10.2	10.2	9.9	9.9	9.9	23.1	41.0	51.9
Sulawesi Selatan	96.9	143.1	203.6	170.2	201.8	236.3	346.3	443.2	29.9	43.7	46.4	32.8	35.7	40.3	57.4	67.0
Sulawesi Tenggara	0.8	1.5	5.9	3.4	1.3	4.3	4.3	5.7	20.5	37.6	60.7	25.8	7.0	17.0	16.1	18.8
Sulawesi	**111.2**	**159.7**	**232.3**	**189.5**	**222.2**	**281.3**	**410.6**	**511.9**	**28.7**	**40.3**	**43.7**	**31.2**	**33.5**	**37.9**	**53.5**	**62.2**
Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
M & IJ	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	**1,706.1**	**2,944.9**	**3,477.2**	**3,805.8**	**4,099.7**	**4,484.7**	**5,016.8**	**5,836.8**	**27.6**	**46.4**	**51.9**	**51.6**	**53.5**	**56.6**	**62.3**	**70.5**

Note: Insus rate is the ratio of area under insus to the whole intensification area (insus plus inmum).

Source: Statistik Intensifikasi Pertanian 1990, BIMAS, MOA

Table 5.22 Change in Paddy Area of under Intensification Program and Its Coverage

	Province	Area under Intensification Program (1,000 ha)							Intensification Rate (%)						
		1982	1983	1984	1985	1986	1987	1988	1982	1983	1984	1985	1986	1987	1988
11	D.I. Aceh	103.9	124.1	161.7	149.2	169.9	175.0	197.2	40.6	45.9	59.9	58.7	58.7	65.0	70.5
12	Sumatera Utara	346.7	352.8	413.8	450.2	456.9	515.8	546.6	61.2	63.9	71.0	73.5	78.4	78.5	81.2
13	Sumatera Barat	256.3	297.4	315.2	317.8	331.3	331.3	333.8	85.5	91.5	93.6	94.2	95.6	95.9	95.3
14	Riau	37.1	37.0	59.2	65.7	72.1	54.5	76.4	28.9	27.3	41.7	46.7	48.8	48.1	50.1
15	Jambi	30.5	32.1	32.6	35.8	79.6	70.2	81.9	19.8	19.7	19.7	20.7	46.3	42.5	45.6
16	Sumatera Selatan	60.1	114.3	123.6	139.7	155.0	236.4	297.9	16.6	27.2	31.6	34.4	36.9	55.4	67.1
17	Bengkulu	25.4	36.1	32.0	39.9	47.8	54.2	53.9	33.2	42.4	38.0	49.0	56.8	59.9	57.2
18	Lampung	129.8	151.1	182.4	187.1	206.9	245.2	242.3	43.3	46.5	50.5	55.8	65.7	66.3	66.4
	Sumatera	**989.8**	**1,145.0**	**1,320.5**	**1,385.5**	**1,519.5**	**1,682.5**	**1,830.0**	**46.2**	**50.3**	**56.6**	**59.2**	**64.5**	**69.1**	**72.1**
31	D.K.I. Jakarta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	Jawa Barat	1,652.3	1,663.0	1,823.2	1,918.8	1,936.3	1,904.1	1,890.3	91.9	90.8	90.6	92.0	93.0	93.5	92.5
33	Jawa Tengah	1,216.6	1,225.9	1,383.0	1,412.5	1,427.0	1,401.3	1,406.5	92.1	93.1	93.9	94.5	94.8	95.7	95.5
34	Yoguyakarta	100.4	102.8	109.8	103.4	104.2	97.0	97.6	70.7	75.1	72.3	74.2	74.1	70.5	70.9
35	Jawa Timur	1,373.0	1,383.7	1,455.5	1,475.6	1,496.8	1,443.5	1,451.5	93.2	93.2	93.0	93.9	93.9	93.9	94.0
	Jawa	**4,342.3**	**4,375.4**	**4,771.5**	**4,910.3**	**4,964.3**	**4,845.9**	**4,846.0**	**91.4**	**91.6**	**91.6**	**92.6**	**93.1**	**93.5**	**93.0**
51	Bali	163.0	162.6	162.2	162.8	162.5	167.1	160.2	96.0	96.5	96.2	97.5	97.4	98.4	98.5
52	Nusa Tenggara Barat	189.3	186.8	205.5	215.2	212.4	220.1	225.4	77.2	80.6	81.8	85.6	86.1	90.3	90.2
53	Nusa Tenggara Timur	24.0	29.3	13.6	17.0	18.0	19.1	20.7	18.1	22.0	11.7	15.0	15.3	17.0	16.8
54	Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Bali & Nusa Tenggara	**376.4**	**378.7**	**381.2**	**395.0**	**393.0**	**406.3**	**406.3**	**68.7**	**71.0**	**71.2**	**74.3**	**74.0**	**74.5**	**73.8**
61	Kalimantan Barat	77.4	88.9	89.8	94.6	92.0	81.2	93.5	25.8	31.7	32.6	34.4	31.2	28.3	31.2
62	Kalimantan Tengah	24.6	32.4	32.4	32.6	33.3	36.7	37.2	21.0	27.6	27.8	28.0	26.5	29.3	28.4
63	Kalimantan Selatan	110.8	136.4	157.6	169.7	170.4	217.5	234.9	36.6	44.4	48.0	50.3	51.2	66.7	70.0
64	Kalimantan Timur	25.4	6.8	8.5	9.9	9.8	12.6	12.2	27.6	15.1	11.4	12.0	11.9	12.5	12.4
	Kalimantan	**238.2**	**264.5**	**288.3**	**306.9**	**305.4**	**348.0**	**377.8**	**29.3**	**35.3**	**36.3**	**37.8**	**36.6**	**41.5**	**43.7**
71	Sulawesi Utara	42.2	55.8	50.3	53.8	67.5	68.8	64.7	54.9	75.6	71.3	70.9	77.9	74.4	77.1
72	Sulawesi Tengah	22.4	27.3	25.7	26.0	63.1	68.5	66.6	22.6	24.6	24.6	25.9	58.8	63.1	53.3
73	Sulawesi Selatan	327.7	438.6	518.9	565.6	586.2	603.1	661.4	64.3	75.6	80.1	82.9	85.5	91.8	95.0
74	Sulawesi Tenggara	4.1	9.7	13.0	18.2	25.4	26.8	30.3	11.2	23.0	28.5	43.5	53.4	60.0	59.5
	Sulawesi	**396.3**	**531.4**	**607.9**	**663.6**	**742.3**	**767.3**	**823.0**	**54.9**	**65.8**	**70.0**	**73.7**	**80.0**	**85.0**	**86.1**
81	Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82	Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
83	**Maluku & Irian Jaya**	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Indonesia	**6,343.0**	**6,694.9**	**7,369.4**	**7,661.2**	**7,924.4**	**8,049.9**	**8,283.2**	**70.6**	**73.1**	**75.5**	**77.4**	**79.3**	**81.1**	**81.7**

Note: Intensification rate is the ratio of area under intensification program to the whole paddy field area.

Source: Statistik Intensifikasi Pertanian 1990, CBS

Table 5.23 Yield and Area of Lowland Paddy under Intensification Program (1989)

Province	Paddy yield (t/ha)			Lowland area (1,000ha)			Intensification area (1,000ha)			Amount of applied fertilizer (kg/ha)			
	Int.	Non-int.	Ave.	Int.	Non-int.	Ave.	Sup.ins.	Ins.	Inm.	Urea	TSP	Others	Total
11 D.I. Aceh	4.15	3.18	3.85	253.7	58.5	312.1	15.7	91.5	146.5	150.5	69.3	6.6	226.4
12 Sumatera Utara	4.06	2.95	3.95	716.7	31.3	748.0	194.6	402.2	119.9	166.3	106.4	44.1	316.8
13 Sumatera Barat	4.52	3.49	4.52	350.1	0.3	350.4	77.4	255.5	17.2	141.3	115.7	50.9	307.9
14 Riau	3.31	2.67	3.20	75.1	17.3	92.4	0.0	40.1	35.0	99.6	68.8	22.3	190.7
15 Jambi	3.44	2.70	3.23	91.4	29.4	120.8	0.0	46.5	44.9	29.4	72.0	7.2	108.6
16 Sumatera Selatan	3.53	2.51	3.35	320.7	41.2	362.0	55.7	181.2	83.9	153.3	124.8	9.6	287.7
17 Bengkulu	3.57	3.00	3.46	60.9	8.9	69.8	3.6	21.8	35.4	123.0	77.0	12.7	212.7
18 Lampung	4.18	3.03	4.17	244.6	1.3	245.9	81.8	116.6	46.2	166.6	133.9	59.7	360.2
Sumatera	**4.01**	**2.88**	**3.87**	**2,113.2**	**188.2**	**2,301.4**	**428.8**	**1,155.4**	**529.0**	**146.7**	**106.1**	**34.1**	**286.9**
31 D.K.I. Jakarta	n.a.	n.a.	n.a.	8.6	0.0	8.6	0.0	4.6	4.1	n.a.	n.a.	n.a.	n.a.
32 Jawa Barat	5.03	3.03	5.03	2,036.1	0.1	2,036.1	704.5	1,163.0	168.5	228.0	141.5	64.6	434.1
33 Jawa Tengah	5.13	3.36	5.13	1,596.3	0.0	1,596.3	354.6	1,030.4	211.6	237.0	113.5	138.4	488.9
34 Yoguyakarta	5.32	0.00	5.32	104.7	0.0	104.7	54.0	44.4	6.3	249.1	87.9	28.0	365.0
35 Jawa Timur	5.27	2.93	5.26	1,623.2	5.4	1,628.6	396.6	1,075.2	151.3	292.1	99.9	35.5	427.5
Jawa	**5.14**	**2.98**	**5.13**	**5,368.9**	**5.5**	**5,374.3**	**1,509.7**	**3,317.6**	**541.8**	**250.2**	**119.8**	**47.5**	**417.5**
51 Bali	5.05	3.75	5.05	178.5	0.0	178.5	20.4	148.1	9.9	251.0	76.9	35.6	363.5
52 Nusa Tenggara Barat	4.33	3.28	4.31	256.6	8.6	265.2	76.2	83.6	96.8	245.0	80.5	18.5	344.0
53 Nusa Tenggara Timur	3.49	2.86	3.02	27.2	39.3	66.5	0.0	1.8	25.4	80.0	61.0	8.0	149.0
54 Timor Timur	n.a.	n.a.	n.a.	7.9	10.3	18.2	0.0	1.6	6.3	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	**4.58**	**2.91**	**4.39**	**470.2**	**58.2**	**528.4**	**96.6**	**235.1**	**138.4**	**282.8**	**78.3**	**24.8**	**385.9**
61 Kalimantan Barat	2.88	2.28	2.63	139.3	89.3	228.7	0.0	67.8	71.5	124.6	71.4	53.9	249.9
62 Kalimantan Tengah	2.23	1.96	2.13	46.4	18.5	64.9	0.0	13.6	32.8	70.4	0.0	0.0	70.4
63 Kalimantan Selatan	2.83	2.31	2.81	314.8	5.8	320.6	0.0	127.6	187.3	105.9	71.9	19.1	196.9
64 Kalimantan Timur	2.99	2.09	2.65	33.8	11.5	45.3	0.0	12.0	21.8	47.2	40.7	5.3	93.2
Kalimantan	**2.78**	**2.18**	**2.65**	**534.3**	**125.1**	**659.5**	**0.0**	**221.0**	**313.4**	**103.5**	**62.1**	**18.4**	**184.0**
71 Sulawesi Utara	4.22	3.33	4.17	83.0	1.5	84.5	0.0	40.2	42.8	181.8	87.9	24.8	294.5
72 Sulawesi Tengah	3.50	2.45	3.25	92.1	19.2	111.3	0.0	50.5	41.6	162.9	46.8	6.6	216.3
73 Sulawesi Selatan	4.28	2.69	4.25	761.3	15.5	776.8	225.8	345.7	189.8	167.4	67.3	24.7	259.4
74 Sulawesi Tenggara	3.35	2.76	3.85	37.7	8.5	308.3	0.0	10.0	27.2	49.2	50.7	20.3	120.2
Sulawesi	**4.17**	**2.60**	**4.10**	**974.1**	**44.7**	**1,280.9**	**225.8**	**446.4**	**301.4**	**163.0**	**66.3**	**20.9**	**250.2**
81 Maluku	n.a.	n.a.	2.72	6.7	1.7	8.4	0.0	6.7	0.0	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	2.70	1.6	0.0	1.6	0.0	0.2	1.4	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	**n.a.**	**n.a.**	**2.70**	**8.3**	**1.7**	**10.0**	**0.0**	**6.9**	**1.4**	**n.a.**	**n.a.**	**n.a.**	**n.a.**
Indonesia	**4.63**	**2.67**	**4.53**	**9,469.0**	**423.4**	**10,154.5**	**2,260.9**	**5,382.4**	**1,825.4**	**212.3**	**105.8**	**39.3**	**357.4**

Remarks: n.a.: data not available.

Source: Cost Structure of Farms Paddy and Palawija 1989, CBS; Statistik Intensifikasi Pertanian 1990, CBS

Table 5.24 Agronomic Traits of Paddy Varieties

Variety	Origin	Released/ Introduced	Maturity (days)	Yield (ton/ha)	Taste	Resistant
PB 36	P	1977	115	5-8	K	Wck1, Wck2, T,WH,BB,BP,KR
Cisadane	I	1980	140	5-8	E	Wck1, Wck2, WH,BB,KR
IR 64	P	1986	115	5-8	E	Wck1, Wck2, WH,BB,KR
Krueng Aceh	I	1981	130	5-8	E	Wck1, Wck2, BB
PB 42	P	1980	135	5-8	K	Wck1, Wck2, BB,KR,BT
Semuru	I	1980	120	4-7	K	Wck1, Wck2, BB,KR
IR 46	P	1983	130	5-8	K	Wck1, Wck2, Wck SU,KR,WH,BB
IR 48	P	1986	135	5-8	K	Wck1, Wck2, BB,B,T
Citandung	I	1983	120	5-8	S	Wck1, Wck2, BB
Sadang	I	1983	125	5-8	E	Wck1, Wck2, WPP,BB,T
Cisokan	I	1985	115	5-8	K	Wck1, Wck2, BB
PB 54	P	1981	125	5-8	K	Wck1, Wck2, T
Borita*	I	1981	140	5-7	S	Wck1, BB
Kelara	I	1983	105	5-8	K	Wck1, Wck2, Wck SU,BB
Cikapung	I	1984	115	5-8	E	Wck1, Wck2, BB
Bahbolon	I	1983	125	5-8	K	Wck1, Wck2, Wck SU,WPP

Note
- P: Philippines
- I: Indonesia
- B: Blast
- BB: Bacterial leaf blight
- BD: Bacterial leaf streak
- E: Good taste
- K: Poor taste
- KH: Rice ragit stunt virus desease
- KR: Rice grassy stunt virus desease
- S: Moderate
- T: Rice tungro virus desease
- Wck 1: Brown plant hopper biotype 1
- Wck 2: Brown plant hopper biotype 2
- Wck SU: Brown plant hopper biotype North Sumatra
- WH: Green leaf hopper
- WPP: White backed plant hopper
- *: For tidal swamp

Source : High-yielding Varieties of Food Crops, CRIFC, 1991

Table 5.25 Change in the Extent of Contribution of Harvested Area and Yield to Production of Lowland Paddy in 1991 as to 1980

Province	Production	Contribution	
		Harvested Area	Yield
	Log P1991/P1980	Log A1991/A1980	Log Y1991/Y1980
11. D.I. Aceh	4.270	2.158	2.112
12. Sumatera Utara	4.264	2.161	2.103
13. Sumatera Barat	4.207	2.094	2.113
14. Riau	4.280	2.139	2.141
15. Jambi	4.092	2.021	2.071
16. Sumatera Selatan	4.178	2.098	2.080
17. Bengkulu	4.284	2.195	2.089
18. Lampung	4.335	2.226	2.110
Sumatera	4.241	2.137	2.104
31. D.K.I. Jakarta	3.651	1.449	2.201
32. Jawa Barat	4.172	2.023	2.150
33. Jawa Tengah	4.165	2.041	2.124
34. Yoguyakarta	4.104	1.997	2.107
35. Jawa Timur	4.123	2.034	2.088
Jawa	4.152	2.030	2.122
51. Bali	4.057	1.951	2.106
52. Nusa Tenggara Barat	4.235	2.092	2.143
53. Nusa Tenggara Timur	4.311	2.219	2.093
54. Timor Timur			
Bali & Nusa Tenggara	4.166	2.058	2.108
61. Kalimantan Barat	4.073	1.981	2.091
62. Kalimantan Tengah	4.171	2.091	2.079
63. Kalimantan Selatar	4.141	2.092	2.049
64. Kalimantan Timur	4.211	2.093	2.118
Kalimantan	4.129	2.058	2.071
71. Sulawesi Utara	4.273	2.168	2.105
72. Sulawesi Tengah	4.401	2.264	2.137
73. Sulawesi Selatan	4.242	2.097	2.145
74. Sulawesi Tenggara	4.662	2.480	2.182
Sulawesi	4.270	2.134	2.136
81. Maluku	5.101	2.993	2.108
82. Irian Jaya	5.210	3.058	2.152
Maluku & Irian Jaya	5.178	3.040	2.138
Indonesia	4.179	2.068	2.111

Source : JICA-FIDP team calculation based on Agricultural Survey Production c Cereals in Indonesia 1980 and 1991, CBS

Table 5.26 Change in the Extent of Contribution of Field Area and Crppping Intensity to Harvested Area of Lowland Paddy in 1991 as to 1983

	Harvested Area	Contribution	
		Field Area	CIH
	Log H1991/Log H1983	Log F1991/F1983	Log CIH1991/CIH1983
11. D.I. Aceh	4.069	2.069	2.000
12. Sumatera Utara	4.154	2.005	2.149
13. Sumatera Barat	4.063	2.032	2.031
14. Riau	4.129	2.129	2.000
15. Jambi	3.987	2.085	1.902
16. Sumatera Selatan	4.012	1.999	2.013
17. Bengkulu	4.121	2.078	2.043
18. Lampung	4.125	2.155	1.970
Sumatera	4.088	2.050	2.038
31. D.K.I. Jakarta	3.782	1.806	1.976
32. Jawa Barat	4.033	1.991	2.042
33. Jawa Tengah	4.051	2.008	2.043
34. Yoguyakarta	3.984	1.991	1.993
35. Jawa Timur	4.023	2.000	2.023
Jawa	4.033	1.998	2.035
51. Bali	3.979	1.970	2.009
52. Nusatenggara Barat	4.057	2.014	2.043
53. Nusatenggara Timur	4.107	2.190	1.917
54. Timor Timur	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	4.038	2.047	1.991
61. Kalimantan Barat	4.027	2.016	2.011
62. Kalimantan Tengah	4.072	2.384	1.688
63. Kalimantan Selatar	4.081	2.175	1.906
64. Kalimantan Timur	4.217	2.395	1.822
Kalimantan	4.072	2.174	1.898
71. Sulawesi Utara	4.116	2.098	2.018
72. Sulawesi Tengah	4.219	2.131	2.088
73. Sulawesi Selatan	4.104	2.030	2.074
74. Sulawesi Tenggara	4.400	2.286	2.114
Sulawesi	4.129	2.064	2.065
81. Maluku	n.a.	n.a.	n.a.
82. Irian Jaya	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.
Indonesia	4.059	2.046	2.013

Source: JICA-FIDP team calculation based on Agricultural Survey Production of Cereals and Land Area by Utilization, 1983 and 1991, CBS

Table5.27 Categorization of Provinces by Production and Environment of Lowland Paddy (1/2) - Basic Data for Ranking -

Province	Yield (kg/ha)	Yield rate (kg/ha/year)	Contribution to Production		Contribution to Harvested area		Ratio of Irr. Field	Amount of Fertilizer (kg/ha)
			Harvested area	Yield	Field area	CIH		
11. D.I. Aceh	3.95	71	2.158	2.112	1.985	2.030	57.0%	162.4
12. Sumatera Utara	3.99	70	2.161	2.103	2.038	2.049	54.2%	287.0
13. Sumatera Barat	4.59	93	2.094	2.113	2.003	2.019	71.5%	367.4
14. Riau	3.22	75	2.139	2.141	1.913	2.103	20.3%	156.7
15. Jambi	3.26	48	2.021	2.071	2.329	1.687	17.9%	77.5
16. Sumatera Selatan	3.42	46	2.098	2.080	1.997	2.027	20.9%	238.2
17. Bengkulu	3.54	40	2.195	2.089	1.999	2.003	72.1%	173.2
18. Lampung	4.22	68	2.226	2.110	2.060	2.022	63.0%	356.3
Sumatera	**3.92**	69	2.137	2.104	2.027	2.017	47.4%	250.4
31. D.K.I. Jakarta	4.72	174	1.449	2.201	1.849	2.089	68.8%	n.a.
32. Jawa Barat	5.10	126	2.023	2.150	1.986	2.021	77.4%	434.0
33. Jawa Tengah	5.18	106	2.041	2.124	1.996	2.018	67.7%	388.7
34. Yoguyakarta	5.40	95	1.997	2.107	1.989	1.985	83.4%	365.1
35. Jawa Timur	5.33	72	2.034	2.088	2.012	1.987	76.8%	426.3
Jawa	**5.20**	103	2.030	2.122	1.997	2.009	74.4%	417.7
51. Bali	5.14	93	1.951	2.106	1.982	2.021	98.8%	358.9
52. Nusa Tenggara Barat	4.39	92	2.092	2.143	1.996	2.038	77.9%	382.1
53. Nusa Tenggara Timur	3.08	31	2.219	2.093	2.066	1.977	67.0%	25.8
54. Timor Timur	2.62	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	**4.38**	77	2.058	2.108	2.009	2.016	80.3%	305.4
61. Kalimantan Barat	2.68	28	1.981	2.091	2.011	2.014	24.0%	148.4
62. Kalimantan Tengah	2.22	11	2.091	2.079	2.339	1.774	29.4%	45.7
63. Kalimantan Selatar	2.85	32	2.092	2.049	1.907	2.135	7.3%	182.3
64. Kalimantan Timur	2.70	43	2.093	2.118	2.605	1.406	11.7%	57.6
Kalimantan	**2.70**	29	2.058	2.071	2.035	2.010	17.7%	119.3
71. Sulawesi Utara	4.19	70	2.168	2.105	2.017	2.003	82.3%	279.4
72. Sulawesi Tengah	3.29	75	2.264	2.137	2.086	2.011	90.3%	165.2
73. Sulawesi Selatan	4.30	89	2.097	2.145	2.007	2.030	56.6%	254.8
74. Sulawesi Tenggara	3.39	89	2.480	2.182	2.103	2.049	83.1%	118.8
Sulawesi	**4.13**	82	2.134	2.136	2.023	2.024	64.7%	242.4
81. Maluku	2.74	46	2.993	2.108	n.a.	n.a.	n.a.	n.a.
82. Irian Jaya	2.67	61	3.058	2.152	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	**2.70**	58	3.040	2.138	n.a.	n.a.	n.a.	n.a.
Indonesia	**4.57**	82	2.068	2.111	2.013	2.010	59.5%	337.9

Remarks: Yield: Average of 1989 to 1991, Yield increase rate: annual average increase rate during 1980 to 1991, Harvested area: LogH1991/H198
Yield: Log Y1991/Y1980, Field area: Log F1990/F1986, CIH: Log CIH1990/CIH1986, Irrigation rate: ratio of irrigated area to total lowland fiel
Amount of fertilizer: average dosage of fertilizer under intensification prograr
Source: JICA-FIDP team estimation based on BIMAS, Agricultural Survey Production of Cereals and Land Area by Utilization, CI

Table 5.28 Categorization of Provinces by Production and Environment of Lowland Paddy (2/2) - Ranking -

Province	Yield	Yield rate	Contribution to Production		Contribution to Harvested area		Ratio of	Amount of	Category
			Harvested area	Yield	Field area	CIH	Irr. Field	Fertilizer	type
11 D.I. Aceh	4	3	1	2	3	5	3	4	2
12 Sumatera Utara	4	3	1	2	4	2	3	2	2
13 Sumatera Barat	2	2	3	2	4	4	2	1	1
14 Riau	5	3	3	1	1	5	5	4	3
15 Jambi	5	5	5	3	2	5	5	5	3
16 Sumatera Selatan	5	4	1	3	4	4	5	3	3
17 Bengkulu	5	5	1	3	3	5	2	4	3
18 Lampung	3	3	1	2	1	4	2	2	2
Sumatera	3	3	3	3	3	4	4	3	n.a.
31 D.K.I. Jakarta	2	1	5	1	5	4	2	n.a.	1
32 Jawa Barat	1	1	3	1	5	3	2	1	1
33 Jawa Tengah	1	1	3	2	4	3	2	1	1
34 Yoguyakarta	1	1	5	2	5	5	1	1	1
35 Jawa Timur	1	3	3	2	4	4	2	1	1
Jawa	1	1	3	1	4	3	2	1	n.a.
51 Bali	1	2	5	2	5	3	1	2	1
52 Nusa Tenggara Barat	3	2	4	1	4	3	2	1	2
53 Nusa Tenggara Timur	5	5	1	1	1	5	3	5	3
54 Timor Timur	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bali & Nusa Tenggara	3	3	3	2	3	5	2	2	n.a.
61 Kalimantan Barat	5	5	4	3	3	5	4	4	3
62 Kalimantan Tengah	5	5	2	5	1	5	4	5	3
63 Kalimantan Selatar	5	5	3	4	1	5	5	3	3
64 Kalimantan Timur	5	5	4	2	1	5	5	5	3
Kalimantan	5	5	3	3	1	5	5	4	n.a.
71 Sulawesi Utara	3	3	2	2	1	5	2	3	2
72 Sulawesi Tengah	5	2	1	1	4	2	1	4	2
73 Sulawesi Selatan	3	1	1	1	4	1	3	3	2
74 Sulawesi Tenggara	5	1	1	1	1	2	3	4	2
Sulawesi	3	2	1	1	3	2	3	3	n.a.
81 Maluku	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
82 Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Maluku & Irian Jaya	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Indonesia	3	2	3	2	3	4	3	2	n.a.

Source: Jica-Fidp team estimatior Note : n.a.: data not available

Rating

Rank	Yield	Yield Rate	Contribution to Production		Contribution to Harvested area		Ratio of	Amount of
			Harvested area	Yield	Field Area	CIh	Irr. Field	Fertilizer
1	>5.0	>100	>2.12	>2.12	>2.12	>2.12	80-100	>360
2	4.5-5	85-100	2.08-2.12	2.08-2.12	2.08-2.12	2.08-2.12	60-80	280-360
3	4.0-4.5	70-85	2.04-2.08	2.04-2.08	2.04-2.08	2.04-2.08	40-60	180-280
4	3.5-4.0	55-70	2.00-2.04	2.00-2.04	2.00-2.04	2.00-2.04	20-40	100-180
5	-3.5	-55	-2.00	-2.00	-2.00	-2.00	0-20	0-100

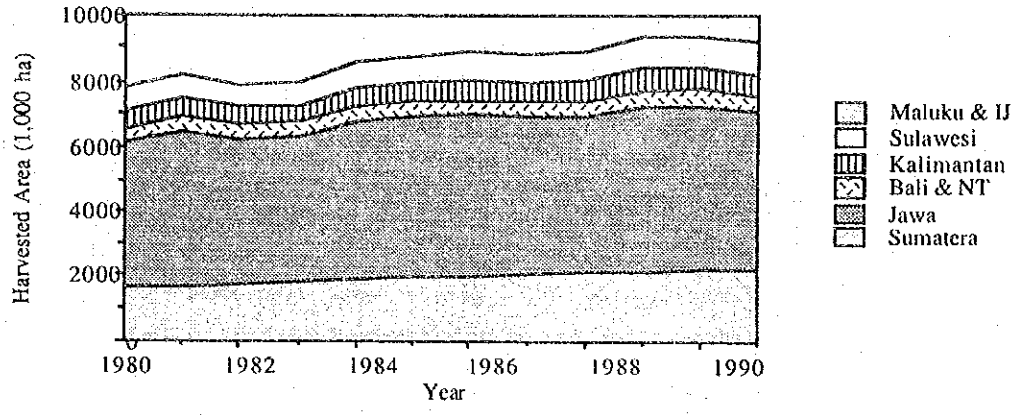


Figure 5.1 Past Change in Harvested Area of Lowland Paddy

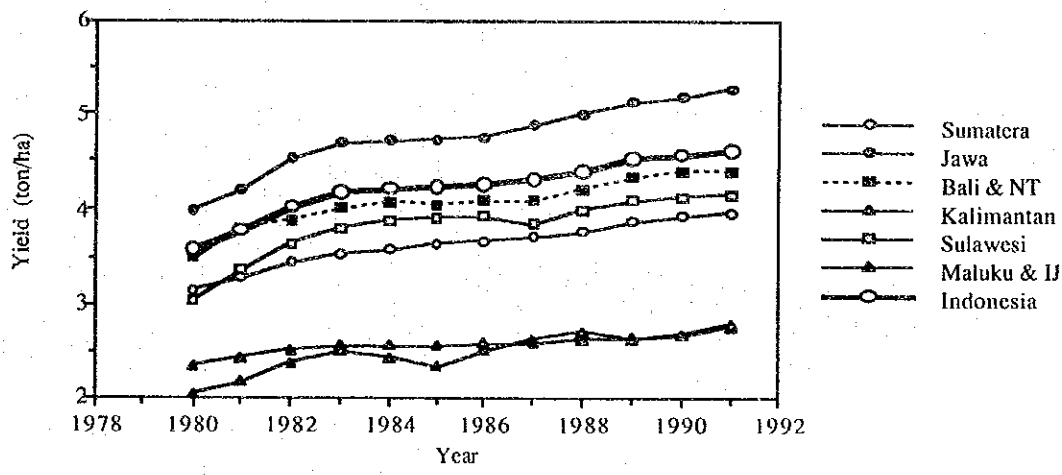


Figure 5.2 Past Change in Yield of Lowland Paddy

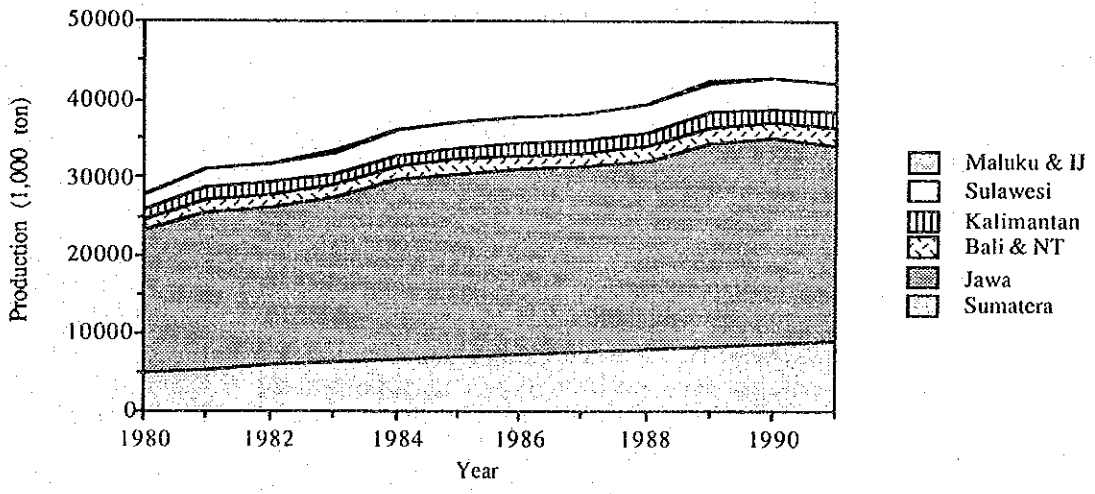


Figure 5.3 Past Change in Production of Lowland Paddy

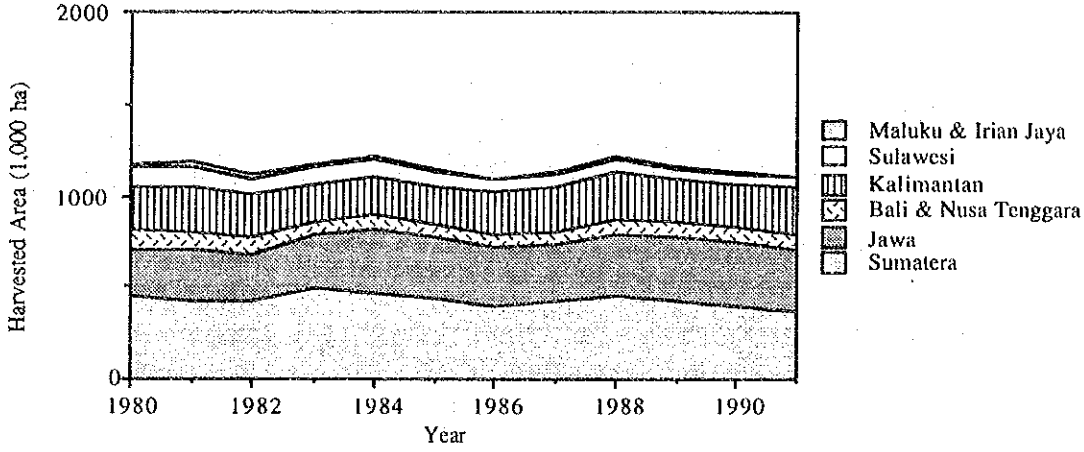


Figure 5.4 Past Change in Harvested Area of Upland Paddy

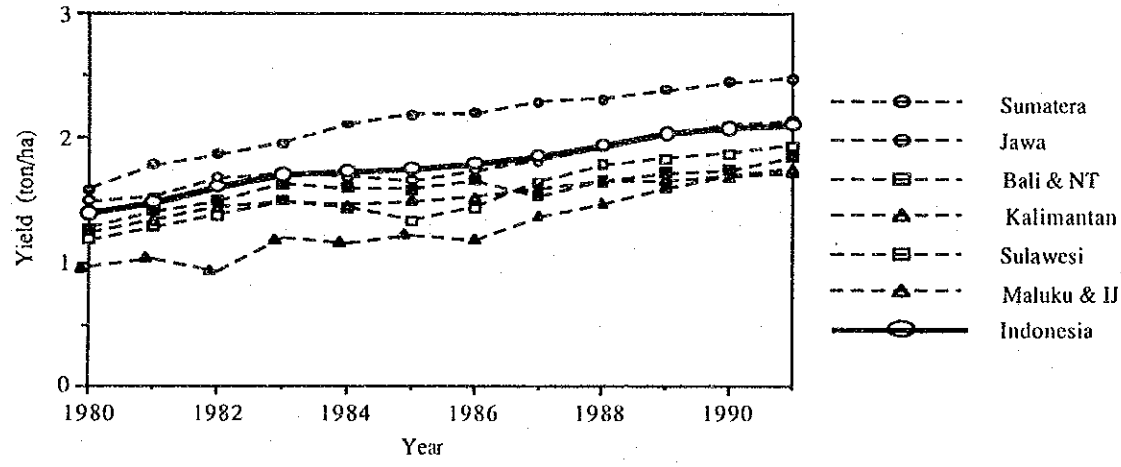


Figure 5.5 Past Change in Yield of Upland Paddy

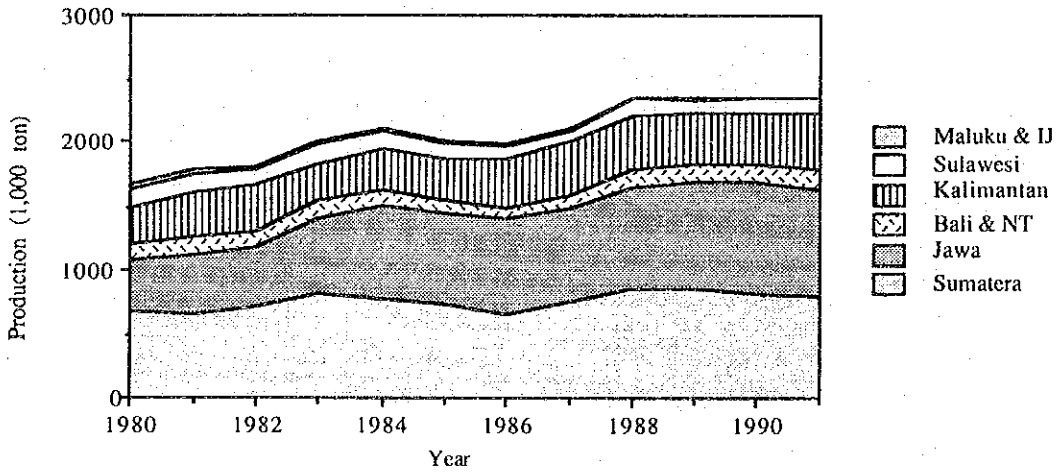


Figure 5.6 Past Change in Production of Upland Paddy

Chapter 6

6. IRRIGATION DEVELOPMENT POTENTIAL

6.1 Past Performance of Irrigation Development

The objective of irrigation is to increase food production by increasing crop intensities and expanding the cultivation area through the supply of irrigation water. In order to attain this objective, the Government has implemented the following four programs; (ii) the construction of extension of existing schemes and new irrigation schemes; (iii) the construction of river and flood control facilities; and (iv) the development of tidal and non-tidal swamp. Past achievements of these programs are as shown below:

Irrigation Development Achievements and Expenditure During Repelita I, II, III, IV and V

Program	Rep I	Rep II	Rep III	Rep IV	Repelita V a/					
	1969~ 1974	1974~ 1979	1979~ 1984	1984~ 1989	1989/ 1990	1990/ 1991	1991/ 1992	1992/ 1993	1993/ 1994	Total
Physical Achievements ('000 ha)										
Rehabilitation	957.8	513.5	320.7	401.3	171.7	236.9	262.1.	282.4	212.2	1,165.3 b/
New Construction c/	171.2	255.5	369.8	218.4	102.8	83.5	77.3	64.2	98.7	426.5
Flood Control	286.6	431.1	387.9	442.9	73.0	85.0	116.4	88.6	90.2	453.2
Swamp Development	199.6	218.6	438.9	191.9	135.1	43.9	60.4	n.a.	155.7	395.1
Total	1,615.2	1,418.7	1,517.3	1,254.5	482.6	449.3	516.2	435.2	556.8	2,440.1
Development Expenditure (Rp. billion)										
Rehabilitation and OM					198.6	206.9	314.4	256.0	330.6	1306.5
New Construction					383.8	483.3	531.6	667.6	705.1	2,771.4
Natural resources					330.2	353.1	292.5	353.4	454.6	1,783.8
Swamp development					50.3	58.9	43.9	116.0	66.1	335.2
Other Support Programs					18.0	20.5	35.3	15.0	20.8	109.7
Total	145.0	696.1	2,169.1	3,750.4	980.9	1,122.7	1,217.6	1,408.1	1,577.1	6,306.5
(Foreign Aid)	(30.6)	(151.5)	(505.6)	(2,663.0)	(816.3)	(732.3)	(714.4)	(751.8)	(797.3)	(3,812.1)
Foreign Aid as Percentage of Development Allocation (%)	21.1	21.8	23.3	71.0	83.2	65.2	58.7	53.4	50.6	60.4
Routine Expenditures d/	1.4	7.0	21.0	48.5	9.5	109	12.7	15.1	18.7	66.9
Total (Rp billion)	146.4	705.1	2,169.1	3,798.9	1,077.7	1,150.3	1,260.6	1,415.4	1,595.9	6,499.9
Total ($ million)	364.0	1,624.0	3,175.4	2,725.6	573.2	605.4	666.5	744.9	778.5	3,368.5

a/ Achievements until 1992/93 and target for 1993/94; b/ includes about 717,000 ha of special maintenance;
c/ includes groundwater development in Repelita V; d/ includes salaries for staff, office equipment, etc.
Source : Appraisal of the Integrated Irrigation Sector Project by ADB, March 1990, Mid Term Review, DGWRD, Oct. 1991 and DIP 1989/90 to 1993/94, BPP, DGWRD

During Repelitas I and II, when the amount of foreign aid was still small, emphasis was placed on the rehabilitation of existing irrigation schemes to attain quick yield at low cost. During Repelita III, greater emphasis was put on the construction of new irrigation facilities and tertiary systems with the biggest investment in the past Repelitas.

During the peiod of Repelita IV, the importance of operation and maintenance of existing irrigation systems was recognized, which led irrigation development policies to a further shift in emphasis towards: (i) the rehabilitation/improvement of existing irrigation schemes necessary to carry out improved O&M; and (ii) the involvement of the farmers in the management and investment of irrigation schemes. The percentage of the foreign aid to the total development expenditure reached at the level of 71.0% during this period because of a financial constraints.

While maintaining its emphasis on O&M of the existing schemes and on its cost recovery, the Government has carried, during Repelita V, on an integrated development which combines the construction, rehabilitation, special maintenance, efficient O/M, handing over small schemes, upgrading swamp and others of the necessary physical infrastructure for irrigation and drainage in order to increase agricultural productivity and efficiency on a sustainable basis.

The program for Repelita V for irrigation sub-sector includes 1.1 million ha of rehabilitation including special maintenance; 500,000 ha of new construction and 400,000 ha of swamp development. The progresses of works so far seems have been on schedule for rehabilitation, and behind schedule for new construction and swamp development as of the beginning of fiscal year 1993/94. (refer to Table 6.1)

The development expenditure of DGWRD during Repelita V, is expected to reach at approximately Rp 6,300 billion (refer to Table 6.2) and the share of foreign aid in the expenditure in each fiscal year become gradually smaller from 83.2% to 50.6% during the same period reflecting probably the recent improvement of economy (refer to Table 6.3).

The routine allocation (DIK; Daftar Isian Kegiatan) for the central office of DGWRD has been prepared by the Ministry of Finance every year (refer to Table 6.4).

6.1.1 Surface Irrigation

The inventory survey on surface irrigation schemes under DGWRD has been carried out by the Directorate of Irrigation I since 1982. This inventory compiles demension of irrigation facilities including type of headworks, irrigation level, number, length and volume of structures and others. However, having no information on the conditions of facilities, the necessity of rehabilitation is not able to be judged. Besides the revision of the value according the change of area of irrigation due to the change of land use has hardly been carried out

because of the delay of reporting. In addition, as this inventory deals only with government schemes, no data on village irrigation is presented. Therefore, the irrigated cropping area (actually irrigated area) which is described in Chapter 5 does not necessarily coincide with the irrigated area in the inventory.

According to the data in 1982, 1985, 1988 and 1989, the irrigated area increased by 273 thousand ha from 3,600 thousand ha in 1982 to 3,873 thousand ha in 1989 as summarized below. The irrigated area increased in Jawa and Sulawesi, and was almost constant in Sumatera (refer to Table 6.5).

Change of Irrigated Area in Surface Irrigation Schemes during 1982 to 1989

Unit: 1,000 ha

Province	1982	1985	1988	1989	1989-1982
Sumatra	613	596	622	627	15
Jawa	2,500	2,537	2,587	2,615	115
Bali/Nusa Tenggara	202	245	255	261	59
Kalimantan	31	25	28	28	-3
Sulawesi	248	272	315	330	82
Maluku/Irian Jaya	6	7	12	12	6
Indonesia	3,600	3,682	3,819	3,873	273

Source: Rekapitulasi Daerah Irigasi Pemerintah, various years, PU

As shown in the following table, the area of new construction consisting of construction of new irrigation systems and extension of existing systems in Repelita V will amount to about 400 thousand ha including the target area in 1993/94.

In Sumatera the new construction area including extension works will increase by 150 thousand ha, followed by 120 thousand ha for Jawa and 64 thousand ha for Sulawesi. New construction in Jawa, however, tends to decrease (refer to Table 6.6).

Physical Achievement of New Construction in Repelita V

Unit : ha

	1989/90	1990/91	1991/92	1992/93	1993/94 *	Total
	41,619	31,452	19,112	15,756	41,094	149,033
Jawa	36,692	31,022	29,466	15,051	10,199	122,430
Bali/ Nusa Tenggara	2,671	2,686	9,000	6,239	18,559	39,155
Kalimantan	1,262	671	2,920	11,232	9,852	25,937
Sulawesi	13,455	14,395	11,122	10,007	15,004	63,983
Maluku/Irian Jaya	558	783	1,799	1,520	896	5,556
Indonesia	96,257	81,009	73,419	59,805	95,604	406,094

Source: Mid Term Review, DOI-I and II for 1992/93 and DIP 1993/94
Note : * is target.

On the other hand, the rehabilitation including special maintenance which has been implemented in Repelita V will be expected to reach to 1.2 million ha in total, reflecting the governemt policy after the attainment of self sufficiency of rice, which comes up to three times of that in Pelita IV. About 70 % of the works have been carried out in Jawa where existing irrigation schemes are concentrated (see Table 6.7).

Physical Achievement of Rehabilitation in Repelita V

Unit : ha

	1989/90	1990/91	1991/92	1992/93	1993/94*	Total
Sumatera	41,042	29,968	36,686	45,006	39,968	192,670
Jawa	100,519	153,549	188,450	183,605	145,395	771,518
Bali/ Nusa Tenggara	7,883	4,261	8,756	5,831	7,329	34,060
Kalimantan	892	1,810	1,352	108	33	4,195
Sulawesi	20,732	43,782	26,081	47,898	16,304	154,797
Maluku/Irian Jaya	646	3,482	750	0	3,179	8,057
Indonesia	171,714	236,852	262,075	282,448	212,208	1,165,297

Source: Mid Term Review, DOI-I and II for 1992/93 and DIP 1993/94
Note : * is target.

6.1.2 Swamp Development

According to the results of the inventory surveys conducted by the Directorate of Swamp in 1989 and 1991, the total design area for the swamp development extended over Sumatera, Kalimantan and Sulawesi covers about 1.9 million ha, 50% of which or about 950 thousand ha are distributed in Sumatera. Out of the whole design area, 1.05 million ha have been used for agriculture which includes 430 thousand ha of not developed area.

Land use area for agricultural purposes

Unit : ha

	Functional Area for Agriculture				Not yet Functional for Agriculture
	Paddy	Upland	Estats crop	Total	
Sumatera *)	325,984	100,106	96,291	522,381	264,147
Kalimantan *)	251,846	85,555	11,630	349,031	122,149
Sulawesi **)	71,232	10,441	100,287	181,960	43,031
Total	649,062	196,102	208,208	1,053,372	429,327

Source: Directorate of Swamp, DGWRD
*) Inventarisasi Pemanfaatan Lahan RPS dan RNPS di SUMATERA dan KALIMANTAN Directorat Rawa, Tahun 1989
**) Inventarisasi Pemanfaatan Lahan RPS dan RNPS di SULAWESI Directorat Rawa, Tahun 1991

The area used for paddy field in the swamp covers 650 thousand ha which shares more than 60 % of the functional area. The remaining 400 thousand ha are used for upland and estate

crop. Sumatera and Kalimantan have the larger share of paddy field in the agricultural land, while Sulawesi has bigger ratio of tree crop.

The swamp area developed by the government in the past four Pelitas amounts to 866 thousand ha of which 708 thousand ha was from the development in the tidal swamp as shown in the following table. Especially in the Pelitas II and III, approximately 600 thousnd ha of tidal swamp were developed.

Progress of Swamp Development in Pelita I, II, III and IV

Unit : ha

Location	Pelital		Pelita II		Pelita III		Pelita IV		Total	
	Non-Tidal	Tidal	Non-Tidal	Tidal	Non-Tidal	Tidal	Non-Tidal	Tidal	Non-Tidal	Tidal
Sumatera	10,250	17,533	11,813	184,292	38,645	233,782	29,893	60,900	90,601	496,507
kalimantan	0	15,559	8,463	64,430	26,583	118,993	13,701	12,504	65,312	211,486
Sulawesi	0	0	0	0	0	0	2,000	0	2,000	0
Total	10,250	33,092	20,276	248,722	65,228	352,775	45,594	73,404	157,913	707,993

Source: Pengembangan Daerah Rawa Dalam Pelita IV, Direktorat Rawa, February 1990

For the swamp development, emphasis has also been shifted from new area development to the upgrading in Repelita V and the achievement reaches to about 240 thousnd ha during 1989/90 to 1991/92 concentrating in Sumatera and Kalimantan as shown below:

Physical Achievement of Groundwater Development in Repelita V

Unit : ha

	1989/90	1990/91	1991/92	1992/93	1993/94*	Total
Sumatera	123,884	23,696	27,940	n.a.	119,952	295,472
Jawa	0	0	0	0	0	0
Bali/ Nusa Tenggara	0	0	0	0	0	0
Kalimantan	6,240	16,831	24,012	n.a.	33,450	80,533
Sulawesi	3,520	1,485	3,813	n.a.	2,260	11,078
Maluku/Irian Jaya	1,500	1,900	4,600	n.a.	0	8,000
Indonesia	135,144	43,912	60,365	n.a.	155,662	395,083

Source: Mid Term Review, DOI-I and II for 1992/93 and DIP 1993/94
Note : * shows target.

6.1.3 Groundwater Development

In the mid-1970s, a technology for low-cost shallow tubewells were developed by private sector in areas where groundwater table is high in Jawa Timur, but this technology has not been extended to any of the other islands.

Efforts by the public sector to develop groundwater irrigation was initiated in Jawa Timur in 1970. In 1972, systematic groundwater studies commenced in East Jawa, and in 1982, East Jawa Groundwater Development Project was launched to provide irrigation to 6,300 ha. Since then, groundwater development has been implemented getting the assistance from IBRD, EEC, UK, CIDA, etc. The groundwater development in Repelita V has been targeted to 20,000 ha in total as shown below, and almost all the work has been concentrated in Jawa and Nusa Tenggara.

Physical Achievement of Groundwater development in Repelita V

Unit : ha

	1989/90	1990/91	1991/92	1992/93	1993/94 *	Total
Sumatera	0	0	0	310	0	310
Jawa	3,654	1,385	2,500	1,669	2,986	12,194
Bali/ Nusa Tenggara	2,938	1,061	1,390	1,803	0	7,192
Kalimantan	0	0	0	0	0	0
Sulawesi	0	0	0	420	150	570
Maluku/Irian Jaya	0	0	0	0	0	0
Indonesia	6,592	2,446	3,890	4,202	3,136	20,266

Source: Mid Term Review, DOI-I and II for 1992/93 and DIP 1993/94
Note : * is target.

6.1.4 Operation and Maintenance

Until 1983/84, the operation and maintenance of existing irrigation schemes under DGWRD was carried out at the costs of Provincial Governments (APBD). Since 1984/85, the Central Government began to allocate costs for O&M (APBN) to confined areas that had been rehabilitated (Sumatera Utara, Sumatera Barat, Sumatera Selatan, Lampung, Jawa Barat, Jawa Tengah, Jogyakarta, Jawa Timur, Sulawesi Selatan and Nusa Tenggara Barat; 10 provinces in total) with APBD funds allocated to other areas.

Further, recognizing the importance of O&M, the Government issued a policy statement for the O&M of irrigation facilities in October 1987. The statement stipulates that within a period of 15 years, efficient O&M cost will be introduced in irrigation systems throughout the country and that the O&M cost will be directly recovered from the beneficiaries. Efficient O&M is applied mainly to main and secondary canals with bigger O&M budget than before and is implemented for five years from the commencement through the the Central Government budget. After five years it will be transferred to Provincial Governments. On the other hand, O&M costs to the terminal canal systems less than tertiary canal will be covered through the introduction of irrigation service fee collected from the beneficiaries and in addition, the

Government -controlled irrigation systems with an area of less than 500 ha are scheduled to be handed over to water Users' Associations (WUAs).

Since 1989/90, APBD funds have met the costs on regular O&M areas whereas APBN and loan have met those on EOM areas (Aceh, Sulawesi Tengah and Maluku were added to the above 10 provinces).

As shown in the following tables, regular O&M area gradually decreased by 500 thousand ha from about 3.75 million ha in 1988/89 to 3.2 million ha in 1992/93, whereas EOM area increased by 700 thousand ha from 580 thousand ha to 1.28 million ha during the same period. The average costs per ha on regular O&M and EOM in 1992/93 are 19,660 Rp/ha and 32,864 Rp/ha respectively.

Further, the subprograms such as handing over small schemes less than 150 ha to farmers' groups[1] (Proyek Irigasi Kecil ; PIK) and irrigation service fee (ISF) which have been implemented or prepared since 1988/89 have not been progressed on schedule, although showing their first returns in 1992/93 in connection with O&M and EOM.

Government Funding of O&M

Fiscal	APBD		APBN		Loan	Total	
Year	regular O&M	EOM	regular O&M	EOM	regular O&M	regular O&M	EOM
1979/80	13,267	0	0	0	0	13,267	0
1980/81	19,971	0	0	0	0	19,971	0
1981/82	26,009	0	0	0	0	26,009	0
1982/83	31,235	0	0	0	0	31,235	0
1983/84	32,895	0	0	0	0	32,895	0
1984/85	30,732	0	13,438	0	0	44,170	0
1985/86	32,425	0	13,999	0	0	46,424	0
1986/87	31,846	0	8,131	0	0	39,977	0
1987/88	30,279	0	7,173	0	2,612	40,064	0
1988/89	31,251	0	0	13,827	0	31,251	13,827
1989/90	41,589	0	0	21,122	0	41,589	21,122
1990/91	47,327	0	0	27,230	0	47,327	27,230
1991/92	58,096	0	0	31,718	0	58,096	31,718
1992/93	62,932	6,393	0	35,594	0	62,932	41,987

Source: Appraisal Report of IISP, March 1990 and DOI-1, DGWRD, OCT. 1992

1) The Government aims to hand over schemes with an area less than 500 ha , but is implementing the program taking the schemes less than 150 ha fir the time being.

O&M area by the Government Fund Source

Unit : ha

Fiscal Year	APBD regular O&M	APBD EOM	APBN EOM	ISF	Total EOM	PIK	Total Area
1988/89	3,752,472	0	582,182	0	582,182	0	4,334,654
1989/90	3,715,709	0	880,784	0	880,784	0	4,596,493
1990/91	3,279,796	0	1,107,965	0	1,107,965	0	4,387,761
1991/92	3,250,155	0	1,151,075	0	1,151,075	0	4,401,230
1992/93	3,201,210	190,842	1,028,704	58,043	1,277,589	37,618	4,516,417

Source: DOI-1, DGWRD, OCT. 1992
a : after 5 years
b : before 5 years , including loan

6.1.5 Village Irrigation

Inventory on village irrigation has not been available so far except the one studied by DGWRD in cooperation with Provincial Governments in 1982. Directorate of Irrigation I has been collecting new inventory data since 1991 in order to grasp the present conditions. Although this survey has not covered the whole provinces, the data of 13 provinces out of 27 provinces are confirmed to be available (refer to Annex G). Data on the remaining provinces was supplemented with the inventory data in 1982, recent JICA study[2] and the ADB study[3]. The total area of village irrigation is, then, estimated at 986 thousand ha (Table 6.8), as shown below:

Estimated Village Irrigation Area

Unit : 1,000ha

Region	Irrigated Area
Sumatera	313
Jawa	329
Bali/Nusa tenggara	139
kalimantan	41
Sulawesi	158
Maluku/Irian Jaya	6
Indonesia	986

Source : Recommended by JICA, FIDP Team (see Table 6.8)

According to the recent inventory by Directorate of Irrigation I, about 60 % of the intake facilities of village irrigation are not well-functioned.

2) JICA, Feasibility Study for Land Development Project, Improvement of Land and Irrigation Systems at Farm Level, October,1992

3) Euroconsult,etc. Second Integrated Sector Project (TA No.1377-INO), March 1992

Necessary rehabilitation works has been implemented by the provincial Government (APBD) through the budget of DGFCA, Ministry of Agriculture (APBN). In 1992/93, some 12,600 ha were rehabilitated with a budget of Rp.410 million. Cost per ha of rehabilitation work is then estimated at Rp.34,000. (see Table 6.9 and Table 6.10)

6.1.6 Land Development

In general, the Ministry of Public Works has the responsibility to cover main and secondary systems in implementing irrigation project, while farmers have to burden the works of tertiary systems and land development The land development project, however, initiated in 1979/80 under the Directorate of Land rehabilitation and development (DLRD), Directorate General of Food Crops Agriculture (DGFCA), Ministry of Agriculture, to support farmers by providing credit through the Bank Rakyat Indonesia. However, to the target of 700 thousand ha for Repelitas III and IV, only about 350 thousand ha consisting of 110 thousand ha by the credit and 240 thousand ha by farmers themselves, were completed and the initial target was not attained because few farmers could access to the credit due to its severe condition.

In light with the above experiences, a new policy, "Assisted Self-help Development System" to reach the target of land development by farmers' participation and the budgetary and technical assistance of the Government was issued in August 1989. In accordance with this policy, the Government started implementation including site selection (investigation), survey and design, farmers registration, land clearing, land leveling and supervision since Repelita V.

As to the target of land development of 375 thousand ha including the development of swamp and village irrigation area during Repelita V, the achievement is estimated at about 300 thousand ha of which 230 thousand ha have been constructed through the budget of the Government and 70 thousand ha by farmers as shown below (see Table 6.11 and Table 6.12).

Physical Progress of Land Development in Repelita V

Unit : ha

Province	1989/90	1990/91	1991/92	1992/93	1993/94	Total
Sumatera	27,889	28,612	28,468	18,033	22,001	125,002
Jawa	17,245	15,284	9,503	5,637	6,225	53,894
Bali/Nusa Tenggara	747	6,483	4,379	2,602	2,600	18,771
Kalimantan	8,255	10,684	7,758	5,818	6,595	39,110
Sulawesi	20,458	12,527	16,115	4,715	6,300	60,115
Maluku/Irian Jaya	3,859	770	667	277	2,140	5,753
INDONESIA	78,454	74,359	66,889	37,082	45,861	302,645

Source : Directorate of Land Rehabilitation & Development , DGFCA, March 15,1993

Physical Progress of Land Development Excluding Farmers' Development

Unit : ha

Province	1989/90	1990/91	1991/92	1992/93	1993/94	Total	Breakdown	
							APBD	Loan
Sumatera	17,764	24,164	22,750	14,562	22,001	101,241	65,660	35,580
Jawa	15,081	11,938	8,820	2,250	6,225	44,315	24,819	19,496
Bali/Nusa Tenggara	837	3,411	3,571	1,353	2,600	11,772	8,036	3,736
Kalimantan	4,859	5,675	5,553	5,505	6,595	28,187	17,314	10,873
Sulawesi	13,396	5,776	8,494	4,423	6,300	38,389	19,658	18,732
Maluku/Irian Jaya	1,308	770	467	277	2,140	4,962	3,654	1,308
INDONESIA	53,245	51,734	49,656	28,370	45,861	228,866	139,141	89,725

Source : Directorate of Land Rehabilitation & Development , DGFCA, March 15,1993

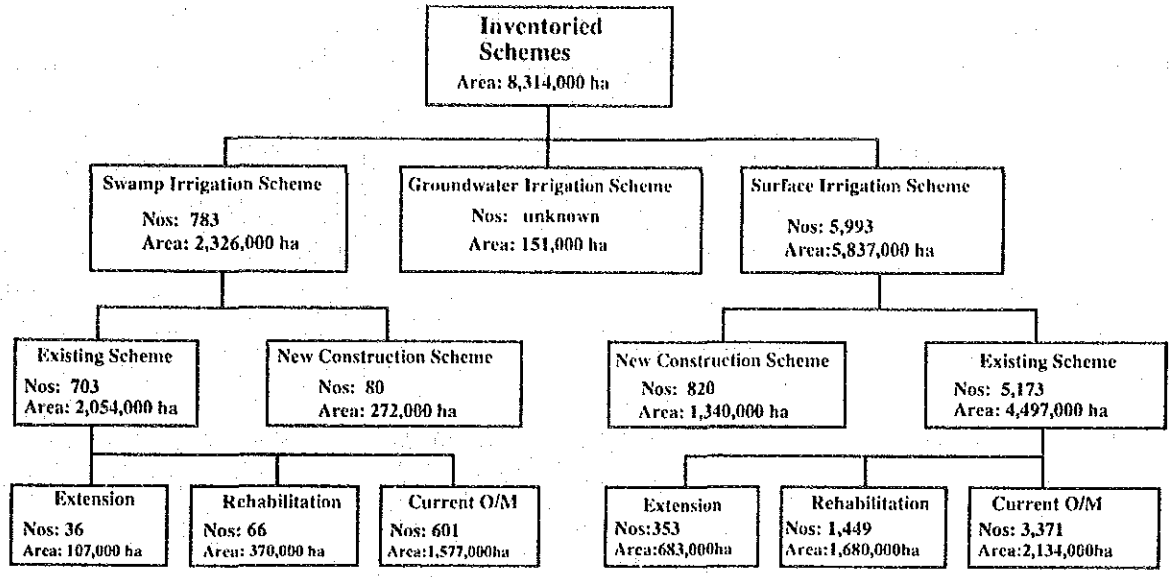
As for the land development area by region, Sumatera has developed about 120 thousand ha which share about 40 % of the whole, followed by Sulawesi (60 thousand ha) and Jawa (54 thousand ha). The region with bigger new construction area for irrigation has bigger land development area.

6.2 Inventory Survey

An inventory survey was conducted as a part of the study in order to grasp the present conditions of existing irrigation schemes and programmed schemes under the Ministry of Public Works (PU). As for the survey method and procedure, the detailed explanation is presented in Annex E.

Terminology on irrigation area was defined by mutual agreement between PU and the study team, as shown on Table 6.13 and Figure 6.1.

Total number of inventoried scheme was 6,776 except groundwater scheme. Total designed area (Luas Rencana) amounts some 8.3 million ha in total. The schemes were classified into several categories by types, stage, size, etc. General classification of the schemes is depicted with number and area in the following chart.



Classification of Inventoried Irrigation Schemes

Irrigation schemes under the responsibility of PU are generally classified into three categories, namely, (i) surface irrigation scheme, (ii) swamp irrigation scheme and (iii) groundwater irrigation scheme. All those schemes are further classified into two groups; (i) new construction scheme and (ii) existing scheme. As for groundwater irrigation scheme, since the project is turned over to the farmers (village irrigation) after the construction, existing schemes will not exist.

Existing schemes consist of on-going scheme, programmed scheme and O&M scheme. Programmed schemes are classified into two categories; (i) extension and (ii) rehabilitation.

(1) Surface Irrigation Scheme

Further, surface irrigation schemes are classified into the following types;

- Existing Scheme
- Rehabilitation Scheme
- Extension Scheme
- Current O&M Scheme
- New Construction Scheme

The following definition was adopted to each type of scheme in accordance with discussion with PU since construction work and rehabilitation works are very often carried out at once and it is difficult to differentiate one from the other.

Existing Scheme: Scheme where is registered in "Buku Inventarisasi" and has irrigated paddy field area (sawah irigasi) at present. Existing schemes are further divided into three categories, on-

- Rehabilitation Scheme : Schemes in which irrigated paddy field area (or luas sawah irigasi) registered in the inventory will not increase after works, although not yet irrigated paddy field in existing scheme is converted to irrigated paddy field This category includes rehabilitation, special maintenance and efficient O&M schemes .

- Extension Scheme : Schemes in which irrigated paddy field area (or luas sawah irigasi) registered in the inventory will increase because new irrigated paddy field is constructed after works.

- Current O&M Scheme : Schemes in which no construction/rehabilitation works are being made and/or are proposed as of 1992/93.

New Construction Scheme : Scheme that has no irrigated paddy field at present condition. So some schemes that are found in "Buku Inventarisasi" are tentatively classified in this category if there is no irrigated paddy field area.

Detail of confirmed surface irrigation scheme is given in Table 6.14 and summarized below; (Unless otherwise specified, values shown in table in main text and attached table relevant in this section are based upon result of the inventory survey)

Confirmed Surface Irrigation Scheme by Type

	Existing		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	1,489	1,266	415	718	1,904	1,984
Jawa	2,475	2,150	19	19	2,494	2,169
Bali & Nusa Tenggara	515	329	154	87	669	416
Kalimantan	167	115	51	73	218	188
Sulawesi	491	600	151	405	642	1,005
Maluku & Irian Jaya	36	38	30	37	66	75
Indonesia	5,173	4,497	820	1,339	5,993	5,837

Existing schemes are summarized below,

Confirmed Existing Surface Irrigation Scheme by Type

	Current O/M		Rehabilitation		Extension		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	846	412	374	421	269	433	1,489	1,266
Jawa	1,730	1,254	731	822	14	74	2,475	2,150
Bali & Nusa Tenggara	374	219	122	88	19	22	515	329
Kalimantan	136	60	15	8	16	47	167	115
Sulawesi	276	185	188	323	27	92	491	600
Maluku & Irian Jaya	9	4	19	18	8	15	36	37
Indonesia	3,371	2,134	1,449	1,680	353	683	5,173	4,497

Of the 5,173 total inventoried existing surface irrigation schemes, 66% or 3,371 are current O&M schemes, 28% or 1,449 are rehabilitation schemes and the remaining 7% or only 353 schemes are extension schemes. Current O&M schemes cover 47% of total area. The ratio of the rehabilitation or extension area to the designed area is bigger in Sumatera and Sulawesi.

On-going scheme is defined as those on which rehabilitation and/or construction works are being carried out as of 1992/93. Therefore, the schemes that have been committed in a particular foreign aid project but are not commenced yet, are categorized into proposed schemes. Summary is given in the following tables:

Summary of On-going Scheme

	Rehabilitation		Extension		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	156	229	100	246	12	6	268	481
Jawa	470	601	10	65	10	8	490	674
Bali & Nusa Tenggara	38	45	7	10	11	9	56	64
Kalimantan	6	3	10	38	2	1	18	42
Sulawesi	96	157	9	43	5	18	110	218
Maluku & Irian Jaya	10	9	5	7	0	0	15	16
Indonesia	776	1,043	141	409	40	43	957	1,495

Of the on-going schemes of about 1.5 million ha, almost all the area consists of rehabilitation scheme of 1 million ha and extension scheme of 410 thousand ha. About 600 thousand ha or 60 % of total rehabilitation scheme area are localized in Jawa, followed by Sumatera (230 thousand ha) and Sulawesi (160,000 ha). On the other hand, extension works are implemented mostly in Sumatera with share of 60 % of all the extension areas. On-going new construction scheme amounts to about 40,000 ha which are distributed in the whole country, showing large scale ones in Sulawesi. On-going rehabilitation schemes are further classified

into three (3) categories, (i) Special Maintenance (SM), (ii) Efficient Operation and Maintenance (EOM), and (iii) ordinary rehabilitation, which features are presented below,

On-going Rehabilitation Scheme by Region

Unit : 1,000 ha

	SM		EOM		Rehabilitation		Total	
	Nos. of schemes (Nos.)	Designed Area (Luas Rencana)	Nos. of schemes (Nos.)	Designed Area (Luas Rencana)	Nos. of schemes (Nos.)	Designed Area (Luas Rencana)	Nos. of schemes (Nos.)	Designed Area (Luas Rencana)
Sumatera	20	42	43	68	93	119	156	229
Jawa	71	135	345	392	54	74	470	601
Bali & Nusa Tenggara	6	17	1	1	31	27	38	45
Kalimantan	0	0	0	0	6	3	6	3
Sulawesi	11	16	45	100	40	41	96	157
Maluku & Irian Jaya	0	0	2	1	8	8	10	9
Indonesia	108	210	436	562	232	272	776	1,043

About 50 % of on-going rehabilitation schemes are under EOM, and more than 60 % of EOM schemes are localized in Jawa. Special maintenance schemes are localized in Jawa as well, but about 120 thousand ha covering about more than 40 % of the rehabilitation schemes are worked out in Sumatera.

The following table shows the summary of proposed schemes

Summary of Proposed Scheme

	Rehabilitation		Extension		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	218	192	169	187	403	712	790	1,091
Jawa	261	221	4	8	9	12	274	241
Bali & Nusa Tenggara	84	43	12	13	143	77	239	133
Kalimantan	9	5	6	9	49	72	64	86
Sulawesi	92	166	18	49	146	387	256	602
Maluku & Irian Jaya	9	9	3	8	30	37	42	54
Indonesia	673	636	212	274	780	1,297	1,665	2,207

The number of proposed schemes totals 1,665 covering 2.2 million ha in total. New construction schemes shares 1.3 million ha or about 60 % of the total area. Proposed rehabilitation schemes are counted at 640 thousand ha and almost all the area are distributed in Jawa, Sumatera and Sulawesi. Proposed extension schemes amount to 270 thousand ha, of which more than 65 % are planned in Sumatera. Of the proposed new construction schemes, 1.1 million ha are found in Sumatera and Sulawesi. In addition, although the ratio of the area is small, 70 thousand ha of new irrigation schemes are planned each in Bali/Nusa Tenggara and

in Kalimantan. If these plans are realized, the irrigated areas will increase by 23 % for Bali/Nusa Tenggara and 63 % for Kalimantan, respectively.

As for the status of the preparation for the implementation, however, almost no answer was found in the inventory survey and to the re-request to each province, almost no satisfactory reply has been returned.

(2) Swamp Irrigation Scheme

Classification of swamp irrigation scheme is almost similar manner as that of surface irrigation scheme, except that irrigated paddy field for surface irrigation schemes is replaced with functioned paddy field (luas sawah berfungsi) for swamp schemes.

Following tables indicate present feature of confirmed swamp irrigation. (see Table 6.15)

Confirmed Swamp Irrigation Scheme by Type

	Existing		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	333	986	40	158	373	1,144
Jawa	0	0	0	0	0	0
Bali & Nusa Tenggara	0	0	0	0	0	0
Kalimantan	275	593	4	10	279	603
Sulawesi	94	469	29	52	123	521
Maluku & Irian Jaya	1	6	7	52	8	58
Indonesia	703	2,054	80	272	783	2,326

The total area of 2.33 million ha consisting of the existing schemes of 2.1 million ha and the new construction schemes of 270 thousand ha, are confirmed as swamp irrigation schemes. Almost all the schemes are localized in Sumatera, Kalimantan and Sulawesi. Especially, Sumatera has 1.14 million ha of swamp irrigation schemes which exceeds Kalimantan (600 thousand ha) and Sulawesi (520 thousand ha).

The summary of existing swamp irrigation schemes is shown in the following table.

Confirmed Existing Swamp Irrigation Scheme by Type

	Current O/M		Rehabilitation		Extension		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	282	650	45	315	6	21	333	986
Jawa	0	0	0	0	0	0	0	0
Bali & Nusa Tenggara	0	0	0	0	0	0	0	0
Kalimantan	231	486	16	37	28	70	275	593
Sulawesi	88	441	5	18	1	1	94	469
Maluku & Irian Jaya	0	0	0	0	1	6	1	6
Indonesia	601	1,577	66	370	36	107	703	2,054

Of the 703 total inventoried existing schemes, 601 or 85% of the total are current O&M schemes covering 1.6 million ha. Out of the remaining 102 schemes, 66 are rehabilitation schemes with 370 thousand ha and 36 are extension schemes of 110 thousand ha. Rehabilitation schemes are mainly located in Sumatera, while about 70 % of extension schemes are located in Kalimantan.

Present status of on-going schemes and proposed schemes are presented below:

Summary of On-going Scheme

	Rehabilitation		Extension		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	19	138	4	13	16	62	39	213
Jawa	0	0	0	0	0	0	0	0
Bali & Nusa Tenggara	0	0	0	0	0	0	0	0
Kalimantan	9	31	19	54	2	3	30	88
Sulawesi	3	7	1	10	6	17	10	34
Maluku & Irian Jaya	0	0	1	6	4	8	5	14
Indonesia	31	176	25	83	28	90	84	349

On-going swamp irrigation schemes amount to about 360 thousand ha and more than 50% of these are rehabilitation schemes. Extension schemes and new construction schemes are implemented at almost same scale. Rehabilitation schemes and new construction schemes are mostly located in Sumatera and extension schemes are localized in Kalimantan.

Summary of Proposed Scheme

	Rehabilitation		Extension		New Construction		Total	
	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)	Nos. of schemes (Nos.)	Designed Area (1000 ha)
Sumatera	26	177	2	8	24	96	52	281
Jawa	0	0	0	0	0	0	0	0
Bali & Nusa Tenggara	0	0	0	0	0	0	0	0
Kalimantan	7	6	9	16	2	7	18	29
Sulawesi	2	11	0	0	23	35	25	46
Maluku & Irian Jaya	0	0	0	0	3	44	3	44
Indonesia	35	194	11	24	52	182	98	400

Proposed schemes come up to 400 thousand ha in total consisting of 190 thousand ha of rehabilitation schemes, 20 thousand ha of extension ones and 180 thousand ha of new construction ones. Almost all the extension schemes are planned in Sumatera while extension schemes are localized in Kalimantan. New construction schemes are found mostly in Sumatera, but it is characteristic that 40 thousand ha of new schemes are planned in Maluku / Irian Jaya.

(3) Groundwater Irrigation Scheme

As for groundwater irrigation scheme, data collection was proceeded only for new construction scheme. Designed area for the schemes are summarized below;

Confirmed Groundwater Irrigation Scheme by Type

Unit: 1,000 ha

	On-going	Proposed	Total
Sumatera	0	4	4
Jawa	3	39	42
Bali & Nusa Tenggara	1	78	79
Kalimantan	0	0	0
Sulawesi	0	26	26
Maluku & Irian Jaya	0	0	0
Indonesia	4	147	151

6.3 Possibility of Irrigation Development

6.3.1 Surface Irrigation Scheme

(1) Potential Expandable Area in Existing Scheme

In the section 6.2, the designed area and its scale of existing and proposed schemes are described using the results of the inventory survey, but there are some areas remaining irrigation potential in existing irrigation schemes. These not-yet or not irrigated paddy fields are summarized in the following table (see Table 6.16 to Table 6.19).

Present Condition of Existing Irrigation Schemes

Unit : 1,000ha

	Number of Scheme	Designed Area	Irrigated Paddy Field	Not yet Irrigated Paddy Field	No Longer Available for Paddy	Potential Area for Paddy Field
Sumatera	1,489	1,266	792	473	27	446
Jawa	2,475	2,150	2,025	125	46	79
Bali/ Nusa Tenggara	515	329	261	68	4	64
Kalimantan	167	115	29	86	2	84
Sulawesi	491	600	381	218	21	197
Maluku/ Irian Jaya	36	37	11	27	1	26
Indonesia	5,173	4,497	3,499	997	101	896

Not yet irrigated paddy field is 1 million ha which is obtained subtracting the irrigated paddy field of 3.5 million ha from the total designed area of 4.5 million ha. Of this amount, there are about 100 thousand ha which are considered to be no longer available for paddy field due to the change of land use, etc. The remaining area of 900,000 ha, therefore, is counted to be expandable for paddy field in the future. These areas are distributed in the areas of the programs consisting of rehabilitation, extension and current O&M and summarized as follows;

Potential Expandable Area for Paddy Field
Reported by Inventory Survey

Unit : 1,000ha

	O&M	Rehabilitation	Extension	Total
Sumatera	154	80	213	446
Jawa	63	11	5	79
Bali/ Nusa Tenggara	38	15	11	64
Kalimantan	37	5	42	84
Sulawesi	70	88	39	197
Maluku/ Irian Jaya	2	12	12	26
Indonesia	364	210	322	896

Out of the extension schemes of 320 thousand ha, about 300 thousand ha are under construction or proposed for implementation.

(2) New Construction Scheme

The designed area of new construction schemes is estimated at about 1.34 million ha. Those proposed are are concentrated in Sumatera (720 thousand ha) and Sulawesi (405 thousan ha). As the results of the inventory survey, it is reported that almost all the areas are expandable for irrigated paddy field (see Table 6.20).

Present Condition of New construction Schemes

Unit : 1,000ha

	Number of Scheme	Designed Area
Sumatera	415	718
Jawa	19	19
Bali/ Nusa Tenggara	154	87
Kalimantan	51	73
Sulawesi	151	405
Maluku/ Irian Jaya	30	37
Indonesia	820	1,339

(3) Required Works for Expansion of Irrigated Paddy Field

The works required for expansion of irrigated paddy field mainly consists of the construction of main and secondary canals and land development. Four categories are considered by the combination of the above two works. Description of each category is shown below;

Classification of Convertible Land

	Present Condition		Required Works	
	Construction of Main Canal	Land Development	Construction of Main Canal	Land Development
Category 1	Not Yet Finished	Not Yet Finished	Required	Required
Category 2	Not Yet Finished	Finished	Required	Not Required
Category 3	Finished	Not Yet Finished	Not Required	Required
Category 4	Finished	Finished	Not Required	Not Required

Construction of main canal system will be necessary in categories 1 and 2, while area of categories 2, and 4 require land development. Breakdown of each category in both extension scheme and new construction scheme is given below;

Breakdown of Potential Expandable Area for Paddy Field (Existing Scheme)

Unit : 1,000ha

	Category 1	Category 2	Category 3	Category 4	Total
Sumatera	92	77	149	128	446
Jawa	8	18	22	31	79
Bali/ Nusa Tenggara	11	4	41	8	64
Kalimantan	20	35	14	15	84
Sulawesi	47	41	73	36	197
Maluku/ Irian Jaya	8	0	11	7	26
Indonesia	186	175	310	225	896

Breakdown of Potential Expandable Area for Paddy Field (New Construction Area)

Unit : 1,000ha

	Category 1	Category 2	Category 3	Category 4	Total
Sumatera	442	239	3	34	718
Jawa	9	5	1	4	19
Bali/ Nusa Tenggara	56	23	3	5	87
Kalimantan	48	20	1	4	73
Sulawesi	153	247	2	3	405
Maluku/ Irian Jaya	26	11	0	0	37
Indonesia	734	545	10	50	1,339

The required work for expansion of irrigated paddy field is summarized below. The table indicates that construction of main canals is needed to cover about 150,000 ha . On the other hand, even in extension work in existing scheme, about 120,000 ha of land development will be required. In this connection, PU has to make close contact to Ministry of Agriculture in order to accomplish full development of existing scheme.

Summary of Required Works for Expansion of Irrigated Paddy Field

Unit : 1,000 ha

	Land Development	Construction of Main Canal	Total
Current O&M	216	149	365
Rehabilitation	145	54	199
Extension	135	158	292
Total	496	361	857

6.3.2 Swamp Irrigation Scheme

The present status of the existing and new construction schemes for swamp irrigation development is shown in the following table respectively. (see Table 6.21 and Table 6.22)