

Table 3.47 Realization, Actual Budgetary Consumption and Unit Cost of Handing over Small Schemes during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp. 1,000/ha)				
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92		
		Progress	1990/91	Progress	Total	Progress	Total	Progress	1990/91	Progress	1990/91	Progress	Average	
11	D.I. Aceh	0	0	1,227	1,227	0	0	0	0	466	466	-	-	380
12	Sumatera Utara	0	0	2,474	2,474	0	0	0	0	940	940	-	-	380
13	Sumatera Barat	6,885	6,000	3,927	16,812	826	900	746	2,472	120	150	190	147	147
14	Riau	0	0	0	0	0	0	0	0	0	0	-	-	-
15	Jambi	0	0	0	0	0	0	0	0	0	0	-	-	-
16	Sumatera Selatan	0	0	0	0	0	0	0	0	0	0	-	-	-
17	Bengkulu	0	0	0	0	0	0	0	0	0	0	-	-	-
18	Lampung	0	0	0	0	0	0	0	0	0	0	-	-	-
	Sumatera	6,885	6,000	7,628	20,513	826	900	2,152	3,878	120	150	282	189	189
31	D.K.I. Jakarta	0	0	0	0	0	0	0	0	0	0	-	-	-
32	Jawa Barat	4,073	5,500	8,395	17,968	488	825	1,595	2,908	120	150	190	162	162
33	Jawa Tengah	1,636	3,096	8,140	12,872	196	464	1,550	2,210	120	150	190	172	172
34	D.I. Yogyakarta	1,764	1,000	1,005	3,769	211	150	190	551	120	150	189	146	146
35	Jawa Timur	0	2,000	6,124	8,124	0	300	1,163	1,463	-	150	190	180	180
	Jawa	7,473	11,596	23,664	42,733	895	1,739	4,498	7,132	120	150	190	167	167
51	Bali	0	0	0	0	0	0	0	0	0	0	-	-	-
52	Nusa Tenggara Barat	0	1,000	1,413	2,413	0	150	256	406	-	150	181	168	168
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
54	Timor Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
	Bali/Nusa Tenggara	0	1,000	1,413	2,413	0	150	256	406	-	150	181	168	168
61	Kalimantan Barat	0	0	0	0	0	0	0	0	0	0	-	-	-
62	Kalimantan Tengah	0	0	0	0	0	0	0	0	0	0	-	-	-
63	Kalimantan Selatan	0	0	0	0	0	0	0	0	0	0	-	-	-
64	Kalimantan Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
	Kalimantan	0	0	0	0	0	0	0	0	0	0	-	-	-
71	Sulawesi Utara	0	0	0	0	0	0	0	0	0	0	-	-	-
72	Sulawesi Tengah	0	0	0	0	0	0	0	0	0	0	-	-	-
73	Sulawesi Selatan	0	1,100	1,021	2,121	0	165	193	358	-	150	189	169	169
74	Sulawesi Tenggara	0	0	0	0	0	0	0	0	0	0	-	-	-
	Sulawesi	0	1,100	1,021	2,121	0	165	193	358	-	150	189	169	169
81	Maluku	0	0	0	0	0	0	0	0	0	0	-	-	-
82	Irian Jaya	0	0	0	0	0	0	0	0	0	0	-	-	-
	Maluku/Irian Jaya	0	0	0	0	0	0	0	0	0	0	-	-	-
	INDONESIA	14,358	19,696	33,726	67,780	1,721	2,954	7,099	11,774	120	150	210	174	174

Source: Mid Term Review

Table 3.48 Realization, Actual Expenditure and Unit Cost of Current O&M during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)						Actual Budgetary Consumption (Million Rp.)						Unit Cost (Rp./ha)						
		1989/90		1990/91		1991/92		1989/90		1990/91		1991/92		1989/90		1990/91		1991/92		
		Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Average	
11	D.I.Aceh	129,465	127,461	121,147	378,073	1,340	1,735	2,180	5,255	10,350	13,612	17,995	13,899	13,899	13,899	13,899	13,899	13,899	13,899	13,899
12	Sumatera Utara	226,523	225,856	213,246	665,625	2,574	3,101	3,899	9,574	11,563	13,730	18,284	14,383	14,383	14,383	14,383	14,383	14,383	14,383	14,383
13	Sumatera Barat	259,268	183,065	181,429	623,762	2,742	2,632	3,059	8,433	10,576	14,377	16,861	13,520	13,520	13,520	13,520	13,520	13,520	13,520	13,520
14	Riau	107,094	202,479	236,611	546,184	1,115	2,242	2,483	5,840	10,411	11,073	10,494	10,692	10,692	10,692	10,692	10,692	10,692	10,692	10,692
15	Jambi	99,504	92,698	97,198	289,400	1,015	904	1,363	3,282	10,201	9,732	14,023	11,341	11,341	11,341	11,341	11,341	11,341	11,341	11,341
16	Sumatera Selatan	362,391	198,748	251,017	812,156	4,087	2,456	3,337	9,880	11,278	12,357	13,294	12,165	12,165	12,165	12,165	12,165	12,165	12,165	12,165
17	Bengkulu	38,568	68,864	87,747	195,179	780	867	1,220	2,867	20,224	12,590	13,904	14,689	14,689	14,689	14,689	14,689	14,689	14,689	14,689
18	Lampung	124,269	116,122	109,921	350,312	1,551	1,727	2,120	5,398	12,481	14,872	19,287	15,409	15,409	15,409	15,409	15,409	15,409	15,409	15,409
	Sumatera	1,347,082	1,215,293	1,298,316	3,860,691	15,204	15,664	19,661	50,529	11,287	12,889	15,143	13,088	13,088	13,088	13,088	13,088	13,088	13,088	13,088
31	D.K.I.Jakarta	6,230	15,053	15,053	36,336	470	750	825	2,045	75,441	49,824	54,806	56,280	56,280	56,280	56,280	56,280	56,280	56,280	56,280
32	Jawa Barat	616,177	602,312	557,702	1,776,191	5,510	5,943	7,701	19,154	8,942	9,867	13,808	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784
33	Jawa Tengah	655,738	530,656	509,842	1,696,246	4,864	8,594	8,500	21,958	7,418	16,195	16,672	12,945	12,945	12,945	12,945	12,945	12,945	12,945	12,945
34	D.I.Jogjakarta	65,374	32,347	34,515	132,236	654	820	880	2,354	10,004	25,350	25,496	17,802	17,802	17,802	17,802	17,802	17,802	17,802	17,802
35	Jawa Timur	721,359	676,910	655,116	2,033,385	8,828	9,750	11,444	30,022	12,238	14,404	17,469	14,621	14,621	14,621	14,621	14,621	14,621	14,621	14,621
	Jawa	2,064,878	1,857,288	1,772,228	5,694,394	20,326	25,857	29,350	75,533	9,844	13,922	16,561	13,264	13,264	13,264	13,264	13,264	13,264	13,264	13,264
51	Bali	86,867	86,867	89,123	262,857	1,065	1,160	1,354	3,579	12,260	13,354	15,192	13,616	13,616	13,616	13,616	13,616	13,616	13,616	13,616
52	Nusa Tenggara Barat	164,694	152,019	150,804	467,517	1,868	2,280	2,979	7,127	11,342	14,998	19,754	15,244	15,244	15,244	15,244	15,244	15,244	15,244	15,244
53	Nusa Tenggara Timur	43,213	39,927	40,077	123,217	649	1,000	901	2,550	15,019	25,046	22,482	20,695	20,695	20,695	20,695	20,695	20,695	20,695	20,695
54	Timor Timur	5,952	7,313	7,313	20,578	82	107	128	317	13,777	14,631	17,503	15,405	15,405	15,405	15,405	15,405	15,405	15,405	15,405
	Bali/Nusa Tenggara	300,726	286,126	287,317	874,169	3,664	4,547	5,362	13,573	12,184	15,892	18,662	15,527	15,527	15,527	15,527	15,527	15,527	15,527	15,527
61	Kalimantan Barat	219,765	116,787	154,212	490,764	1,608	1,171	1,897	4,676	7,317	10,027	12,301	9,528	9,528	9,528	9,528	9,528	9,528	9,528	9,528
62	Kalimantan Tengah	129,363	199,006	217,511	545,880	965	1,981	2,613	5,559	7,460	9,954	12,013	10,184	10,184	10,184	10,184	10,184	10,184	10,184	10,184
63	Kalimantan Selatan	226,225	154,673	162,030	542,928	1,684	1,446	1,815	4,945	7,444	9,349	11,202	9,108	9,108	9,108	9,108	9,108	9,108	9,108	9,108
64	Kalimantan Timur	7,058	35,035	35,035	77,128	255	279	437	971	36,129	7,963	12,473	12,589	12,589	12,589	12,589	12,589	12,589	12,589	12,589
	Kalimantan	582,411	505,501	568,788	1,656,700	4,512	4,877	6,762	16,151	7,747	9,648	11,888	9,749	9,749	9,749	9,749	9,749	9,749	9,749	9,749
71	Sulawesi Utara	64,856	64,490	66,025	195,371	845	1,059	1,400	3,304	13,029	16,421	21,204	16,911	16,911	16,911	16,911	16,911	16,911	16,911	16,911
72	Sulawesi Tengah	87,066	67,931	67,682	222,679	964	996	2,465	4,425	11,072	14,662	36,420	19,872	19,872	19,872	19,872	19,872	19,872	19,872	19,872
73	Sulawesi Selatan	200,822	174,374	172,000	547,196	2,729	3,488	3,650	9,867	13,589	20,003	21,221	18,032	18,032	18,032	18,032	18,032	18,032	18,032	18,032
74	Sulawesi Tenggara	34,674	31,818	46,541	113,033	348	430	1,135	1,913	10,036	13,514	24,387	16,924	16,924	16,924	16,924	16,924	16,924	16,924	16,924
	Sulawesi	387,418	338,613	352,248	1,078,279	4,886	5,973	8,650	19,509	12,612	17,640	24,557	18,093	18,093	18,093	18,093	18,093	18,093	18,093	18,093
81	Maluku	7,237	15,683	15,683	38,603	155	225	248	628	21,418	14,347	15,813	16,268	16,268	16,268	16,268	16,268	16,268	16,268	16,268
82	Irian Jaya	6,907	10,284	11,040	28,231	229	247	498	974	33,155	24,018	45,109	34,501	34,501	34,501	34,501	34,501	34,501	34,501	34,501
	Maluku/Irian Jaya	14,144	25,967	26,723	66,834	384	472	746	1,602	27,149	18,177	27,916	23,970	23,970	23,970	23,970	23,970	23,970	23,970	23,970
	INDONESIA	4,696,659	4,228,788	4,305,620	13,231,067	48,976	57,390	70,531	176,897	10,428	13,571	16,381	13,370	13,370	13,370	13,370	13,370	13,370	13,370	13,370

Source: Mid Term Review

Table 3.49 Realization, Actual Expenditure and Unit Cost of Current O&M for Surface Irrigation during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp./ha)					
		1989/90		1990/91		1989/90		1990/91		1989/90		1990/91		1991/92	
		Progress	1989/90	Progress	1990/91	Progress	1989/90	Progress	1990/91	Progress	1989/90	Progress	1990/91	Progress	Average
11	D.I.Aceh	127,815	124,961	118,647	371,423	1,325	1,710	2,146	5,181	10,367	13,684	18,087	13,949		
12	Sumatera Utara	173,978	156,003	153,931	483,912	2,101	2,424	3,181	7,706	12,076	15,538	20,665	15,924		
13	Sumatera Barat	244,297	179,502	177,776	601,575	2,637	2,596	3,013	8,246	10,794	14,462	16,948	13,707		
14	Riau	11,826	24,424	21,866	58,116	258	283	491	1,032	21,816	11,587	22,455	17,758		
15	Jambi	26,085	26,190	26,190	78,465	354	239	631	1,224	13,571	9,126	24,093	15,599		
16	Sumatera Selatan	87,350	47,129	48,570	183,049	2,162	558	1,165	3,885	24,751	11,840	23,986	21,224		
17	Bengkulu	26,888	53,164	72,047	152,099	675	710	1,024	2,409	25,104	13,355	14,213	15,838		
18	Lampung	124,269	106,122	99,921	330,312	1,551	1,627	1,995	5,173	12,481	15,331	19,966	15,661		
	Sumatera	822,508	717,495	718,948	2,258,951	11,063	10,147	13,646	34,856	13,450	14,142	18,981	15,430		
31	D.K.I.Jakarta	6,230	15,053	15,053	36,336	470	750	825	2,045	75,441	49,824	54,806	56,280		
32	Jawa Barat	616,177	602,312	557,702	1,776,191	5,510	5,943	7,701	19,154	8,942	9,867	13,808	10,784		
33	Jawa Tengah	655,738	530,666	509,842	1,696,246	4,864	8,594	8,500	21,958	7,418	16,195	16,672	12,945		
34	D.I.Jogyakarta	65,374	32,347	34,515	132,236	654	820	880	2,354	10,004	25,350	25,496	17,802		
35	Jawa Timur	721,359	676,910	655,116	2,053,385	8,828	9,750	11,444	30,022	14,404	17,469	14,621	15,661		
	Jawa	2,064,878	1,857,288	1,772,228	5,694,394	20,326	25,857	29,350	75,533	9,844	13,922	16,561	13,264		
51	Bali	86,867	86,867	89,123	262,857	1,065	1,160	1,354	3,579	12,260	13,354	15,192	13,616		
52	Nusa Tenggara Barat	164,694	152,019	150,804	467,517	1,868	2,280	2,979	7,127	11,342	14,998	19,754	15,244		
53	Nusa Tenggara Timur	43,213	39,927	40,077	123,217	649	1,000	901	2,550	15,019	25,046	22,482	20,695		
54	Timor Timur	5,952	7,313	7,313	20,578	82	107	128	317	13,777	14,631	17,503	15,405		
	Bali/Nusa Tenggara	300,726	286,126	287,317	874,169	3,664	4,547	5,362	13,573	12,184	15,892	18,662	15,527		
61	Kalimantan Barat	98,036	12,148	12,512	122,696	792	125	216	1,133	8,079	10,290	17,263	9,234		
62	Kalimantan Tengah	4,224	4,096	3,788	12,108	45	33	29	107	10,653	8,057	7,656	8,887		
63	Kalimantan Selatan	20,117	21,873	21,926	63,916	193	118	53	364	9,594	5,395	2,417	5,695		
64	Kalimantan Timur	7,058	19,590	19,590	46,238	255	125	244	624	36,129	6,381	12,455	13,495		
	Kalimantan	129,435	57,707	57,816	244,958	1,285	401	542	2,228	9,928	6,949	9,375	9,095		
71	Sulawesi Utara	64,856	64,490	66,025	195,371	845	1,059	1,400	3,304	13,029	16,421	21,204	16,911		
72	Sulawesi Tengah	87,066	67,931	67,682	222,679	964	996	2,465	4,425	11,072	14,662	36,420	19,872		
73	Sulawesi Selatan	200,822	174,374	171,000	546,196	2,729	3,488	3,637	9,854	13,389	20,003	21,269	18,041		
74	Sulawesi Tenggara	34,674	31,818	45,541	112,033	348	430	1,122	1,900	10,036	13,514	24,637	16,959		
	Sulawesi	387,418	338,613	350,248	1,076,279	4,886	5,973	8,624	19,483	12,612	17,640	24,623	18,102		
81	Maluku	7,237	15,685	15,685	38,603	155	225	248	628	21,418	14,347	15,813	16,268		
82	Irian Jaya	3,507	6,884	5,040	15,431	198	165	318	681	56,459	23,969	63,095	44,132		
	Maluku/Irian Jaya	10,744	22,567	20,723	54,034	353	390	566	1,309	32,856	17,282	27,313	24,225		
	INDONESIA	3,715,709	3,279,796	3,207,280	10,202,785	41,577	47,315	58,090	146,982	11,190	14,426	18,112	14,406		

Source: Mid Term Review

Table 3.50 Realization, Actual Budgetary Consumption and Unit Cost of O&M for Swamp Development during 1989/90 to 1991/82

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp./ha)				
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92		Total
		Progress	Progress	Progress	Progress	Total	Progress	Progress	Total	Progress	Progress	Total		
11	D.I.Aceh	1.650	2.500	2.500	6.650	15	25	34	74	9.091	10.000	13.600	11.128	
12	Sumatera Utara	52.545	69.853	59.315	181.713	473	677	718	1.868	9.002	9.692	12.105	10.280	
13	Sumatera Barat	14.971	3.563	3.653	22.187	105	36	46	187	7.014	10.104	12.592	8.428	
14	Riau	95.268	178.055	214.745	488.068	857	1.959	1.992	4.808	8.996	11.002	9.276	9.851	
15	Jambi	73.419	66.508	71.008	210.935	661	665	732	2.038	9.003	9.999	10.309	9.757	
16	Sumatera Selatan	275.041	151.619	202.447	629.107	1.925	1.898	2.172	5.995	6.999	12.518	10.729	9.529	
17	Bengkulu	11.680	15.700	15.700	43.080	105	157	196	458	8.990	10.000	12.484	10.631	
18	Lampung	0	10.000	10.000	20.000	0	100	125	225	-	10.000	12.500	11.250	
	Sumatera	524.574	497.798	579.368	1.601.740	4.141	5.517	6.015	15.673	7.894	11.063	10.382	9.785	
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	-	-	-	-	
32	Jawa Barat	0	0	0	0	0	0	0	0	-	-	-	-	
33	Jawa Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
34	D.I.Jogyakarta	0	0	0	0	0	0	0	0	-	-	-	-	
35	Jawa Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Jawa	0	0	0	0	0	0	0	0	-	-	-	-	
51	Bali	0	0	0	0	0	0	0	0	-	-	-	-	
52	Nusa Tenggara Barat	0	0	0	0	0	0	0	0	-	-	-	-	
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	-	-	-	-	
54	Timor Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Bali/Nusa Tenggara	0	0	0	0	0	0	0	0	-	-	-	-	
61	Kalimantan Barat	121.729	104.639	141.700	368.068	816	1.046	1.681	3.543	6.703	9.996	11.863	9.626	
62	Kalimantan Tengah	125.139	194.910	213.723	533.772	920	1.948	2.584	5.452	7.352	9.994	12.090	10.214	
63	Kalimantan Selatan	206.108	132.800	140.104	479.012	1.491	1.328	1.762	4.581	7.234	10.000	12.576	9.563	
64	Kalimantan Timur	0	15.445	15.445	30.890	0	154	193	347	-	9.971	12.496	11.233	
	Kalimantan	452.976	447.794	510.972	1.411.742	3.227	4.476	6.220	13.923	7.124	9.996	12.173	9.862	
71	Sulawesi Utara	0	0	0	0	0	0	0	0	-	-	-	-	
72	Sulawesi Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
73	Sulawesi Selatan	0	0	1.000	1.000	0	0	13	13	-	-	13.000	13.000	
74	Sulawesi Tenggara	0	0	1.000	1.000	0	0	13	13	-	-	13.000	13.000	
	Sulawesi	0	0	2.000	2.000	0	0	26	26	-	-	13.000	13.000	
81	Maluku	0	0	0	0	0	0	0	0	-	-	-	-	
82	Irian Jaya	3.400	3.400	6.000	12.800	31	82	180	293	9.118	24.118	30.000	22.891	
	Maluku/Irian Jaya	3.400	3.400	6.000	12.800	31	82	180	293	9.118	24.118	30.000	22.891	
	INDONESIA	980.950	948.992	1.098.340	3.028.282	7.399	10.075	12.441	29.915	7.543	10.617	11.327	9.879	

Source: Mid Term Review

Table 3.51 Realization, Actual Budgetary Consumption and Unit Cost of EOM during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp./ha)				
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92		Average
		Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92	
11	D.I.Aceh	3,800	3,745	10,059	17,604	62	102	356	520	16,316	27,236	35,391	29,539	
12	Sumatera Utara	36,515	53,641	55,265	145,421	753	1,325	1,865	3,943	20,622	24,701	33,746	27,114	
13	Sumatera Barat	26,985	39,557	40,057	106,599	603	1,040	1,224	2,867	22,346	26,291	30,556	26,895	
14	Riau	0	0	0	0	0	0	0	0	-	-	-	-	
15	Jambi	0	0	0	0	0	0	0	0	-	-	-	-	
16	Sumatera Selatan	61,748	85,511	88,239	235,498	1,473	2,324	2,724	6,521	23,855	27,178	30,871	27,690	
17	Bengkulu	0	0	0	0	0	0	0	0	-	-	-	-	
18	Lampung	78,830	104,930	113,691	297,451	1,934	2,612	3,435	7,981	24,334	24,893	30,213	26,831	
	Sumatera	207,878	287,384	307,311	802,573	4,825	7,403	9,604	21,832	23,211	25,760	31,252	27,203	
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	-	-	-	-	
32	Jawa Barat	268,954	295,875	309,946	874,775	6,885	6,766	7,946	21,597	25,599	22,868	25,637	24,689	
33	Jawa Tengah	158,102	271,638	299,336	735,076	3,908	6,962	9,079	19,949	24,718	25,076	30,330	27,139	
34	D.I.Jogyakarta	24,149	25,399	25,399	74,947	569	650	804	2,023	23,562	25,592	31,655	26,992	
35	Jawa Timur	236,845	270,052	283,346	790,243	5,559	6,987	8,385	20,931	23,471	25,873	29,593	26,487	
	Jawa	688,050	868,964	918,027	2,475,041	16,921	21,365	26,214	64,500	24,593	24,587	28,555	26,060	
51	Bali	0	0	0	0	0	0	0	0	-	-	-	-	
52	Nusa Tenggara Barat	20,693	22,193	22,193	65,079	463	592	712	1,767	22,375	26,675	32,082	27,152	
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	-	-	-	-	
54	Timor Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Bali/Nusa Tenggara	20,693	22,193	22,193	65,079	463	592	712	1,767	22,375	26,675	32,082	27,152	
61	Kalimantan Barat	0	0	0	0	0	0	0	0	-	-	-	-	
62	Kalimantan Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
63	Kalimantan Selatan	15,300	24,400	23,700	63,400	394	677	720	1,791	25,752	27,746	30,380	28,249	
64	Kalimantan Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Kalimantan	15,300	24,400	23,700	63,400	394	677	720	1,791	25,752	27,746	30,380	28,249	
71	Sulawesi Utara	0	0	0	0	0	0	0	0	-	-	-	-	
72	Sulawesi Tengah	0	0	12,609	12,609	0	0	499	499	-	-	-	-	
73	Sulawesi Selatan	48,073	64,934	77,147	190,154	1,066	1,629	2,039	4,734	22,175	25,087	26,430	24,896	
74	Sulawesi Tenggara	0	0	0	0	0	0	0	0	-	-	-	-	
	Sulawesi	48,073	64,934	89,756	202,763	1,066	1,629	2,538	5,233	22,175	25,087	28,277	25,808	
81	Maluku	0	0	0	0	0	0	0	0	-	-	-	-	
82	Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-	
	Maluku/Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-	
INDONESIA		979,994	1,267,875	1,360,987	3,608,856	23,669	31,666	39,788	95,123	24,152	24,976	29,235	26,358	

Source: Mid Term Review

Table 3.52 Realization, Actual Budgetary Consumption and Unit Cost of EOM for Surface Irrigation during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp./ha)			
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92	
		Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92
11	D.I.Aceh	3,800	3,745	10,059	17,604	62	102	356	520	16,316	27,236	35,391	29,539
12	Sumatera Utara	32,815	44,491	44,525	121,851	658	1,071	1,539	3,268	20,052	24,072	34,565	26,824
13	Sumatera Barat	21,085	24,157	24,157	69,399	451	613	741	1,805	21,390	25,376	30,674	26,009
14	Riau	0	0	0	0	0	0	0	0	-	-	-	-
15	Jambi	0	0	0	0	0	0	0	0	-	-	-	-
16	Sumatera Selatan	15,238	16,601	17,129	48,968	277	410	563	1,250	18,178	24,697	32,868	25,527
17	Bengkulu	0	0	0	0	0	0	0	0	-	-	-	-
18	Lampung	51,030	62,880	69,081	182,991	1,219	1,444	2,079	4,742	23,888	22,964	30,095	25,914
	Sumatera	123,968	151,874	164,951	440,793	2,667	3,640	5,278	11,585	21,514	23,967	31,997	26,282
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	-	-	-	-
32	Jawa Barat	268,954	295,875	309,946	874,775	6,885	6,766	7,946	21,597	25,599	22,868	25,637	24,689
33	Jawa Tengah	158,102	277,638	299,336	735,076	3,908	6,962	9,079	19,949	24,718	25,076	30,330	27,159
34	D.I.Jogyakarta	24,149	25,399	25,399	74,947	569	650	804	2,023	23,562	25,592	31,655	26,992
35	Jawa Timur	236,845	270,052	285,346	790,243	5,559	6,987	8,385	20,931	23,471	25,873	29,593	26,487
	Jawa	688,050	868,964	918,027	2,475,041	16,921	21,365	26,214	64,500	24,593	24,587	28,555	26,060
51	Bali	0	0	0	0	0	0	0	0	-	-	-	-
52	Nusa Tenggara Barat	20,693	22,193	22,193	65,079	463	592	712	1,767	22,375	26,675	32,082	27,152
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	-	-	-	-
54	Timor Timur	0	0	0	0	0	0	0	0	-	-	-	-
	Bali/Nusa Tenggara	20,693	22,193	22,193	65,079	463	592	712	1,767	22,375	26,675	32,082	27,152
61	Kalimantan Barat	0	0	0	0	0	0	0	0	-	-	-	-
62	Kalimantan Tengah	0	0	0	0	0	0	0	0	-	-	-	-
63	Kalimantan Selatan	0	0	0	0	0	0	0	0	-	-	-	-
64	Kalimantan Timur	0	0	0	0	0	0	0	0	-	-	-	-
	Kalimantan	0	0	0	0	0	0	0	0	-	-	-	-
71	Sulawesi Utara	0	0	0	0	0	0	0	0	-	-	-	-
72	Sulawesi Tengah	0	0	12,609	12,609	0	0	499	499	-	-	39,575	39,575
73	Sulawesi Selatan	48,073	64,934	77,147	190,134	1,066	1,629	2,039	4,734	22,175	25,087	26,430	24,896
74	Sulawesi Tenggara	0	0	0	0	0	0	0	0	-	-	-	-
	Sulawesi	48,073	64,934	89,756	202,763	1,066	1,629	2,538	5,233	22,175	25,087	28,277	25,808
81	Maluku	0	0	0	0	0	0	0	0	-	-	-	-
82	Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-
	Maluku/Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-
INDONESIA		880,784	1,107,965	1,194,927	3,183,676	21,117	27,226	34,742	83,085	23,975	24,573	29,075	26,097

Source: Mid Term Review

Table 3.53 Realization, Actual Budgetary Consumption and Unit Cost of EOM for Swamp Development during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp./ha)				
		1989/90		1990/91		1989/90		1990/91		1989/90		1990/91		Average
		Progress	1991/92	Progress	1991/92	Progress	1991/92	Progress	1991/92	Progress	1991/92	Progress	1991/92	
11	D.I.Aceh	0	0	0	0	0	0	0	0	0	0	0	0	-
12	Sumatera Utara	3,700	9,150	10,740	23,590	95	254	326	675	25,676	27,760	30,354	28,614	
13	Sumatera Barat	5,900	15,400	15,900	37,200	152	427	483	1,062	25,763	27,727	30,377	28,548	
14	Riau	0	0	0	0	0	0	0	0	-	-	-	-	
15	Jambi	0	0	0	0	0	0	0	0	-	-	-	-	
16	Sumatera Selatan	46,510	68,910	71,110	186,530	1,196	1,914	2,161	5,271	25,715	27,775	30,390	28,258	
17	Bengkulu	0	0	0	0	0	0	0	0	-	-	-	-	
18	Lampung	27,800	42,050	44,610	114,460	715	1,168	1,356	3,239	25,719	27,776	30,397	28,298	
	Sumatera	83,910	135,510	142,360	361,780	2,158	3,763	4,326	10,247	25,718	27,769	30,388	28,324	
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	-	-	-	-	
32	Jawa Barat	0	0	0	0	0	0	0	0	-	-	-	-	
33	Jawa Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
34	D.I.Jogyakarta	0	0	0	0	0	0	0	0	-	-	-	-	
35	Jawa Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Jawa	0	0	0	0	0	0	0	0	-	-	-	-	
51	Bali	0	0	0	0	0	0	0	0	-	-	-	-	
52	Nusa Tenggara Barat	0	0	0	0	0	0	0	0	-	-	-	-	
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	-	-	-	-	
54	Timor Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Bali/Nusa Tenggara	0	0	0	0	0	0	0	0	-	-	-	-	
61	Kalimantan Barat	0	0	0	0	0	0	0	0	-	-	-	-	
62	Kalimantan Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
63	Kalimantan Selatan	15,300	24,400	23,700	63,400	394	677	720	1,791	25,752	27,746	30,380	28,249	
64	Kalimantan Timur	0	0	0	0	0	0	0	0	-	-	-	-	
	Kalimantan	15,300	24,400	23,700	63,400	394	677	720	1,791	25,752	27,746	30,380	28,249	
71	Sulawesi Utara	0	0	0	0	0	0	0	0	-	-	-	-	
72	Sulawesi Tengah	0	0	0	0	0	0	0	0	-	-	-	-	
73	Sulawesi Selatan	0	0	0	0	0	0	0	0	-	-	-	-	
74	Sulawesi Tenggara	0	0	0	0	0	0	0	0	-	-	-	-	
	Sulawesi	0	0	0	0	0	0	0	0	-	-	-	-	
81	Maluku	0	0	0	0	0	0	0	0	-	-	-	-	
82	Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-	
	Maluku/Irian Jaya	0	0	0	0	0	0	0	0	-	-	-	-	
	INDONESIA	99,210	159,910	166,060	425,180	2,552	4,440	5,046	12,038	25,723	27,766	30,387	28,313	

Source: Mid Term Review

Table 3.54 Realization, Actual Budgetary Consumption and Unit Cost of Upgrading of Swamp during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp.1,000/ha)				
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92		Average
		Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92	Progress	1990/91	Progress	1991/92	
			Total		Total		Total		Total		Total		Total	
11	D.I.Aceh	3,000	650	850	4,500	140	752	1,630	2,522	47	1,157	1,918	560	
12	Sumatera Utara	3,534	1,905	950	6,389	1,040	2,194	1,028	4,262	294	1,152	1,082	667	
13	Sumatera Barat	3,900	0	3,000	12,400	2,104	0	1,272	3,376	224	#DIV/0!	424	272	
14	Riau	3,900	1,921	5,440	11,261	3,056	2,882	3,745	9,683	784	1,500	688	860	
15	Jambi	6,000	2,800	2,300	11,100	1,060	2,659	1,569	5,288	177	950	682	476	
16	Sumatera Selatan	55,600	11,420	10,000	77,020	12,444	9,832	5,563	27,839	224	861	556	361	
17	Bengkulu	700	3,800	3,000	7,500	2,142	2,155	1,129	5,426	3,060	567	376	723	
18	Lampung	41,350	0	1,000	42,350	9,547	0	4,009	13,556	231	-	4,009	320	
	Sumatera	123,484	22,496	26,540	172,520	31,533	20,474	19,945	71,952	255	910	752	417	
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	0	0	0	0	
32	Jawa Barat	0	0	0	0	0	0	0	0	0	0	0	0	
33	Jawa Tengah	0	0	0	0	0	0	0	0	0	0	0	0	
34	D.I.Jogyakarta	0	0	0	0	0	0	0	0	0	0	0	0	
35	Jawa Timur	0	0	0	0	0	0	0	0	0	0	0	0	
	Jawa	0	0	0	0	0	0	0	0	0	0	0	0	
51	Bali	0	0	0	0	0	0	0	0	0	0	0	0	
52	Nusa Tenggara Barat	0	0	0	0	0	0	0	0	0	0	0	0	
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	0	0	0	0	
54	Timor Timur	0	0	0	0	0	0	0	0	0	0	0	0	
	Bali/Nusa Tenggara	0	0	0	0	0	0	0	0	0	0	0	0	
61	Kalimantan Barat	2,225	4,631	7,644	14,500	2,079	3,393	2,039	7,511	934	733	267	518	
62	Kalimantan Tengah	3,200	7,700	8,131	19,031	1,150	5,506	3,130	9,786	359	715	385	514	
63	Kalimantan Selatan	715	3,800	7,537	12,052	132	2,075	2,275	4,482	185	546	302	372	
64	Kalimantan Timur	100	700	700	1,500	276	1,327	895	2,498	2,760	1,896	1,279	1,665	
	Kalimantan	6,240	16,831	24,012	47,083	3,637	12,301	8,339	24,277	583	731	347	516	
71	Sulawesi Utara	0	0	0	0	0	0	0	0	0	0	0	0	
72	Sulawesi Tengah	0	0	500	500	0	0	466	466	0	0	932	932	
73	Sulawesi Selatan	0	0	0	0	0	0	0	0	0	0	0	0	
74	Sulawesi Tenggara	0	0	800	800	0	0	1,079	1,079	0	0	1,349	1,349	
	Sulawesi	0	0	1,300	1,300	0	0	1,545	1,545	0	0	1,188	1,188	
81	Maluku	0	0	0	0	0	0	0	0	0	0	0	0	
82	Irian Jaya	1,500	1,900	4,600	8,000	784	3,071	2,600	6,455	523	1,616	565	807	
	Maluku/Irian Jaya	1,500	1,900	4,600	8,000	784	3,071	2,600	6,455	523	1,616	565	807	
	INDONESIA	131,224	41,227	56,452	228,903	35,954	35,846	32,429	104,229	274	869	574	455	

Source: Mid Term Review

Table 3.55 Realization, Actual Budgetary Consumption and Unit Cost of Upgrading of Non-Tidal Swamp during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp.)				Unit Cost (Rp.1,000/ha)					
		1989/90		1990/91		1989/90		1990/91		1989/90		1990/91		1991/92	
		Progress	1991/92	Progress	1991/92	Total	Progress	1991/92	Total	Progress	1991/92	Total	Progress	1991/92	Average
11	D.I.Aceh	3,000	650	850	4,500	140	752	1,630	2,522	47	1,157	1,918	560		
12	Sumatera Utara	3,534	1,905	950	6,389	1,040	2,194	1,028	4,262	294	1,152	1,082	667		
13	Sumatera Barat	9,400	0	3,000	12,400	2,104	0	1,272	3,376	224	-	424	272		
14	Riau	0	0	0	0	0	0	0	0	-	-	-	-		
15	Jambi	0	0	0	0	0	0	0	0	-	-	-	-		
16	Sumatera Selatan	4,800	2,500	0	7,300	152	695	0	847	32	278	-	116		
17	Bengkulu	700	3,800	3,000	7,500	2,142	2,155	1,129	5,426	3,060	567	376	723		
18	Lampung	41,350	0	1,000	42,350	9,547	0	4,009	13,556	231	-	4,009	320		
	Sumatera	62,784	8,855	8,800	80,439	15,125	5,796	9,068	29,989	241	655	1,030	373		
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	-	-	-	-		
32	Jawa Barat	0	0	0	0	0	0	0	0	-	-	-	-		
33	Jawa Tengah	0	0	0	0	0	0	0	0	-	-	-	-		
34	D.I.Jogyakarta	0	0	0	0	0	0	0	0	-	-	-	-		
35	Jawa Timur	0	0	0	0	0	0	0	0	-	-	-	-		
	Jawa	0	0	0	0	0	0	0	0	-	-	-	-		
51	Bali	0	0	0	0	0	0	0	0	-	-	-	-		
52	Nusa Tenggara Barat	0	0	0	0	0	0	0	0	-	-	-	-		
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	-	-	-	-		
54	Timor Timur	0	0	0	0	0	0	0	0	-	-	-	-		
	Bali/Nusa Tenggara	0	0	0	0	0	0	0	0	-	-	-	-		
61	Kalimantan Barat	725	3,531	2,804	7,060	630	1,467	938	3,035	869	415	335	430		
62	Kalimantan Tengah	800	4,000	2,931	7,731	477	1,984	884	3,345	596	496	302	453		
63	Kalimantan Selatan	715	900	2,300	3,915	132	164	762	1,058	185	182	331	270		
64	Kalimantan Timur	100	700	700	1,500	276	1,327	895	2,498	2,760	1,896	1,279	1,665		
	Kalimantan	2,340	9,131	8,735	20,206	1,515	4,942	3,479	9,936	647	541	398	492		
71	Sulawesi Utara	0	0	0	0	0	0	0	0	-	-	-	-		
72	Sulawesi Tengah	0	0	500	500	0	0	466	466	-	-	932	932		
73	Sulawesi Selatan	0	0	0	0	0	0	0	0	-	-	-	-		
74	Sulawesi Tenggara	0	0	800	800	0	0	1,079	1,079	-	-	1,349	1,349		
	Sulawesi	0	0	1,300	1,300	0	0	1,545	1,545	-	-	1,188	1,188		
81	Maluku	0	0	0	0	0	0	0	0	-	-	-	-		
82	Irian Jaya	1,500	1,900	4,600	8,000	784	3,071	2,600	6,455	523	1,616	565	807		
	Maluku/Irian Jaya	1,500	1,900	4,600	8,000	784	3,071	2,600	6,455	523	1,616	565	807		
	INDONESIA	66,624	19,886	23,435	109,945	17,424	13,809	16,692	47,925	262	694	712	436		

Source: Mid Term Review

Table 3.56 Realization, Actual Budgetary Consumption and Unit Cost of Upgrading of Tidal Swamp during 1989/90 to 1991/92

Code	Province	Physical Realization (ha)				Actual Budgetary Consumption (Million Rp)				Unit Cost (Rp.1,000/ha)				
		1989/90		1991/92		1989/90		1991/92		1989/90		1991/92		
		Progress	1990/91	Progress	Total	Progress	Total	Progress	Total	Progress	Total	Progress	Average	
11	D.I.Aceh	0	0	0	0	0	0	0	0	0	0	-	-	-
12	Sumatera Utara	0	0	0	0	0	0	0	0	0	0	-	-	-
13	Sumatera Barat	0	0	0	0	0	0	0	0	0	0	-	-	-
14	Riau	3,900	1,921	5,440	11,261	3,056	2,882	3,745	9,683	784	1,500	688	860	
15	Jambi	6,000	2,800	2,300	11,100	1,060	2,659	1,569	5,288	177	950	682	476	
16	Sumatera Selatan	50,800	8,920	10,000	69,720	12,292	9,137	5,563	26,992	242	1,024	556	387	
17	Bengkulu	0	0	0	0	0	0	0	0	0	0	-	-	-
18	Lampung	0	0	0	0	0	0	0	0	0	0	-	-	-
	Sumatera	60,700	13,641	17,740	92,081	16,408	14,678	10,877	41,963	270	1,076	613	456	
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	0	0	-	-	-
32	Jawa Barat	0	0	0	0	0	0	0	0	0	0	-	-	-
33	Jawa Tengah	0	0	0	0	0	0	0	0	0	0	-	-	-
34	D.I.Jogyakarta	0	0	0	0	0	0	0	0	0	0	-	-	-
35	Jawa Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
	Jawa	0	0	0	0	0	0	0	0	0	0	-	-	-
51	Bali	0	0	0	0	0	0	0	0	0	0	-	-	-
52	Nusa Tenggara Barat	0	0	0	0	0	0	0	0	0	0	-	-	-
53	Nusa Tenggara Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
54	Timor Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
	Bali/Nusa Tenggara	0	0	0	0	0	0	0	0	0	0	-	-	-
61	Kalimantan Barat	1,500	1,100	4,840	7,440	1,449	1,926	1,101	4,476	966	1,751	227	602	
62	Kalimantan Tengah	2,400	3,700	5,200	11,300	673	3,522	2,246	6,441	280	952	432	570	
63	Kalimantan Selatan	0	2,900	5,237	8,137	0	1,911	1,513	3,424	-	659	289	421	
64	Kalimantan Timur	0	0	0	0	0	0	0	0	0	0	-	-	-
	Kalimantan	3,900	7,700	15,277	26,877	2,122	7,359	4,860	14,341	544	956	318	534	
71	Sulawesi Utara	0	0	0	0	0	0	0	0	0	0	-	-	-
72	Sulawesi Tengah	0	0	0	0	0	0	0	0	0	0	-	-	-
73	Sulawesi Selatan	0	0	0	0	0	0	0	0	0	0	-	-	-
74	Sulawesi Tenggara	0	0	0	0	0	0	0	0	0	0	-	-	-
	Sulawesi	0	0	0	0	0	0	0	0	0	0	-	-	-
81	Maluku	0	0	0	0	0	0	0	0	0	0	-	-	-
82	Irian Jaya	0	0	0	0	0	0	0	0	0	0	-	-	-
	Maluku/Irian Jaya	0	0	0	0	0	0	0	0	0	0	-	-	-
	INDONESIA	64,600	21,341	33,017	118,958	18,530	22,037	15,737	56,304	287	1,033	477	473	

Source: Mid Term Review

Table 3.57 Physical Area and Amount of Contract for Land Development during 1989/90 to 1990/91

Code	Province	Contracted Area (ha)		Contracted Amount (Million Rupiah)		Unit Price (Thousand Rupiah/ha)	
		1989/90	1990/91	1989/90	1990/91	1989/90	1990/91
				Total	Total	Total	Average
11	D.I. Aceh	4,166	8,270	6,922	19,358	1,848	270
12	Sumatera Utara	2,500	4,709	6,057	13,266	1,017	407
13	Sumatera Barat	4,157	5,403	3,731	13,291	1,531	366
14	Riau	2,000	1,270	5,974	9,244	263	132
15	Jambi	2,224	2,696	3,357	8,278	849	382
16	Sumatera Selatan	3,683	0	3,756	7,439	688	187
17	Bengkulu	3,179	7,334	4,910	15,423	1,408	443
18	Lampung	4,750	8,099	9,932	22,781	909	191
	Sumatera	26,660	37,780	44,639	109,079	8,514	319
31	D.K.I. Jakarta			0	0	0	0
32	Jawa Barat	10,512	4,218	3,490	18,220	3,820	363
33	Jawa Tengah	1,856	1,530	2,330	5,716	541	292
34	Yogyakarta	458	1,042	180	1,680	137	299
35	Jawa Timur	3,500	5,125	3,000	11,625	1,323	378
	Jawa	16,326	11,915	9,000	37,241	5,821	357
51	Bali	150	300	150	600	45	300
52	N.T.B.	1,000	0	529	1,529	0	0
53	N.T.T.	1,000	4,535	2,319	7,854	313	313
54	Timor Timur	1,059	0	1,132	2,191	0	0
	Bali/Nusa Tenggara	3,209	4,835	4,130	12,174	358	112
61	Kalimantan Barat	6,483	1,004	2,492	9,979	1,421	219
62	Kalimantan Tengah	3,185	2,775	4,935	10,893	1,126	354
63	Kalimantan Selatan	1,267	3,396	6,645	11,308	427	337
64	Kalimantan Timur	901	1,673	1,708	4,282	334	370
	Kalimantan	11,834	8,848	15,780	36,462	3,308	280
71	Sulawesi Utara	2,662	1,301	4,250	8,213	136	51
72	Sulawesi Tengah	8,707	7,865	6,046	22,618	4,172	479
73	Sulawesi Selatan	6,000	1,159	2,548	9,707	1,943	324
74	Sulawesi Tenggara	4,297	5,555	5,250	15,102	1,725	402
	Sulawesi	21,666	15,880	18,094	55,640	7,977	368
81	Maluku	1,000	1,286	539	2,825	411	411
82	Irian Jaya	550	0	518	1,068	200	364
	Maluku and Irian Jaya	4,759	1,286	1,057	3,892	611	128
		81,244	80,544	92,700	254,488	26,589	327
INDONESIA				54,313	116,429	441	586
Land Development, DDFCA, Jun. 1992							

Annex G

*Small Scale Irrigation
(Irigasi Desa)*

ANNEX G

SMALL SCALE IRRIGATION (IRIGASI DESA)

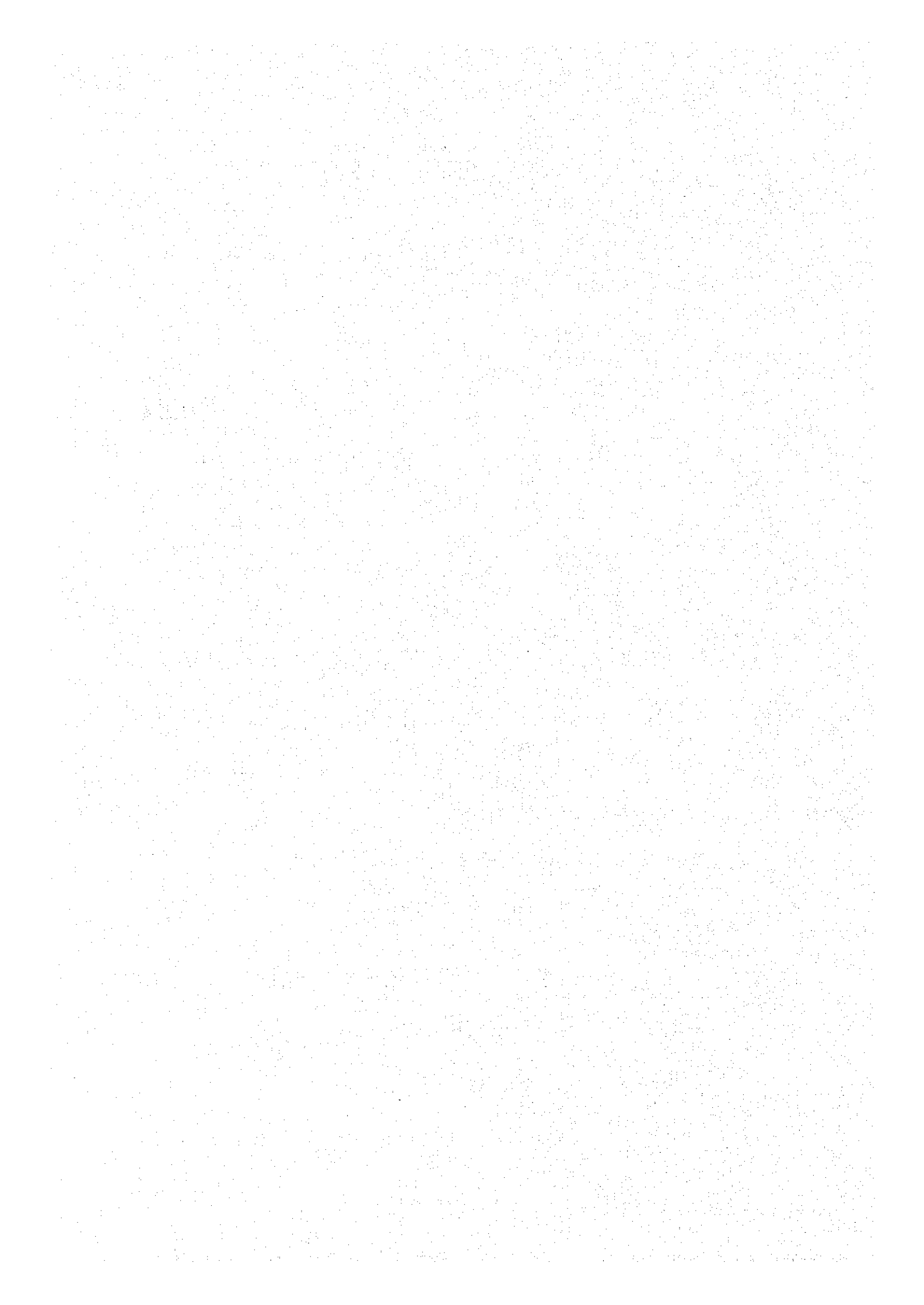
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Text



1. General

In addition to the some million ha of PU irrigation schemes, there are about one million ha farmer-operated irrigation schemes, so called "Irigasi Desa". Ministry of Agriculture (MoA) has supported these irrigation schemes through credit, and physical development including planning, land reclamation, small canal construction and so on. Today, custodian of those "Irigasi Desa" has been changed to Ministry of Public Works (MoPW) from MoA. Accordingly MoPW intend to categorized those farmer-operated irrigation schemes into Irigasi Kecil (Small Scale Irrigation Scheme). Then naming of those schemes may change to "Small Scale Irrigation" from "Irigasi Desa" or "Village Irrigation". In this Annex, however former name of "Irigasi Desa" is used to avoid confusion from PU's small scale irrigation system.

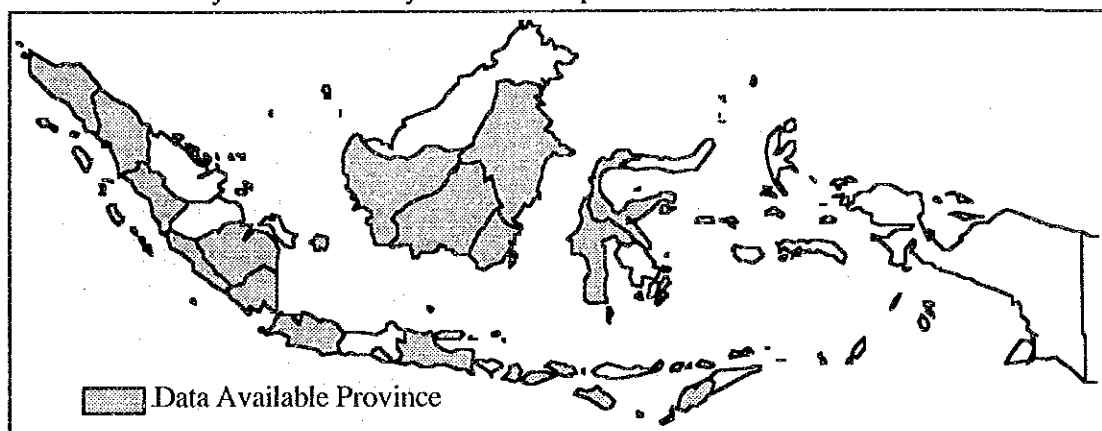
To clarify the exiting condition of Irigasi Desa, we FIDP Team scrutinized so far available data and information. The result of latest inventory survey carried out by DOI-I in last fiscal year is assumed to have most accurate information but not computerized information. The Team then started with computerizing work and made analysis work for revealing the existing condition of Irigasi Desa. This Annex show the result of analysis and its procedure.

2. Data

Inventory survey for the Irigasi Desa has been carried out by two agencies namely Ministry of Agriculture (MoA) and Ministry of Public Works (MoPW). Only MoPW's data covered whole Indonesia. Those data are available in following data source or office.

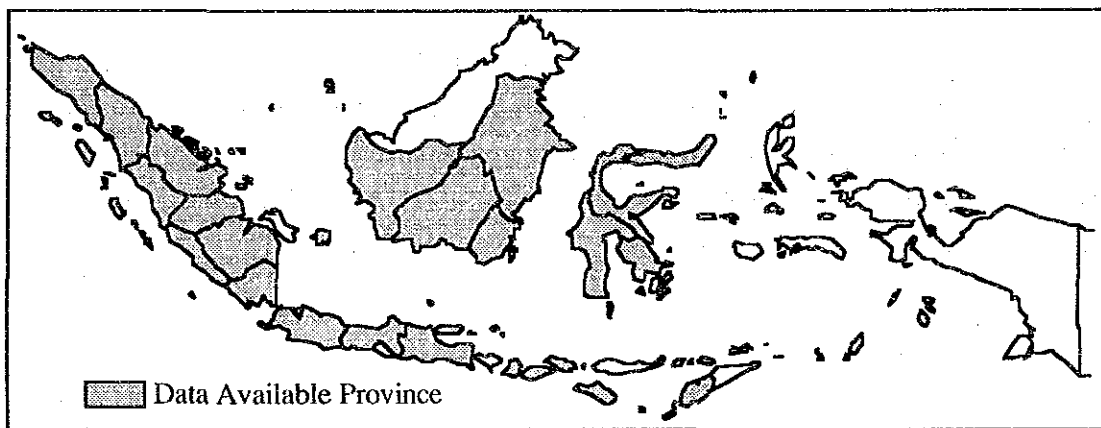
Data-1. Data from inventory survey carried out by MoPW-DOI-I in 1992 (18 Provinces)

This is latest inventory data. Survey was carried out in last fiscal year of 1992/93 covering 18 provinces as shown below. Table 2.1 shows the result of survey. Full inventory data are compiled in Data Book.



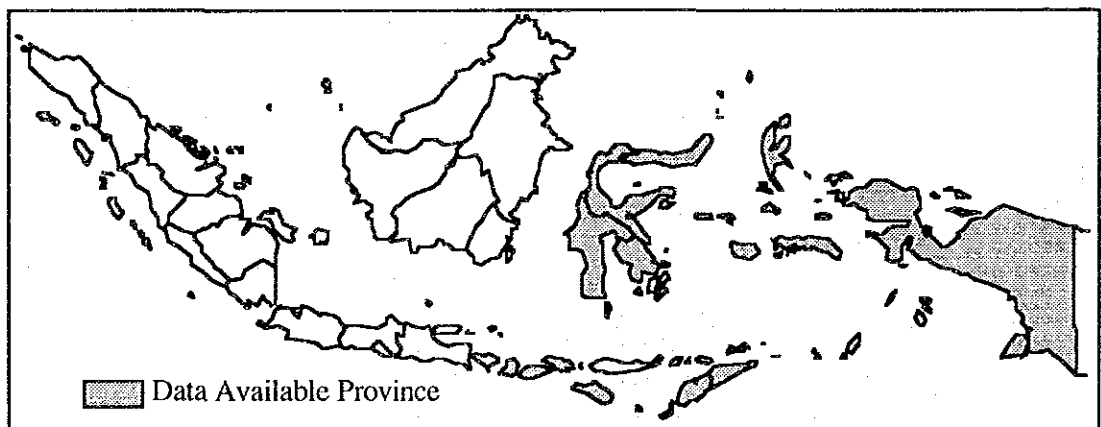
Data-2 "Rekapitulasi Daerah Irigasi Desa dan SawahTadah Hujan", MoPW, DGWRD, DOI-I, September 1982 (23 province)

This is the first inventory survey on Small Scale Irrigation schemes carried out in September 1982 by Sub-Directorate of Operation and Maintenance, Directorate of Irrigation I, DGWRD in cooperation with the provincial offices. The survey which was checked in 1983 and printed out in April 1984. The inventory survey results was attached as Table 2.2 herein and show that the number of irrigation schemes was 25,300, and the designed area (Baku) and irrigated area (Functional Area) 1,885,700 ha and 1,036,600 ha respectively in 23 provinces as shown below.



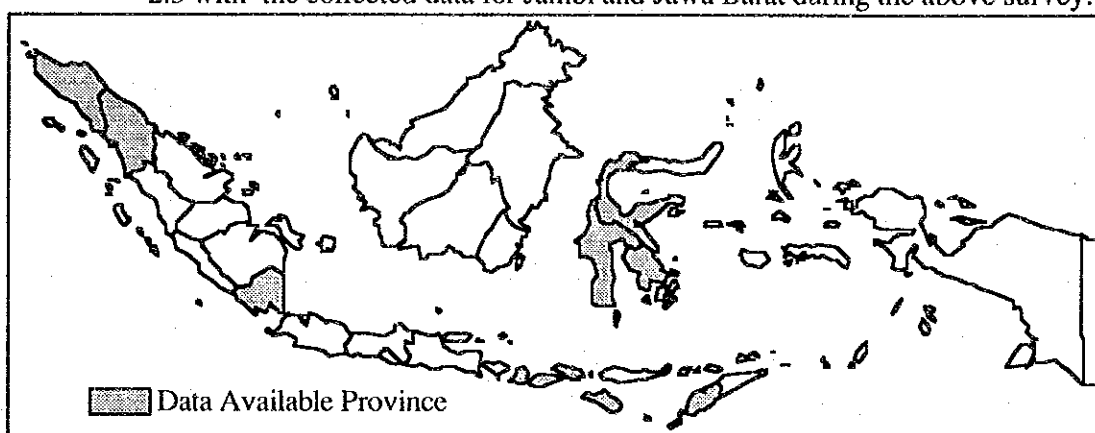
Data-3 Second Integrated Irrigation Sector Project (IISP - II), MoPW, ADB, September 1992. (10 provinces)

Recent studies on the Second Integrated Irrigation Sector Project (IISP - II) by ADB collected the data on village irrigation covering in the eastern region (10 provinces ; Bali, Nusa Tenggara, Timor Timur , Sulawesi, Maluku and Irian Jaya as shown below) in 1992. The data were mainly collected from PRAS and summarized in Table 2.3.



Data-4 "Feasibility Study for Land Development Project Improvement of Land and Irrigation System at Farm Level", MoA, JICA, October 1992, (8 provinces)

The feasibility study for the land development project (improvement of land and irrigation systems at farm level) was carried out by JICA for the Directorate General of Food Crop Agriculture (DGFC) during the period from March 1991 to October 1992. The study included the inventory survey of village irrigation in 3 provinces (Sumatera Utara, Sulawesi Selatan and Nusa Tenggara Barat) and assisted the inventory survey done by the Provincial Agricultural Services (PRAS) in 5 province (Aceh, Lampung, Sulawesi Tengah, Sulawesi Tenggara and Nusa Tenggara Timur). The survey results are shown in Table 2.3 with the collected data for Jambi and Jawa Barat during the above survey.



3. Estimation of Irrigation Area

Irrigation area of Irigasi Desa was estimated based on the mainly DOI-I's data (Data-1 & Data-2) and other inventory data were used for those provinces which has no data in Data-1 and Data-2.

3.1 DOI-I's Inventory data

As can be seen in Table 2.1 (Data-1), 9 Provinces have no information and 4 Provinces not cover all Cabang Dinas.

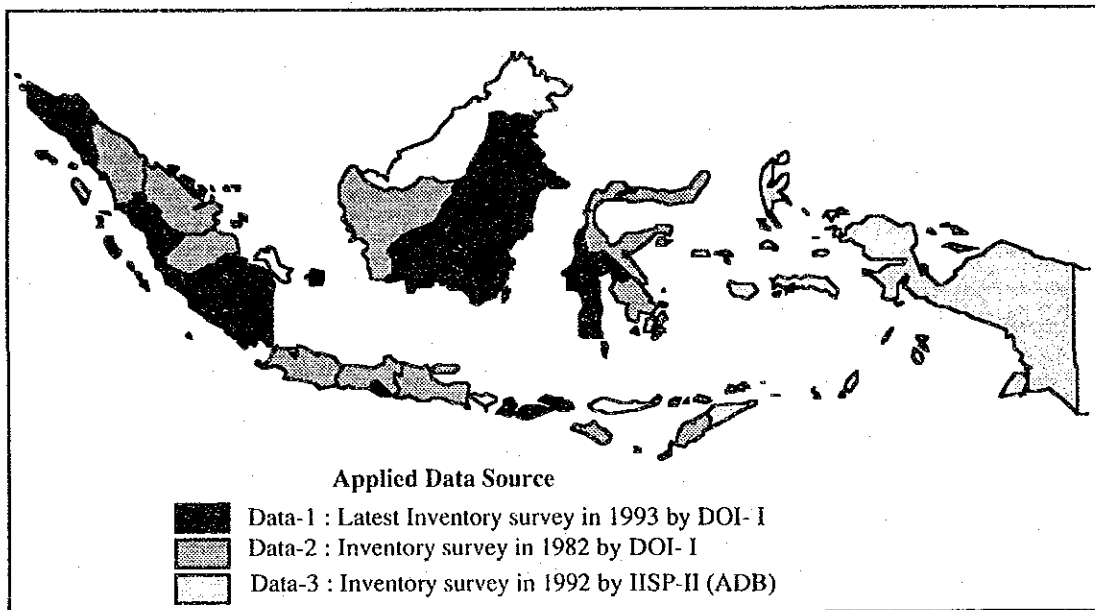
After checking all the data in detail, we found that NTT has complete data but doubtful. Then the result of Data-1 was applied to following 13 Provinces.

Aceh (11)	Yogyakarta(34)	Bali (51)	Kalimantan Barat (61)	Sulawesi Selatan (73)
Sumatera Barat(13)		NTB (52)	Kalimantan Tengah (62)	
Sumatera Selatan (16)			Kalimantan Selatan (63)	
Bengkulu(17)			Kalimantan Timur (64)	
Lampung(18)				

Irrigation area of all remaining Provinces except Timor Timur, Maluku and Irian Jaya was applied the Data-2 results. Applied Provinces are following 11 Provinces.

Sumatera Utara (12)	Jakarta (31)	NTT (53)	Sulawesi Utara (71)
Riau (14)	Jawa Barat (32)		Sulawesi Tengah (72)
Jambi (15)	Jawa Tengah (33)		Sulawesi Tenggara (74)
	Jawa Timur (35)		

As for the remaining three Provinces ie. Timor Timur, Maluku and Irian Jaya, only Data-3 has the information. Data source to be applied to estimate the area of irrigation in each Province, then fixed as shown in following Figure.



3.2 Area of Irigasi Desa

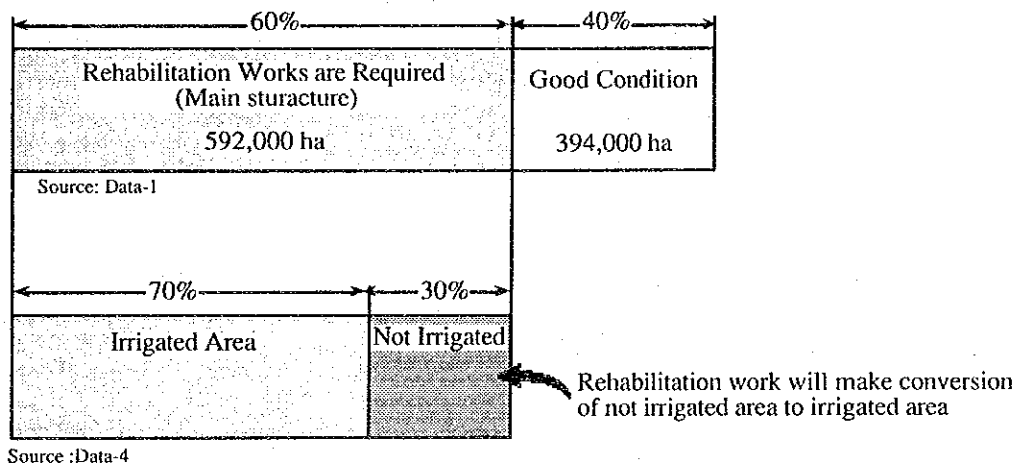
The area of present Irigasi Desa system in the whole Indonesia is estimated at about 986,000 ha based on the aforementioned three inventory data. Table 2.4 shows the estimated Irigasi Desa area of each Province and summarized below.

Area of Irigasi Desa	
Region	Area (ha)
Sumatera	312,620
Jawa	329,306
Bali/Nusa Tenggara	139,057
Kalimantan	40,885
Sulawesi	157,794
Maluku/Irian Jaya	6,349
INDONESIA	986,011

3.3 Condition of Present Irigasi Desa System

Data-1 include condition of structures and canals as well as acreage of the system. According to this inventory information, about 495,000 ha or 60 % of system have damaged intake structure out of 858,000 ha of total area in this inventory. Applying this damaged ratio to the estimated Irigasi Desa area of about 986,000 ha, it may be said that about 592,000 ha of system may require rehabilitation works of intake structure. These area may have water shortage problem and some portion of area may not received any water from the canal. The proportion of not irrigated area to the required rehabilitation area is to be estimated at 30 % referring to the information of Data-4.

Above discussion can be illustrated as shown below.



3.4 Consideration

(1) Data Incompleteness

As shown in Table 2.1, new inventory survey does not cover the whole Indonesia. This data incompleteness make difficulty to grasp the present condition of Irigasi Desa. Then supplemental inventory survey works are required to accomplish the "Inventory Survey for Village Irrigation Scheme". Following 14 Provinces are needed to do supplemental inventory survey.

No.	Province Name (Code)
1	Sumatera Utara (12)
2	Riau (14)
3	Jambi (15)
4	Jakarta (31)
5	Jawa Barat (32)
6	Jawa Tengah (33)
7	Jawa Timur (35)
8	NTT (53)
9	Timor Timur (54)
10	Sulawesi Utara (71)
11	Sulawesi Tengah (72)
12	Sulawesi Tenggara (74)
13	Maluku (81)
14	Irian Jaya (82)

(2) Data Accuracy

There are some inaccurate data such as;

- Total irrigated area is two or three times of the total irrigation area surveyed by CBS.
- Duplicated scheme name
- Duplicated with PU's irrigation scheme
- Too many same area's scheme within a Kabupaten.
- Definition of Area of Irrigation is not clear, i.e. survey results is actually irrigated area or designed area.

Data needs checking works to clear above matters.

(3) Review Works

Our estimation is standing on so far available data, then all our estimation figure should be reviewed as soon as possible upon completion of supplemental inventory survey and data checking works.

4. Performance in Repelita V

At present, the rehabilitation of existing Irigasi Desa schemes has been mainly implemented through the budget of DGFCFA, Ministry of Agriculture (APBN) and the budget of the provincial Government (APBD). Tables 4.1 and 4.2 show the progress of the rehabilitation program of Irigasi Desa schemes carried out by DGFCFA in Repelita V and summarized as follows; These tables showed that DGFCFA assisted the rehabilitation of Irigasi Desa of about 310 places and 24,000 ha using 900,000,000 Rupiah for 4 years during 1989/90 to 1992/93.

Numbers and Area of Rehabilitation of Village Irrigation in Repelita V

Province/Island	1989/90		1990/91		1991/92		1992/93		Total	
	Nos.	Area ha	Nos.	Area ha	Nos.	Area ha	Nos.	Area ha	Nos.	Area ha
Sumatera	3	310	12	1,115	13	1,693	56	2,956	84	6,074
Jawa	11	643	15	758	6	586	33	2,212	65	4,199
Bali/Nusa Tenggara	7	644	9	766	11	2,276	28	1,164	55	4,850
Kalimantan	2	140	8	417	10	743	32	2,905	52	4,205
Sulawesi	5	439	6	375	7	389	39	3,333	57	4,536
Maluku/Irian Jaya	0	0	0	0	0	0	0	0	0	0
INDONESIA	28	2,176	50	3,431	47	5,687	188	12,570	313	23,864

Source : Directorate of Land Rehabilitation and Development, DGFCFA

Budget Used for Rehabilitation of Village Irrigation (APBN)

Unit: Rp. million

Province/Island	1989/90		1990/91		1991/92		1992/93		Total	
	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual
Sumatera	9.3	44.8	59.6	131.4	245.1					
Jawa	33.7	47.9	22.8	112.5	216.9					
Bali & Nusa Tenggara	16.1	35.3	46.1	73.0	170.5					
Kalimantan	0.0	43.8	46.2	23.0	113.0					
Sulawesi	18.6	22.7	41.1	69.0	151.4					
Maluku & Irian Jaya	0.0	0.0	0.0	0.0	0.0					
INDONESIA	77.7	194.5	215.7	408.9	896.8					

Source : Directorate of Land Rehabilitation and Development, DGFCFA

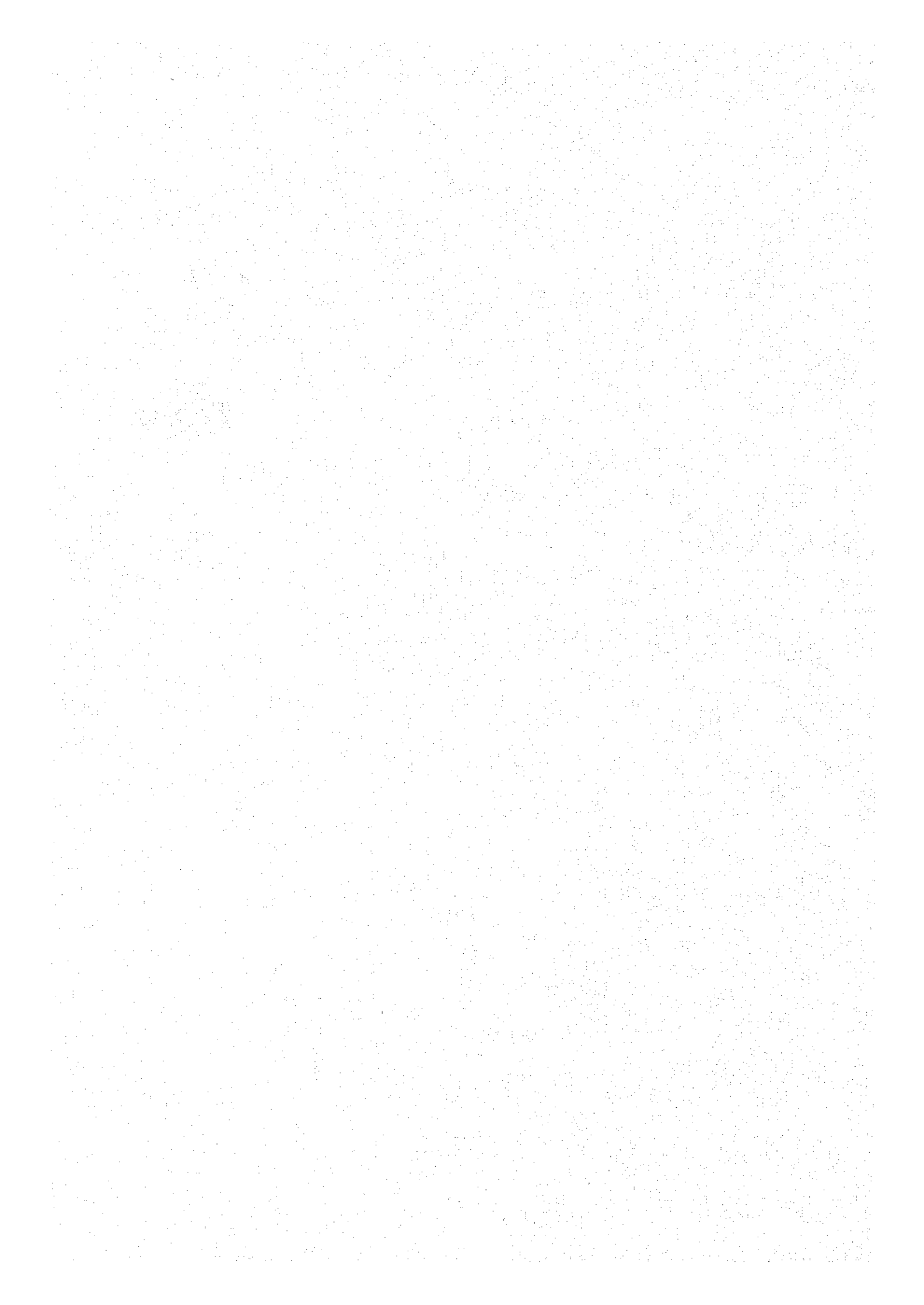
5. Necessity of Rehabilitation

There are about one million ha of irrigation systems at farmers' level in the country as estimated in Section 3 which are constructed and maintained by farmers themselves to irrigate their lands. It is recognized that these Irigasi Desa systems play a significant role in meeting country's food requirements and in supporting lives of the rural population.

However, many of such farmers' irrigation systems at farm level have been damaged and not functioning well nor maintained well. The irrigation schemes with an area less than 150 ha under DGWRD have been handed over to the farmers' groups after improving the systems by rehabilitation, efficient O&M, special maintenance, etc. It is pressing requirement to improve also irrigation systems at farm level in order to increase agricultural production, expand employment opportunity, raise farmers' income, and improve welfare of the rural population.

As mentioned in Section 3.3, about 60% or 600,000 ha of existing area have water shortage problem due to damage of irrigation facilities. These facilities needs urgent rehabilitation for increasing farmer's income and its high cost performance.

Tables



Tabel 2.1 Inventory Data on Irigasi Desa by Province

Based on the Inventory Survey by DOI-I in 1992

No.	Province	Cabang Dinas/Kabupaten Irr. Region	Code No.	Name	Nos.of Scheme	Area (ha)
1	D.I. Aceh	Pengairan I	1106	Acch Besar	11	1,250
		Pengairan II	1107	Pidie	19	163
				Sigli	10	388
		Pengairan III	1108	Acch Utara	27	3,582
		Pengairan IV	1103	Acch Timur	8	1,100
		Pengairan V	1105	Acch Tengah	28	1,970
		Pengairan VI	1105	Acch Barat	123	34,960
		Pengairan VII	1101	Acch Selatan	33	2,209
				Acch Tenggara	-	-
				1109	Cabang Calang	-
Total					259	45,622
2	Sumatera Utara		1201	Deli Serdang	-	-
			1202	Langkat	23	1,501
			1203	Tanah Karo	90	3,894
			1204	Dairi	67	3,452
			1205	Simalungun	67	5,508
			1206	Asahan	22	8,323
			1207	Labuhan Ratu	20	3,425
			1208	Tapanuli Utara	-	-
			1209	Tapanuli Selatan	38	3,584
			1210	Tapanuli Tengah	28	3,632
			1211	Nias	43	2,653
		Total				
3	Sumatera Barat		1301	Lubuk Sikaping	726	12,948
			1302	Bukit Tinggi	93	4,860
			1303	Payakumbuh	-	-
			1304	Batu Sangkar	593	8,595
			1305	Padang	-	-
			1306	Solok	217	10,724
			1307	Sijunjung	135	788
			1308	Painan	245	11,342
Total					2,009	49,256
4	Riau		1401	Kodya Pekanbaru	N.A	N.A
			1402	Kampar	N.A	N.A
			1403	Indragiri Hulu	N.A	N.A
			1404	Bengkalis	N.A	N.A
			1405	Kepulauan Riau	N.A	N.A
5	Jambi		1501	Bungo Tebo	N.A	N.A
			1502	Sarongun Bangko	N.A	N.A
			1503	Kerinci	N.A	N.A
6	Sumatera Selatan	Pengairan Mura I	1601	Musi Rawas	4	790
		Musi Rawas II	1608	Musi Rawas	34	7,393
		Pengairan Dati II Lahat	1604	Lahat	316	33,740
		Lahat	1602	Lahat	46	3,419
		Dati II Bangka	1607	Bangka	27	4,230
		Pengairan	1608	Dati II Belitung	12	610
		Pengairan OKU I	1604	Ogan Komering	81	8,396
		Pengairan Dati II	1603	Muara Enim	28	3,640
			1610	Kodya Palembang	-	-
Total					548	62,218
7	Bengkulu	Pengairan Bengkulu Selatan	1701	Bengkulu Selatan	105	8,393
		Pengairan Arga Makmur	1702	Bengkulu Utara	47	4,312
		Pengairan Curup	1703	Rejang Lebong	50	3,635
Total					202	16,340
8	Lampung	Cabang Palas	1802	Lampung Selatan	31	10,881
		Pengairan Lampung Utara	1805	Lampung Utara	72	5,974
		Pengairan Pring Sewu	1801	Lampung Selatan	14	10,651
		Pengairan Metro	1803	Lampung Utara	23	10,650
			1804	Cabang Bandar Jaya	-	-
Total					140	38,156
9	D.K.I		3171	Jakarta Selatan	0	0
			3172	Jakarta Timur	0	0
			3173	Jakarta Pusat	0	0
			3174	Jakarta Barat	0	0
			3175	Jakarta Utara	0	0

Tabel 2.1 Inventory Data on Irigasi Desa by Province

Based on the Inventory Survey by DOI-I in 1992

No.	Province	Cabang Dinas/Kabupaten Irr. Region	Code No.	Name	Nos.of Scheme	Area (ha)
10	Jawa Barat	Pengairan Bandung (+Kodya)	3207	Bandung	1,148	34,835
		Pengairan Serang	3201	Serang	71	6,566
		Pengairan Tanggerang	3203	Tangerang	35	4,541
		Pengairan Bogor	3204	Bogor	571	25,771
		Pengairan Sukabumi	3205	Sukabumi	961	44,495
		Pengairan Cianjur	3206	Cianjur	535	6,449
		Pengairan Garut	3208	Garut	1,091	38,291
		Pengairan Tasikmalaya	3209	Tasikmalaya	857	37,425
		Pengairan Ciamis	3210	Ciamis	917	28,348
		Pengairan Indramayu Barat	3213	Indramayu Barat	-	-
		Pengairan Indramayu Timur	3214	Indramayu Timur	-	-
		Pengairan Rentang	3215	Rentang	-	-
		Pengairan Pandeglang	3216	Pandeglang	257	19,649
		Pengairan Lebak/Rangkas Bitung	3217	Lebak/Rangkas B.	305	24,284
		Pengairan Sumedang	3218	Sumedang	698	14,373
		Pengairan Majalengka	3219	Majalengka	-	-
		Pengairan Cirebon	3220	Cirebon	6	555
		Pengairan Kuningan	3221	Kuningan	335	5,747
		Pengairan Induk Tarum Barat II	3251	Induk Tarum B.II	-	-
		Pengairan Cikarang	3252	Cikarang	-	-
		Pengairan Lemah Abang	3253	Lemah Abang	-	-
		Pengairan Induk Tarum Barat I	3254	Induk Tarum B.I	-	-
		Pengairan Cipaminkis	3255	Cipaminkis	-	-
		Pengairan Rengas Dengklok	3256	Rengas Dengklok	-	-
		Pengairan Telagasari	3257	Telagasari	-	-
		Pengairan Purwakarta	3258	Purwakarta	-	-
		Pengairan Induk Tarum Timur	3259	Induk Tarum T.	-	-
		Pengairan Jatisari	3260	Jatisari	-	-
		Pengairan Binong	3261	Binong	-	-
		Pengairan Patrol	3262	Patrol	-	-
		Pengairan Subang	3263	Subang	-	-
		Pengairan Pompa Curug	3264	Pompa Curug	-	-
Pengairan Jitu Walahar	3265	Jitu Walahar	-	-		
	Total			7,787	291,329	
11	Jawa Tengah		3333	Malahayu	N.A	N.A
			3334	Pemali Hulu	N.A	N.A
			3335	Pemali Hilir	N.A	N.A
			3336	G u n g	N.A	N.A
			3337	C o m a l	N.A	N.A
			3338	Sengkarang	N.A	N.A
			3339	Kupang Sambong	N.A	N.A
			3340	B o d r i	N.A	N.A
			3341	Tuntang Hulu	N.A	N.A
			3342	Tuntang Hilir	N.A	N.A
			3343	Progo Hulu	N.A	N.A
			3344	L u s i	N.A	N.A
			3345	Serang Hulu	N.A	N.A
			3346	Serang Hilir	N.A	N.A
			3347	Muria Barat	N.A	N.A
			3348	Muria Timur	N.A	N.A
			3349	Bs.Wonogiri	N.A	N.A
			3350	Bs.Klaten	N.A	N.A
			3351	Bs.Karanganyar	N.A	N.A
			3352	Bs.Boyolali	N.A	N.A
	3353	Sragen	N.A	N.A		
	3354	Bogowonto	N.A	N.A		
	3355	Luk Ulo	N.A	N.A		
	3356	Serayu Hulu	N.A	N.A		
	3357	Serayu Tengah	N.A	N.A		
	3358	Serayu Hilir	N.A	N.A		
	3359	Citanduy Timur	N.A	N.A		
12	Yogyakarta		3401	Kulonprogo	34	1,392
			3402	Sleman	924	8,919
			3403	Bantul	83	3,844
			3404	Gunung Kidul	39	558
			3405	Kodya Yogyakarta	0	0
	Total			1,080	14,713	

Tabel 2.1 Inventory Data on Irigasi Desa by Province
Based on the Inventory Survey by DOI-I in 1992

No.	Province	Cabang Dinas/Kabupaten Irr. Region	Code No.	Name	Nos.of Scheme	Area (ha)
13	Jawa Timur		3501	Brantas Malang	99	4,751
			3502	Brantas Kepanjen	-	-
			3503	Brantas Kasri	-	-
			3504	Brantas Pasuruan	35	791
			3505	Brantas Kediri	64	1,173
			3506	Brantas Nganjuk	3	74
			3507	Brantas Tulungagung	33	107
			3508	Brantas Trenggalek	68	1,304
			3509	Brantas Blitar	61	1,455
			3510	Brantas Jombang	62	2,488
			3511	Brantas Mojoagung	-	-
			3512	Brantas Pare	-	-
			3513	Brantas Mojokerto	80	1,010
			3514	Brantas Sidoarjo	-	-
			3515	Brantas Wonokromo	-	-
			3516	Pek.Samp.Lumajang	65	2,838
			3517	Pek.Samp.Probolinggo	42	1,002
			3518	Pek.Samp.Krasaan	-	-
			3519	Pek.Samp.Tanggul	-	-
			3520	Pek.Samp.Bondowoso	27	946
			3521	Pek.Samp.Situbondo	18	197
			3522	Pek.Samp.Rawatantu	-	-
			3523	Pek.Samp.Jember	37	459
			3524	Pek.Samp.Banyuwangi	59	883
			3525	Pek.Samp.Genteng	-	-
			3526	Pek.Samp.Benculuk	-	-
			3527	Madiun	45	640
			3527	Sampang	13	287
			3528	Barat	-	-
			3529	Ngawi	47	2,636
			3530	Ponorogo	20	695
			3531	Pacitan	30	779
			3532	Bojonegoro	250	5,453
			3533	Tuban	69	2,931
			3534	Lamongan	133	6,966
	3535	Pamekasan	40	1,193		
	3536	Bangkalan	27	1,768		
	3537	Sumenep	55	934		
	Total				1,482	43,760
14	Bali		5101	Jembrana	31	1,887
			5102	Tabanan	119	5,636
			5103	Badung	0	0
			5104	Gianyar	80	2,590
			5105	Klungkung	7	343
			5106	Bangli	10	330
			5107	Karang Asem	31	3,846
			5108	Buleleng	140	2,894
			Total			418
15	Nusa Tenggara Barat		5201	Kota Mataram	0	0
			5202	Lombok Barat	90	2,908
			5203	Lombok Tengah	23	1,407
			5204	Lombok Timur	183	10,855
			5205	Sumbawa Barat	46	6,628
			5206	Sumbawa Timur	206	26,172
			5207	Dompu	74	11,279
			5208	Bima	189	9,658
	Total			811	68,907	
16	Nusa Tenggara Timur	Kupang	5301	Kupang	240	15,675
		Propinsi N.T.T	5302	Timor Tengah S	33	13,282
		Timor Tengah	5303	Dati II T.T.U	9	2,302
		Belu	5304	Belu	13	2,800
		Alor	5305	Dati II Alor	22	9,798
		Seksi Flores Timur	5306	Flores Timur	19	1,715
		Sikka	5307	Dati II Sikka	56	2,842
		Ende	5308	Ende	89	7,744
			5309	Dati II Ngada	103	2,651
		Manggarai	5310	Manggarai	315	60,521
			5311	Sumba Timur	21	2,245
			5312	Sumba Barat	40	2,380
	Total			960	123,955	

Tabel 2.1 Inventory Data on Irigasi Desa by Province
Based on the Inventory Survey by DOT-I in 1992

No.	Province	Cabang Dinas/Kabupaten Irr. Region	Code No.	Name	Nos. of Scheme	Area (ha)
17	Timor Timur		5401	Ambeno	N.A	N.A
			5402	Bobonaro	N.A	N.A
			5403	D i l i	N.A	N.A
			5404	Manatuto	N.A	N.A
			5405	Baucau	N.A	N.A
			5406	Viqueque	N.A	N.A
			5409	Erмира	N.A	N.A
			5410	Covalima	N.A	N.A
18	Kalimantan Barat		6101	Pontianak	34	4,044
			6102	Singawang	-	-
				Sambas	27	1,688
			6103	Sanggau	7	460
			6104	Sintang	11	725
			6105	Ketapang	21	3,608
			6106	Kapuas Hulu	13	583
	Total			113	11,108	
19	Kalimantan Tengah		6201	Kota Waringin Barat	2	832
			6207	Murung Raya/Kapuas	2	650
			6208	Barito Utara	3	2,800
			6210	Barito Timur/Sel.	4	2,670
			Total			11
20	Kalimantan Selatan		6302	Banjar	10	1,975
			6303	Tapin	13	2,600
			6304	Hulu Sei Selatan	8	1,725
			6305	Hulu Sei Tengah	4	475
			6306	Hulu Sei Utara	5	600
			6307	Tabaleng	4	825
			6308	Tanah Laut	8	1,000
			6309	Kotabaru	5	1,700
			Total			57
21	Kalimantan Timur	K u t a i Samarinda P a s i r B e r a u Bulungan	6403	K u t a i	21	2,550
			6401	Samarinda (Kodya)	5	230
			6404	P a s i r	23	5,665
			6405	B e r a u	6	1,630
			6406	Bulungan	3	1,850
			6402	Kodya Balikpapan		
	Total			58	11,925	
22	Sulawesi Utara		7101	Minahasa	N.A	N.A
			7102	Bolang Mangandon	N.A	N.A
			7103	Gorontalo	N.A	N.A
			7104	Tahua	N.A	N.A
			7105	Pengairan Dumoga	N.A	N.A
23	Sulawesi Tengah	Donggala	7201	Donggala	29	6,486
			7202	Poso	-	-
			7203	Luwuk Banggai	-	-
			7204	Buol Toli-Toli	-	-
			7205	Parigi	12	1,276
	Total			41	7,762	
24	Sulawesi Selatan	Pengairan Bendun Benteng Kabupaten Enrekang Kabupaten Polewali Mamasa Pengairan Gowa-Takalar Pengairan Maros Pengairan Bone Kabupaten Soppeng Kabupaten Wajo Pengairan Bulukumba Selayar Pengairan Jeneponto-Bantaeng Pengairan Selatan-Tator Pengairan Pangkep-Baru Pengairan Pangkep-Baru Pengairan Pangkep-Baru Pengairan Sinjai Pengairan Lawu Utara Pengairan Luwu Selatan/Tator	7301	Pinrang	19	4,575
			7302	Sidren	44	3,569
			7303	Mandar	45	18,574
			7304	Gowa/Takalar	18	3,285
			7305	M a r o s	45	5,822
			7306	B o n e	41	9,908
			7307	Soppeng/Wajo	29	5,185
				Sopeng Wajo	4	1,300
			7308	Bulukumba	73	12,204
			7309	Jeneponto/Bantaeng	111	19,041
			7310	Luwu/Tator	34	9,259
			7311	Pangkep/Barru	2	450
				Kab. Pangkep	3	420
				Kab. Barru	27	3,630
				Kab. Pangkep & Kep.	24	1,902
			7312	Bendung Benteng	-	-
			7313	Sinjai	36	4,446
7314	Luwu Utara	53	8,870			
	Kab. Tana Toraja	71	12,606			
	Total			679	125,046	

Tabel 2.1 Inventory Data on Irigasi Desa by Province

Based on the Inventory Survey by DOI-I in 1992

No.	Province	Cabang Dinas/Kabupaten Irr. Region	Code No.	Name	Nos.of Scheme	Area (ha)
25	Sulawesi Tenggara		7401	Kendari	N.A	N.A
			7402	Unaaha	N.A	N.A
			7403	Kolaka	N.A	N.A
26	Maluku		8101	Maluku Utara	N.A	N.A
			8102	Maluku Tengah	N.A	N.A
			8103	Halmahera Tengah	N.A	N.A
27	Irian Jaya		8201	Jayapura	N.A	N.A
			8202	Monokwari	N.A	N.A
			8203	Paniai (Nabire)	N.A	N.A
			8204	Sorong	N.A	N.A
			8205	Merauke	N.A	N.A
Ground Total					17,053	981,447

Table 2.2 Results of Inventory Survey on Irigasi Desa in 1982 by DGWRD

Code	Province	Number of Kabupaten	Number of Kecamatan	Number of Desa	Village Irrigation Scheme				Rain-fed Paddy Field (ha)						
					Number of Scheme	Design Area (ha)	Functional Area (ha)	Structure (nos)			Inside of Village		Outside of		
								Weir	Free Intake	Others	PU Schemes	Irr. Schemes	Irr. Schemes	Irr. Schemes	
11	D.I.Aceh	10	133	5,388	852	96,649	43,266	509	108	243	860	43,002	53,383	88,203	184,588
12	Sumatera Utara	19	197	5,563	1,152	193,435	79,580	677	370	403	1,450	24,078	38,410	118,400	180,888
13	Sumatera Barat	14	100	1,467	2,944	107,641	70,580	948	1,315	1,351	3,614	14,925	23,811	52,724	91,460
14	Riau	7	72	894	99	25,813	2,491	56	5	39	100	4,674	4,138	30,764	39,576
15	Jambi	6	37	1,158	333	66,719	18,957	167	98	966	1,231	2,184	8,611	40,850	51,645
16	Sumatera Selatan	13	92	2,001	1,379	110,278	62,959	1,183	80	126	1,389	7,858	2,317	322,828	333,003
17	Bengkulu	4	24	1,204	121	28,130	16,189	15	106	0	121	0	0	9,496	9,496
18	Lampung	4	76	1,487	964	63,542	31,542	379	494	91	964	4,344	11,636	53,763	69,743
	Sumatera	77	731	19,162	7,824	692,207	325,564	3,934	2,576	3,219	9,729	101,065	142,306	717,028	960,399
31	D.K.I.Jakarta	5	30	234	29	4,868	1,607	84	25	27	136	1,004	623	1,504	3,131
32	Jawa Barat	29	427	5,522	10,298	310,364	251,809	4,833	1,384	1,268	7,485	48,449	33,728	171,846	254,023
33	Jawa Tengah	37	496	7,850	507	27,168	26,325	1,884	1,396	826	4,106	56,956	843	161,695	219,494
34	D.I.Jogyakarta	5	73	438	0	0	0	0	0	0	0	5,218	0	10,999	16,217
35	Jawa Timur	38	577	8,312	818	41,950	34,852	207	67	544	818	46,720	7,098	170,528	224,346
	Jawa	114	1,603	22,356	11,652	384,350	314,593	7,008	2,872	2,665	12,545	158,347	42,292	516,572	717,211
51	Bali	9	51	643	1,000	42,032	39,529	733	200	67	1,000	8	1	516	525
52	NTB	7	56	494	773	66,439	48,864	585	75	141	801	6,745	14,469	23,597	44,811
53	NTT	13	98	1,662	1,126	109,859	42,624	645	364	154	1,163	1,219	7,460	10,891	19,570
54	Timor Timur	13	65	449	-	-	-	-	-	-	-	-	-	-	0
	Bali/Nusa Tenggara	42	270	3,248	2,899	218,330	131,017	1,963	639	362	2,964	7,972	21,930	35,004	64,906
61	Kalimantan Barat	8	108	4,685	319	63,921	33,569	36	320	37	393	2,156	7,379	190,764	200,299
62	Kalimantan Tengah	6	82	1,096	19	6,329	986	6	12	1	19	0	300	46,533	46,833
63	Kalimantan Selatan	11	100	1,840	833	237,893	111,451	496	116	277	889	2,944	18,673	269,551	291,168
64	Kalimantan Timur	7	71	1,067	124	31,593	11,601	30	69	37	136	0	10,012	65,152	75,164
	Kalimantan	32	361	8,688	1,295	339,736	157,607	568	517	352	1,437	5,100	36,364	572,000	613,464
71	Sulawesi Utara	7	83	1,162	483	26,138	12,252	140	151	218	509	668	7,022	12,851	20,541
72	Sulawesi Tengah	5	62	159	139	17,809	10,361	56	47	37	140	210	1,616	5,124	6,950
73	Sulawesi Selatan	23	169	1,114	842	182,380	75,084	485	301	96	882	33,607	68,801	219,073	321,481
74	Sulawesi Tenggara	6	45	697	170	24,792	10,135	127	42	1	170	635	45	5,426	6,106
	Sulawesi	41	359	3,132	1,634	251,119	107,852	808	541	352	1,701	35,120	77,484	242,474	355,078
81	Maluku	5	56	1,845	0	0	0	0	0	0	0	0	0	21,735	21,735
82	Irian Jaya	10	115	819	-	-	-	-	-	-	-	-	-	-	0
	Maluku/Irian Jaya	15	171	2,664	0	0	0	0	0	0	0	0	0	21,735	21,735
INDONESIA		321	3,495	59,250	25,304	1,885,742	1,036,613	14,281	7,145	6,950	28,376	307,604	320,376	2,104,813	2,732,795

Source : Rekapitulasi Daerah Irigasi Desa dan Sawah Tadah Hujan, September 1982 by DOLDGWRD

Table 2.3 Collected Data on Irigasi Desa by JICA, IISP-II and PRAS

Code	Province	Data in 1982 by JICA and PRAS			Data in 1992 by IISP		
		Number of Scheme	Area (ha)		Number of Scheme	Designed Area (ha)	Irrigated Area (ha)
			Design Area	Functional Field			
11	D.I.Aceh	598		32,213			
12	Sumatera Utara	845	121,775	57,234			
13	Sumatera Barat						
14	Riau						
15	Jambi	398		28,754			
16	Sumatera Selatan						
17	Bengkulu						
18	Lampung	130		14,066			
	Sumatera	1,971	121,775	132,267			
31	D.K.I.Jakarta						
32	Jawa Barat	2,855		165,942			
33	Jawa Tengah						
34	D.I.Jogyakarta						
35	Jawa Timur						
	Jawa	2,855	0	165,942			
51	Bali				468	20,647	19,874
52	Nusa Tenggara Barat	328	35,499	29,800	196	22,966	18,775
53	Nusa Tenggara Timur	305		28,302	479	43,631	n.a.
54	Timor Timur				n.a.	20,000	10,000
	Bali/Nusa Tenggara	633	35,499	58,102	1,143	107,244	48,649
61	Kalimantan Barat						
62	Kalimantan Tengah						
63	Kalimantan Selatan						
64	Kalimantan Timur						
	Kalimantan						
71	Sulawesi Utara				240	19,086	11,500
72	Sulawesi Tengah	134		8,218	110	12,458	7,487
73	Sulawesi Selatan	962	149,260	67,300	959	155,912	67,265
74	Sulawesi Tenggara	163		18,082	250	36,359	15,685
	Sulawesi	1,259	149,260	93,600	1,559	223,815	101,937
81	Maluku	0	0	0	-		6,000
82	Irian Jaya	-	-	-	16		349
	Maluku/Irian Jaya	0	0	0	16		6,349
INDONESIA		6,718	306,534	449,911	2,718	331,059	156,935

Table 2.4 Estimated Area of Irigasi Desa by Province

Code	Province	Number of Scheme	Irrigated Area (ha)	Data Source
11	D.I.Aceh	259	45,622	Data-1
12	Sumatera Utara	1,132	79,580	Data-2
13	Sumatera Barat	2,009	49,256	Data-1
14	Riau	99	2,491	Data-2
15	Jambi	333	18,957	Data-2
16	Sumatera Selatan	548	62,218	Data-1
17	Bengkulu	202	16,340	Data-1
18	Lampung	140	38,156	Data-1
31	D.K.I.Jakarta	29	1,607	Data-2
32	Jawa Barat	10,298	251,809	Data-2
33	Jawa Tengah	507	26,325	Data-2
34	D.I.Jogyakarta	1,080	14,713	Data-1
35	Jawa Timur	818	34,852	Data-2
51	Bali	418	17,526	Data-1
52	Nusa Tenggara Barat	811	68,907	Data-1
53	Nusa Tenggara Timur	1,126	42,624	Data-2
54	Timor Timur	-	10,000	Data-3
61	Kalimantan Barat	113	11,108	Data-1
62	Kalimantan Tengah	11	6,952	Data-1
63	Kalimantan Selatan	57	10,900	Data-1
64	Kalimantan Timur	58	11,925	Data-1
71	Sulawesi Utara	483	12,252	Data-2
72	Sulawesi Tengah	139	10,361	Data-2
73	Sulawesi Selatan	679	125,046	Data-1
74	Sulawesi Tenggara	170	10,135	Data-2
81	Maluku	-	6,000	Data-3
82	Irian Jaya	16	349	Data-3
	Sumatera	4,722	312,620	
	Jawa	12,732	329,306	
	Bali/Nusa Tenggara	2,355	139,057	
	Kalimantan	239	40,885	
	Sulawesi	1,471	157,794	
	Maluku/Irian Jaya	16	6,349	
	INDONESIA	21,535	986,011	

Data-1 Inventory Survey by DOI-I,DGWRD 1992

Data-2 Inventory Survey by DOI-I,DGWRD 1982

Data-3 Inventory Survey data by ADB in 1992

Table 4.1 Numbers and Areas for Rehabilitation of Irigasi Desa

No.	Province	Numbers of Schemes										Area (ha)									
		1989/90		1990/91		1991/92		1992/93		1993/94		Total		1989/90		1991/92		1992/93		1993/94	
		Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program
11	D.I.Aceh	1	5	3	4	3	4	3	16	90	325	180	300	n.a.							
12	Sumatera Utara	0	0	3	18	5	26	0	26	0	0	301	985	n.a.							
13	Sumatera Barat	0	1	2	6	0	9	0	9	0	70	150	412	n.a.							
14	Riau	0	0	0	4	1	5	0	5	0	0	0	230	n.a.							
15	Jambi	0	0	0	6	0	6	0	6	0	0	0	302	n.a.							
16	Sumatera Selatan	0	3	1	6	0	10	0	10	0	370	607	139	n.a.							
17	Bengkulu	0	0	3	6	0	9	0	9	0	0	155	313	n.a.							
18	Lampung	2	3	1	6	0	12	0	12	220	350	300	275	n.a.							
	Sumatera	3	12	13	56	9	93	0	93	310	1,115	1,693	2,956	n.a.							
31	D.K.I.Jakarta	0	0	0	0	0	0	0	0	0	0	0	0	n.a.							
32	Jawa Barat	3	5	1	8	0	17	0	17	255	370	150	614	n.a.							
33	Jawa Tengah	3	3	1	9	6	22	6	22	156	200	135	646	n.a.							
34	D.I.Jogyakarta	2	3	3	6	4	18	4	18	130	145	226	275	n.a.							
35	Jawa Timur	3	4	1	10	0	18	0	18	102	43	75	677	n.a.							
	Jawa	11	15	6	33	10	75	10	75	643	758	586	2,212	n.a.							
51	Bali	2	3	4	6	5	20	5	20	80	119	126	230	n.a.							
52	Nusa Tenggara Barat	5	6	4	10	5	30	5	30	564	647	140	522	n.a.							
53	Nusa Tenggara Timur	0	0	3	12	1	16	1	16	0	0	2,010	412	n.a.							
54	Timor Timur	0	0	0	0	0	0	0	0	0	0	0	0	n.a.							
	Bali/Nusa Tenggara	7	9	11	28	11	66	11	66	644	766	2,276	1,164	n.a.							
61	Kalimantan Barat	2	5	6	10	4	27	4	27	140	227	461	787	n.a.							
62	Kalimantan Tengah	0	0	0	6	1	7	1	7	0	0	0	412	n.a.							
63	Kalimantan Selatan	0	3	1	8	1	13	1	13	0	190	100	945	n.a.							
64	Kalimantan Timur	0	0	3	8	0	11	0	11	0	0	182	761	n.a.							
	Kalimantan	2	8	10	32	6	58	6	58	140	417	743	2,905	n.a.							
71	Sulawesi Utara	2	2	4	20	4	32	4	32	210	130	167	930	n.a.							
72	Sulawesi Tengah	0	0	2	5	10	17	10	17	0	0	172	350	n.a.							
73	Sulawesi Selatan	3	4	1	4	3	15	3	15	229	245	50	335	n.a.							
74	Sulawesi Tenggara	0	0	0	10	5	15	5	15	0	0	0	1,718	n.a.							
	Sulawesi	5	6	7	39	22	79	22	79	439	375	389	3,333	n.a.							
81	Maluku	0	0	0	0	4	4	4	4	0	0	0	0	n.a.							
82	Irian Jaya	0	0	0	0	1	1	1	1	0	0	0	0	n.a.							
	Maluku/Irian Jaya	0	0	0	0	5	5	5	5	0	0	0	0	n.a.							
INDONESIA		28	50	47	188	63	376	63	376	2,176	3,431	5,687	12,570	n.a.							

Source : Directorate of Land Rehabilitation and Development, DGPCA

Table 4.2 Budget Used for Rehabilitation of Irigasi Desa (APBN)

No.	Province	Unit: Rp1,000					Total
		1989/90 Actual	1990/91 Actual	1991/92 Actual	1992/93 Actual	1993/94 Program	
11	D.I.Aceh	3,100	18,875	14,100	9,200	20,740	66,015
12	Sumatera Utara	0	0	12,500	41,850	37,850	92,200
13	Sumatera Barat	0	3,775	9,400	15,000	0	28,175
14	Riau	0	0	0	12,000	11,899	23,899
15	Jambi	0	0	0	n.a.	0	0
16	Sumatera Selatan	0	10,800	5,390	15,475	0	31,665
17	Bengkulu	0	0	12,860	15,000	0	27,860
18	Lampung	6,200	11,325	5,300	22,900	0	45,725
	Sumatera	9,300	44,775	59,550	131,425	70,489	315,539
31	D.K.I.Jakarta	0	0	0	0	0	0
32	Jawa Barat	9,300	7,770	4,120	30,500	0	51,690
33	Jawa Tengah	9,300	14,670	5,200	28,500	48,180	105,850
34	D.I.Yogyakarta	5,800	10,400	9,450	18,500	29,090	73,240
35	Jawa Timur	9,300	15,100	4,000	35,000	0	63,400
	Jawa	33,700	47,940	22,770	112,500	77,270	294,180
51	Bali	620	5,100	12,450	18,000	41,800	77,970
52	Nusa Tenggara Barat	15,500	22,650	19,500	25,000	37,050	119,700
53	Nusa Tenggara Timur	0	7,550	14,100	30,000	7,575	59,225
54	Timor Timur	0	0	0	0	0	0
	Bali & Nusa Tenggara	16,120	35,300	46,050	73,000	86,425	256,895
61	Kalimantan Barat	0	22,650	26,730	23,000	29,200	101,580
62	Kalimantan Tengah	0	0	0	n.a.	9,870	9,870
63	Kalimantan Selatan	0	21,150	5,400	n.a.	7,020	33,570
64	Kalimantan Timur	0	0	14,100	n.a.	0	14,100
	Kalimantan	0	43,800	46,230	23,000	46,090	159,120
71	Sulawesi Utara	9,300	7,550	18,800	56,500	30,280	122,430
72	Sulawesi Tengah	0	0	16,380	12,500	0	28,880
73	Sulawesi Selatan	9,300	15,100	5,950	n.a.	32,970	63,320
74	Sulawesi Tenggara	0	0	0	n.a.	40,700	40,700
	Sulawesi	18,600	22,650	41,130	69,000	103,950	255,330
81	Maluku	0	0	0	0	28,250	28,250
82	Irian Jaya	0	0	0	0	8,060	8,060
	Maluku & Irian Jaya	0	0	0	0	36,310	36,310
INDONESIA		77,720	194,465	215,730	408,925	420,534	1,317,374

Source : Directorate of Land Rehabilitation and Development, DGFC

Annex H

Environmental Consideration

ANNEX H

ENVIRONMENTAL CONSIDERATION

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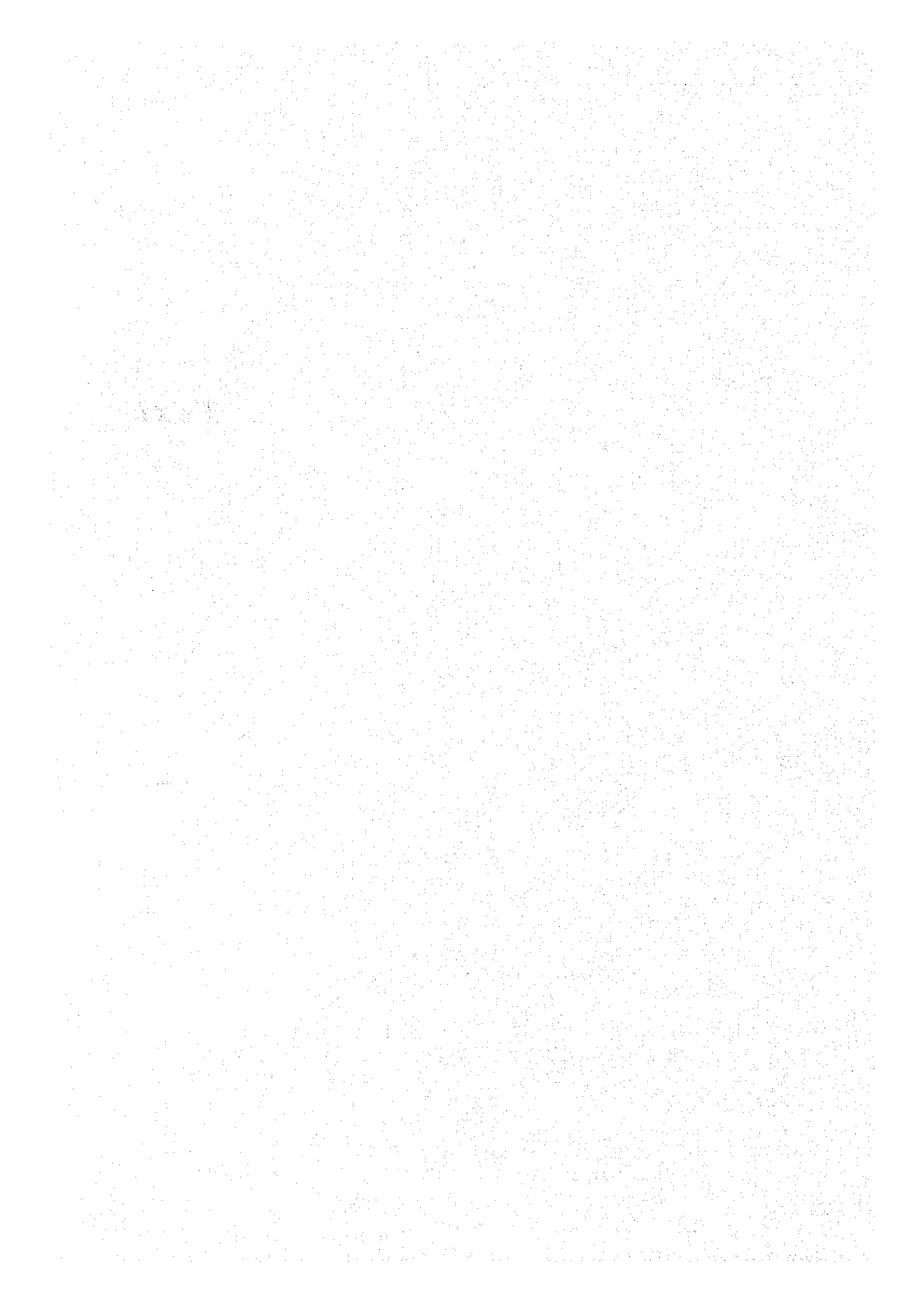
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Text



1. Introduction

Environmental problems are caused in general attributable to the increasing demand of human activity for higher living standards as well as population growth. Increase demands for food, water and energy shoulder the nature much burden, which finally bring about various environmental problems such as the deterioration of water quality, decrease of soil fertility, soil erosion, air pollution, acidic rain, etc., all of which adversely affect the ordinary life of people.

It is the early 1970's that public concern for the environment became the subject of international conferences. The United Nations organized a first "World Environment Conference" in 1972, which founded the United Nations Environmental Program. In 1978, the International Union for the Conservation of Nature, the IUCN, launched the "World Conservation Strategy (WCS)", which concerned about the natural wealth in the third world, and introduced the concept of sustainable development.

This concept was popularized by the "World Commission on Environment and Development (WCED)", which later published the report "Our Common Future" (1987). This report addresses the relationship between environment and long-term development. Sound management of the natural resources is considered a prerequisite to economic development, whereas economic development is necessary for sound environmental management.

The concept of sustainable development acknowledges the importance of economic growth, but it also recognizes that the natural resources are finite and that a wasteful use of them today jeopardizes income and welfare in the future. Indonesia accepted the World Conservation Strategy; in its National Conservation Strategy.

As a result, due attention is given to the maintenance of the environmental equilibrium in the development planning of Indonesia.

In this paper, environmental consideration on water resources including irrigation is discussed first, then the general procedure of environmental impact assessment is explained second, and finally Indonesian system on environmental impact assessment is discussed especially for surface irrigation project.

This paper mainly owes to the following references:

Delft Hydraulics et al. *Environmental Aspects of WR Planning*, Technical Note No.7, Planning of Integrated Water Resources Development, Bina Program Pengairan (BPP), Jakarta, March 1992.

Environmental Impact Management Agency (BAPEDAL) et al. *A Guide to Environmental Assessment in Indonesia*, 1992

World Bank. *Environmental Assessment Sourcebook, Volume II, Sectoral Guideline*, World Bank Technical Paper Number 140, Washington D.C., 1991.

Ministry of Public Works. *Technical Guidelines for Analysis of Environmental Impacts of Surface Water Irrigation Projects*, Jakarta, 1990

2. Functions of Water Resources System

Management of environment on water resources aims to prevent the water resources system (WRS) from deteriorating so that it could be not able to perform its function adequately. Since Water resources sector include irrigation sub-sector in Indonesia, functions of water resources in relation to environment will be discussed here.

Most important functions of a WRS is overviewed in the following table:

Table 2.1 Functions of the water resources system

Functions	Description	Functions
Provision of local products (intangible)	Local communities use water and water based products that are not marketed	- local drinking water - traditional fishing - subsistence irrigation
Provision of commercial products (tangible)	Use by public or private enterprises of water and water based products that are marketed or otherwise given a monetary value.	- urban drinking water - industrial water supply - irrigation - hydro power generation - commercial fishing
Environmental functions (tangible)	Regulation functions, non-consumptive use.	- self-purification capacity - regulation of the hydrological cycle - reduction of salt intrusion - recreation and tourism - transportation
Option values (intangible)	Functions or values that may become important in the future	- gene pool
Existence values (intangible)	Values assigned to entities of the system, not derived from other functions or values.	- nature conservation

Source: Delft Hydraulics et al. *Environmental Aspects of WR Planning*, Technical Note No.7, Planning of Integrated Water Resources Development, Bina Program Pengairan (BPP), Jakarta, March 1992.

Actual functions and potential or latent functions, and between functions that are tangible (that can be given a value, monetary or otherwise) and those that are intangible, should be distinguished. In many projects, provision of local products such as local drinking water, traditional fishing, subsistence irrigation are not evaluated as monetary values.

Environmental problems related to water resources development are in general classified into four broad categories as shown in the next Table.

Table 2.2 General classification of environmental problems

Type of problem	Example
Environmental degradation	<ul style="list-style-type: none"> - habitat destruction - isolation - disturbance - inundation/desiccation - hydrological changes
Exhaustion of natural resources	<ul style="list-style-type: none"> - erosion/soil degradation - over-exploitation of renewable resources - exhaustion of non-renewable resources
Pollution	<ul style="list-style-type: none"> - dispersion of toxic substances - eutrophication - acid deposition - climate change - solid waste disposal
Safety risks	<ul style="list-style-type: none"> - vector-borne diseases - calamities, disasters - intoxication

Source: Delft Hydraulics et al. *Environmental Aspects of WR Planning*, Technical Note No.7, Planning of Integrated Water Resources Development, Bina Program Pengairan (BPP), Jakarta, March 1992.

Water resources development may on the one hand be influenced by, or, on the other hand cause problems belonging to one or more of these categories.

When considering measures to solve environmental problems related to water resources development, not only technical and financial aspects, but also sociological and psychological discussion have to be taken into account. How benefits and burdens of a project are distributed over time and space and between groups of people or different economic sectors is also of importance.

Many environmental problems have a time lag between the generation of the problem and the time of its actual impact, in other words there is a shift-off of the burdens to further generations. The siltation of reservoirs is a good example.

Another type of shift-off is hydro-power projects that cause problems in the downstream area due to changes in the sediment and water regime. In this case, the environmental impacts become manifest in areas outside the project area. Shift-off mechanisms also occur when the economic sectors in society that benefit from a project are not the same as those that experience the negative impacts of the development, or when individuals get benefits obtained at the cost of collective burdens.

Those who are going to propose projects should consider such shift-off mechanisms as above explicitly. Impacts of project will not affect within one generation only, nor within the proposed project areas only, nor within objective sectors only, and nor within expected beneficiaries only. In this sense, planners should have wide views and cultivated common sense to consider such environmental impacts. An overview of the various shift-off mechanisms is given in the following table.

Table 2.3 Shift-off mechanism underlying environmental problems

Benefits	Burdens	Examples
now	later	future generation
here	there	downstream effects of reservoirs
one sector	other sectors	urban, industrial vs. rural, fisheries
individual	collective	"Tragedy of the commons"

Source: Delft Hydraulics et al. *Environmental Aspects of WR Planning*, Technical Note No.7, Planning of Integrated Water Resources Development, Bina Program Pengairan (BPP), Jakarta, March 1992.

Incorporation of environmental aspects into the planning process should start with an inventory of all functions of the water resources and an identification of all interested parties that make use of these functions (table below). For reasons of environmental soundness and sustainability, i.e. the ability of the system to perform its functions for society now and in the future, this inventory of actual and potential functions should have high priority. Water resources planning should aim at avoiding the loss of functions as much as possible and at enhancement of the multi-functionality of the system. This requires a identification of possible conflicts between functions.

Table 2.4 Checklist for the functions of and demands on the water resources

Function	Users	Demands on system
Local products:		
- water supply	villagers	high water quality, groundwater recharge
- traditional fishing	artisan fishermen	medium water quality, flood frequency
- subsistence agriculture	farmers	flood frequency
Commercial products:		
- urban water supply	municipalities	high water quality, continuity
- industrial water supply	private enterprises	high/medium water quality, continuity
- irrigation	irrigation boards	seasonally distributed water flow
- hydro-power	electricity companies	continuity
- commercial fishery	private fishing companies, individual fishermen	medium water quality, natural water regime
Environmental functions:		
- self-purification capacity	most water users	sufficient minimum flows
- regulation of hydrological cycle	most water users	minimal extreme events (floods and droughts)
- prevention of salt intrusion	farmers, water companies	minimum low flows
- recreation and tourism	urban people and tourists	a rich and diversified eco-system, high water quality
- transportation	private companies	minimum water depth
Option value/existence value	-	a rich and diversified ecosystem, high water quality

Source: Delft Hydraulics et al. *Environmental Aspects of WR Planning*, Technical Note No.7, Planning of Integrated Water Resources Development, Bina Program Pengairan (BPP), Jakarta, March 1992.

3. Environmental Consideration on Irrigation and Drainage

Irrigation and drainage projects manage water supplies for the purpose of agricultural production. There is a wide variety of irrigation types depending upon the source of water (surface or groundwater), means of water storage, conveyance and distribution system, and methods of delivery (field application).

Large scale utilization of surface water (predominantly rivers) for irrigation has long been practiced, in some countries for thousands of years, and still accounts for the major public sector investments in irrigation due to its importance on increasing and stabilizing food production.

The dominant delivery method is surface irrigation (flood or furrow irrigation) in which water is distributed over the irrigated area by gravity in overland flow. Almost all irrigation system in Indonesia are also classified in this category. The other systems are sprinkler and drip (trickle) irrigation. Although they are relatively new technologies requiring higher initial investment and more intensive management than surface irrigation, sprinkler and drip irrigation show great potential for maximizing the efficiency of water use and reducing irrigation-related environmental problems.

Irrigation projects can include the following facilities and infrastructure: (a) dams, watershed and reservoirs; (b) diversion and intake facilities; (c) wells, pumping stations, canals, ditches and pipelines for the conveyance of water (including drainage); and (d) distribution systems for sprinkler and drip irrigation.

3.1 Potential Environmental Impacts

The potential negative environmental impacts of most large irrigation projects include: waterlogging and salinization of soils, increased incidence of water-borne and water-related diseases, resettlement or changes in the lifestyle of local populations, and increase of agricultural pests and diseases resulting from the elimination of dry season die-back and the creation of a more humid microclimate. The expansion and intensification of agriculture made possible by irrigation has the potential for causing increased erosion; pollution of surface and groundwater from agricultural biocides; deterioration of water quality; and increased nutrient levels in the irrigation and drainage water resulting in algal blooms, proliferation of aquatic weeds and eutrophication in irrigation canals and downstream waterways. Increased quantities of agricultural chemicals are usually required in irrigated lands to keep production levels up; fertilizer must be used to compensate for high growth rate and loss of nutrients through leaching, and pesticides to control the greater numbers of crop pests and diseases.

As for waterlogging and salinity hazard, it will be serious problem particularly in arid or semi-arid zones with fine soils (e.g., vertisols) in a wide floodplain such as the downstream area of Indus river and Nile river basin. Due to the humid climate with high rainfall, Indonesia will not be suffered from waterlogging or salinity problem. Even in eastern islands where have long dry season, waterlogging or salinity problem will not be expected due to porous soil structures.

Large irrigation projects which impound or divert river waters have the potential to cause major environmental disturbances resulting from changes in the hydrology and limnology of river

basins. Reducing the river flow changes floodplain land use and ecology, disrupts riverine and estuarine fisheries, and causes salt water intrusion up the river and into the groundwater of adjacent lands. Diversion and loss of water through irrigation reduces the water supply for downstream users, including municipalities, industries and agriculturists. Without certain legal regulation such as water right, this kind of problem may not be solved in the course of the development in a river basin in principle.

A reduction in a river's base flow also decreases the dilution of municipal and industrial wastes added downstream, posing pollution and health hazards. The deterioration of water quality below an irrigation project can render the water unfit for other users, harm aquatic species, and, because of high nutrient content, result in aquatic weed growth that clogs waterways and has health, navigation and ecological consequences. Regulation on water quality is prerequisite, which calls for the necessity of water treatment and continuous monitoring.

The potential direct negative environmental impacts of the use of groundwater supplies for irrigation arise from overtapping groundwater supplies (withdrawing water in excess of the rate of recharge). This results in the lowering of the water table, land subsidence, decreased water quality, and saltwater intrusion (in coastal areas). Assessment of groundwater potential and recharge amount in planning stage is a crucial determinant for the success of the project. Monitoring and evaluation is another important work at post-project stage.

A number of external environmental factors influence irrigation projects. Upstream land use will affect the quality of water entering the irrigation area, particularly the sediment content (e.g., from agriculturally-induced erosion) and chemical composition (e.g., from agricultural and industrial pollutants). Use of river waters with a large sediment load may result in canal clogging. Over time, cleaning the canals and depositing the sediment on cropland, or simply irrigating with water of high sediment content can raise the land level to such a height that irrigation is impaired. Careful study on land use in the upstream of the project site will be necessary so as to reflect the future environmental change into project design.

The obvious benefits conferred by irrigation are those resulting from increased production of food. In addition, concentration and intensification of production on a smaller area can protect forests or wildlands from being converted to agriculture. Increased vegetative cover for a greater portion of the year helps reduce soil erosion, as does land preparation (e.g., land levelling and contouring). Some health benefits result from improved hygiene and a decrease in the incidence of certain diseases. Irrigation projects can also moderate flooding downstream.

3.2 Special Issues

(1) Social Issues

Social disruption is inevitable in large irrigation projects covering vast areas. Local people dislocated by the irrigation project face the classic resettlement problems: a decrease in the standard of living, increased health problems, social conflicts, and deterioration of natural resources in the resettlement area. The people remaining in the area will likely have to change their land use practice and agricultural patterns. The local people often find that they have less access to water, land and vegetation resources as a result of the project. Conflicting demands on the water resources and inequalities in distribution can easily occur both in the project area and downstream. All these factors -- changing agricultural practices, increasing population density, and altering the distribution of wealth -- can have a profound influence on traditional social patterns.

An increase, sometimes extraordinary, of water-borne or water-related diseases commonly is associated with the introduction of irrigation. The diseases most often linked with irrigation are schistosomiasis, malaria and onchocerciasis, whose vectors proliferate in the irrigation waters. Other irrigation-related health risks include those associated with increased use of agrochemicals, deterioration of water quality, and increased population pressure in the area.

(2) Irrigation Efficiency and Improvement of Existing Systems

Inefficient use of water (i.e., overwatering) wastes water which could go to other users and avoid ecological impacts downstream. This problem would be occurred where competition of water demand among areas or sectors are in critical condition (e.g., Jawa island). In such areas maximizing the efficiency of water use should be or primary concern of all irrigation project.

3.3 Characteristics of Irrigation in Indonesia

When talking about irrigation in Indonesia, one has usually imagined the irrigation to paddy field. The irrigation development in Indonesia is thus for paddy field. Unlike the upland crops, lowland paddy grows under a inundated condition in a levelled flat field. Under the inundated condition, water in paddy field usually move downwards, leaching nutrients out of soil. In this sense, salinity problem will unlikely to occur in Indonesia.

Being flat and levelled with levees, paddy field will not cause soil erosion, on the contrary paddy field tends to prevent soil erosion from strong rainfall. Besides paddy field can retard runoff by storing rainwater in a field. A part of stored water will be leached out of soil layer to augment groundwater.

Thus, irrigation for lowland paddy is rather different from that for upland crops. Other problems such as water related diseases, effect to downstream area, social problems, etc. will, however, be common issues to be examined.

4. Methods of Environmental Impact Assessment

4.1 Purpose of Environmental Impact Assessment (EIA)

The purpose of EIA is to present the likely environmental impacts of a proposed project, plan or policy so that a rational decision can be made upon its implementation. EIA also contributes to the reduction or mitigation of adverse impacts by proposing a number of project alternatives. Project alternatives may include alternative sites, alternative processes or alternative implementation schedules. The earlier it is carried out in the planning process, the more EIA may optimize the project design, from both economic and environmental points of view. For this reason, EIA is sometimes referred to as Early Identification of Alternatives. When applied in this way, EIA may also contribute to the sustainability of the resource use and environmental soundness of the executed projects.

The results of the assessment have to be presented in a proper and understandable way in a document called the Environmental Impact Statement (EIS). This document gives an overview of the beneficial and adverse impacts of the proposed project and the presented project alternatives.

4.2 Participants in the EIA process

(1) The proponent

The proponent is the person or group of persons who wishes to establish or carry out a proposed development activity, which is considered to have impacts on the environment. The proponent, sometimes called the initiator, may be a private person, a company, or a government agency.

(2) The decision maker

The decision maker is the person or agency whose decision on the proposed activity is requested by the proponent.

(3) Interest groups

In some countries, interest groups have been established who represent the general public. These groups, who are in most case likely affected people by the proposed activity and who have keen interest in the environment as a whole.

(4) Consultants

Consultants often play an important role in the preparation of the EIS. They may be employed by either the proponent or the decision maker.

4.3 General procedure of an EIA

The EIA process can be subdivided into three main stages:

- the pre-study phase;
- the actual impact assessment, which result in the EIS; and
- the post-study period, in which the information is used to come to a decision and in which the impacts of the project are monitored.

The impact assessment starts with the collection and analysis of basic data on the project and on the environment (including both socio-economic and natural aspects) as far as it is likely to be affected. The collection and analysis of the environmental data provides a description of the so-called base line conditions. In defining the baseline conditions also the environmental effects of autonomous developments (trends), may be taken into account.

Potential impacts are identified, based on the information on baseline conditions and sources of impact. This identification involves and estimate of the order of magnitude of the impacts. Usually not all potential impacts are studied in detail. For the selection of the impacts to be studied in detail, criteria are used such as:

- the magnitude of the change;
- the extent of the affected area; and
- the significance with respect to the effects.

The process of selecting relevant alternatives and identification of the important impacts is commonly known as scoping. The scope of the EIA, which also includes agreement on the contents and requirements of the EIS, is usually determined in a number of meetings between the proponent and the decision making authority.

The actual study period concentrates on the preparation of the Environmental Impact Statement. In this phase an assessment is made of the selected alternatives and impacts. Furthermore measures to mitigate undesired, adverse impacts are proposed. In drafting the EIS, the following considerations have to be taken into account:

- the information must be clearly presented;
- the information has to be presented for the different phases of the activity (construction, operation); both direct and indirect and cumulative impacts have to be included;
- the information has to be structured in such a way that the significant impacts of each alternative are highlighted; and
- the EIS must have a summary, which is understandable for non-experts.

In some countries the pre-study phase is called the Initial Environmental Examination (IEE). The outcome of the IEE is sometimes used to determine whether or not the impacts of the proposed project are such that a full scale EIA has to be performed.

In the post-study, the EIS is reviewed, the actual decision is made and the impacts are monitored. The general outline of an environmental impact assessment is illustrated in the following figure, in which the conceptual framework of EIA studies is shown.

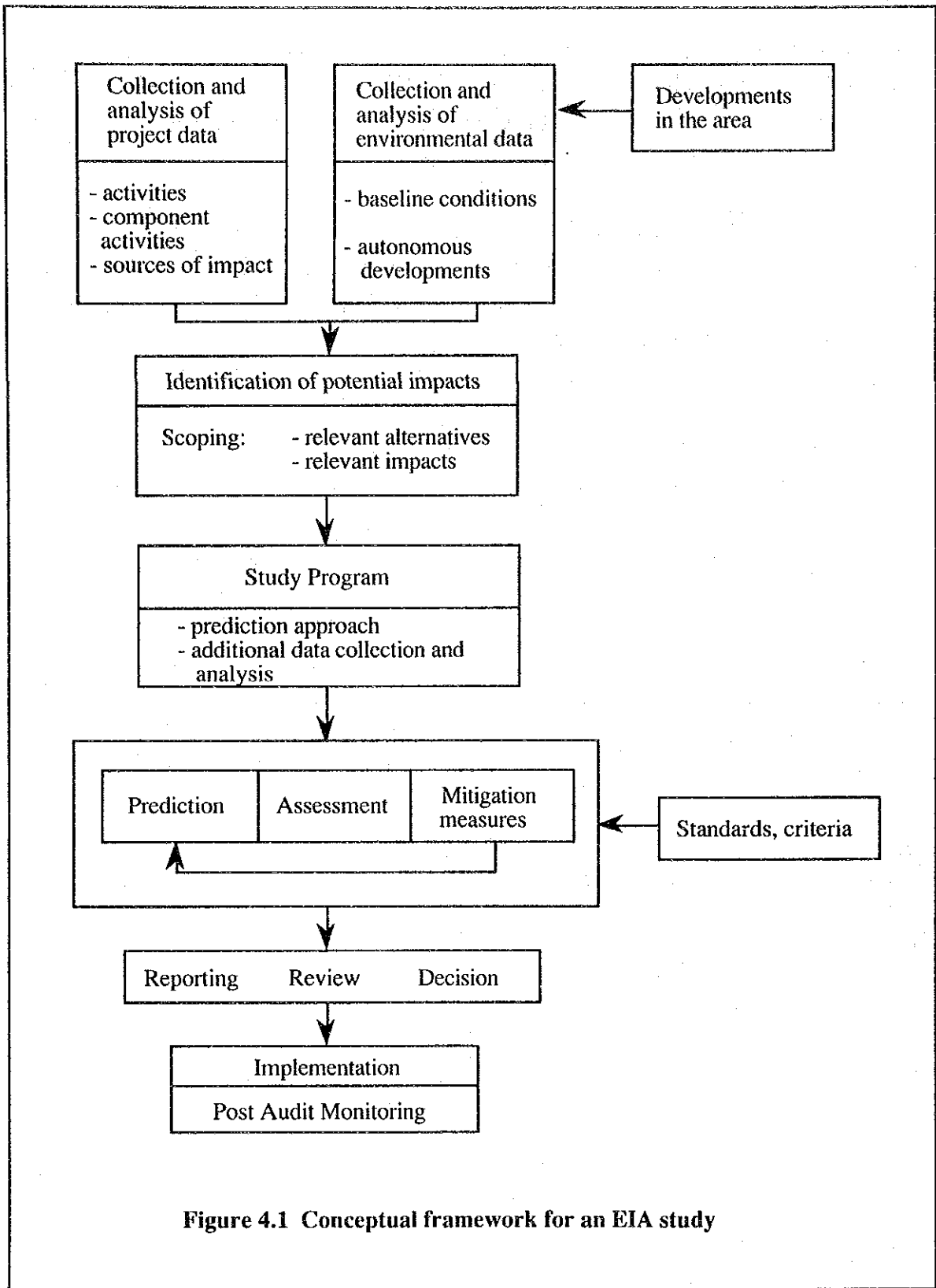


Figure 4.1 Conceptual framework for an EIA study

4.4 Field and Level of Application of EIA

(1) Field of application

For which projects or plans an EIA is obligatory differs from one country to another. There are three different approaches to the question of how to regulate the field of application of EIA. The first is an ad-hoc approach, in which a separate decision is made for each case, that is not based on a formal screening procedure. In the second approach the field of application of EIA is roughly determined, e.g. by giving certain project size thresholds, by a global screening of the environmental impacts or by applying environmental sensitivity criteria. Sometimes the screening is carried out as a formalized Initial Environmental Examination (IEE). On the basis of the results of this IEE it is decided whether or not a full scale EIA has to be carried out. In the third approach a positive or negative list is used. Such a list describes all the cases in which an EIA is, or is not, obligatory.

(2) Level of application

An EIA can be applied at various levels: at the level of individual projects, as well as at the level of strategies (plan and programs). The advantage of a policy level EIA is that it can be conducted early in the planning phase, before concrete proposals for projects are made. In this way the total scope of alternatives is larger. Also EIA's at the planning level may demonstrate the cumulative impact of a number of small projects which together form a development strategy, but are too small on a project basis for separate EIA's.

4.5 Management aspects of EIA

The main objective of an EIA is to give the environmental aspects of a proposed activity a proper place in the decision making process. This requires first of all collection of information on environmental effects of the proposed activity and secondly the use of this information by the decision maker. Many EIA's in the past have not reached their objective, because the authors failed to present the information which was required so as to be actually used by the decision maker. Experience has shown that crucial factors for success of an EIA are timing, focus on the main issues, and clear presentation of the results.

As regards the timing of an EIA, the assessment should take place as early as possible in the planning stage, parallel to other (e.g. technical design) studies. Too much detail in the EIA and EIS should be avoided. As major developments bring about other developments, which may have impacts as well, it is not always clear at which level further consequential impacts should be ignored. A good scoping procedure may solve this problem. The EIS should contain a

clear, balanced and understandable account of the impacts resulting from a proposed activity. Improperly analyzed or unclearly presented information, that is too extensive or unstructured, is of no use at all to the decision maker.

5. EIA in Indonesia

5.1 History

In response to the Stockholm Environmental Conference held in 1972, BAPPENAS established a Bureau for National Resources and the Environment, which might be the first commitment of the Indonesian Government to the principles of sustainable development and environmental protection. Professor Emil Salim was appointed to head a new State Ministry concerned with environmental affairs in 1976, which later was renamed as the State Ministry for Population and Environment (KLH). The Environmental Management Act in 1982 (Law Number 4/82) provided a legal basis for all subsequent policies. A number of Environmental Study Centers (PSLs) had been established in all national and provincial universities and in a number of private universities. The national Environmental Impact Management Agency, BAPEDAL, was established in July 1990. By the end of the decade the number of Indonesian Environmental NGOs had grown to more than 300. Another key development was the issuing of national regulations for environmental impact assessment in 1986.

5.2 EIA

Article 16 of the Environmental Management Act of 1982, Law 4/82, provides the legal basis for environmental assessment in Indonesia. As most Indonesian laws bearing upon the management of development, however, Law 4/82 does not provide operational guidelines for systematic implementation. Such guidelines awaited issuing of the Environmental Assessment Regulation (PP29 of 1986) and a series of Ministerial decrees beginning in 1987. PP29/86, known also by the mnemonic AMDAL for Analisa Mengenai Dampak Lingkungan, provides explicit guidance for the overall process.

AMDAL is an integrated review process to coordinate the planning and review of proposed development activities, particularly their ecological, socio-economic and cultural components, as a complement to the technical and economic feasibility.

Overall coordination of the AMDAL process is now under the responsibility of BAPEDAL, Authority for process implementation currently lies the Central and Provincial levels of government:

1. at the central level with 14 sectoral government departments and non-departmental government institutions, and
2. at the regional level with 27 provincial governments of Indonesia.

The goal of AMDAL is to facilitate and expedite economically sound, environmentally and socially acceptable development ventures. It involves the following essential steps:

1. Identify the potential environmental impacts of a proposed project
2. Predict the extent of impacts if the project is implemented
3. Evaluate the impacts, including:
 - a. identifying which can be mitigated or managed and how that management will be done, for example, through changes in project design or location, and
 - b. identifying and assessing the significance of those impacts which cannot be mitigated (residual impacts).

It is not necessarily that all projects are to enter the AMDAL process. The determination of potential environmental impacts will be based on the proposed project type, complexity and location.

The AMDAL process is comprised of the following documents:

PIL (Penyajian Informasi Lingkungan, or Preliminary Environmental Information)

KA (Kerangka Acuan, or Terms-of- Reference)

ANDAL (Analisis Dampak Lingkungan, or Environmental Impact Analysis)

RKL (Rencana Pengelolaan Lingkungan, or Environmental Management Plan)

RPL (Rencana Pemantauan Lingkungan, or Environmental Monitoring Plan)

AMDAL should be initiated as early as possible in the planning stages of a project.

The first point of contact for a project proponent is the responsible government authority at the national or provincial level, either:

- a. A sectoral agency,
- b. A non-departmental government institution, or
- c. The Investment Board.

The proponent is to contact the responsible agency. In case the project is private and requires foreign investment or needs assistance from the Indonesian Government, the proponent must get permit from the Investment Board (Badan Koordinasi Penanaman Modal, BKPM). The BKPM may then pass the proponent to the appropriate agency of the Central or Regional Government. Other private projects may proceed directly to the responsible government authority at the national or provincial level.

Table 5.1 General Relationship between AMDAL and Project Planning

AMDAL stage	Project Cycle Phase
Initial screening of project	Planning and program development
PIL	Pre-feasibility design
AMDAL and conceptual outline of the RKL/RPL	Feasibility design
Project Approval-in-principle	Feasibility design
Detailed RKL/RPL	Detailed design and permit
Implementation of RKL/RPL; Modification if necessary	Pre-construction; Construction; Operation; Post-project Evaluation

Initial project screening and scoping are conducted to determine whether the project type is exempt from the AMDAL Process and, if not, where in the Process it should enter. (The scoping of impacts is a critical component of the AMDAL Process, and should take place in an inter-disciplinary forum involving the proponent, consultant and all relevant government departments and public interests). Government projects and non-BKPM private projects are screened by the responsible government authority. BKPM private projects are screened by an intersectoral team coordinated by BAPEDAL.

One of four screening and scoping decisions will be made:

- a. Project is exempt from the AMDAL Process,
- b. Project is unacceptable as proposed,
- c. The proponent will be asked to prepare a PIL document when the potential impacts of a project are unknown
- d. The proponent will be asked to prepare KA for an ANDAL report when important impacts associated with the project are thought.

If the project is determined unacceptable as proposed, the proponent may revise and resubmit it, or abandon the proposal. If an AMDAL document is to be prepared, it will be reviewed by either a Central or Regional AMDAL Commission, or its designate. An AMDAL Commission may at any time make the decision to reject an AMDAL document due to inadequacies.

Table 5.2 Roles of AMDAL Commissions

	Central Commissions (Komisi Pusat)	Regional Commissions (Komisi Daerah)
Established by:	Each sectoral Minister or Head of non-departmental government agency	Governor.
Chaired by:	Typically the Secretary General of the agency	Typically Provincial Development Planning Bureau (BAPPEDA)
Permanent members:	Ministry of Home Affairs; BAPEDAL; University or other experts; agency representatives.	Provincial office of the State Ministry of Population and Environmental Study (BKLH); Environmental Study Center in the Province (PSL)
Temporary members:	May include members of the local community, non-governmental organizations, other governmental agencies affected by the proposal, and the Investment Board.	

If a PIL is prepared first, a decision will be made within 30 days of its submission to:

- a. Proceed to KA for an ANDAL, because the PIL has shown that there are potentially important impacts. Preparation of the KA is the responsibility of the proponent. Approval and sign-off are the joint responsibility of the proponent and government,
- b. Proceed to the RKL/RPL, because impacts are not significant and can be mitigated and managed.

After the KA are approved, the proponent will submit an ANDAL report to the responsible AMDAL Commission. It is desirable that ANDAL contain at least conceptual RKL and RPL documents. The Commission has 90 days in which to decide to:

- a. Reject the project because the associated impacts are unacceptable, in which case the proponent may revise or abandon the proposal,
- b. Allow the project to proceed to RKL and RPL. The decision approving the ANDAL expires if the proposed activity is not implemented within 5 years of it.

Once PIL or ANDAL report is approved, the proponent will be asked to submit the proposed RKL and RPL¹. These documents should be based on feasibility-level project design.

¹ It is desirable that the PIL and ANDAL documents contain at least conceptual RKL and RPL documents, such that the reviewer can be aware of which of the identified impacts can be mitigated and managed. At least one agency, the Department of Public Works, requires this.

After the RKL and/or RPL are submitted, the responsible AMDAL Commission has 30 days in which to make a decision on the document(s). They may be approved with or without conditions.

Final decisions on projects reviewed at the national level are made by the sectoral Minister, on recommendation of the Central AMDAL Commission. Decisions on projects reviewed at the provincial level are made by the Governor, on recommendation of the Regional AMDAL Commission.

Detailed engineering design and associated permits follow the AMDAL decision-in-principle, and incorporate the conceptual environmental management and monitoring conditions laid out in the feasibility design. Components of the environment that can not be licensed, such as important ecological values, must be adequately addressed in the RKL and RPL.

6. Technical Guidelines for AMDAL on Irrigation Projects

In accordance with the Act No.4/82, followed by PP29/86, Minister of Public Works issued the decree No.46/PRT/1990 concerning Technical Guidelines for the Management of AMDAL of Public Works Projects. Based on the Decree No.46/PRT/1990, a series of Technical Guidelines for the Management of Analysis of Environmental Impacts of Public Works Projects have been issued.

The guidelines have been prepared aiming to provide more detailed guidelines for preparation of AMDAL documents in order to ensure more accurate analysis of the impacts brought about by the project activities. Besides, the Technical Guidelines are expected to serve as reference for the project initiators in the preparation of AMDAL documents. So far 11 volumes of guidelines have been issued, including

- | | |
|--------------------------------------|-----------------|
| 1) Ground Water Irrigation Projects | (779/KPTS/1990) |
| 2) Surface Water Irrigation Projects | (779/KPTS/1990) |
| 3) Swamp Water Irrigation Projects | (779/KPTS/1990) |
| 4) Road and Bridge Projects | (779/KPTS/1990) |
| 5) Waste Management Projects | (779/KPTS/1990) |
| 6) Waste Water Management Projects | (779/KPTS/1990) |
| 7) Municipal Drainage Projects | (779/KPTS/1990) |
| 8) Water Supply Projects | (779/KPTS/1990) |
| 9) Human Settlement Projects | (184/KPTS/1991) |

- 10) Flood Control and River Regulation Projects (184/KPTS/1991)
 11) Reservoir Projects (412/KPTS/1992)

Of the above 11 guidelines, items 1) to 3), and 11) will be related to irrigation projects. Those four guidelines classify the projects according to the project scale whether they need EIA. They are tabulated as below:

Table 6.1 Classification of Ground Water Irrigation Project by Scale

Categories I (ANDAL)	Categories II (PIL/ANDAL)	Categories III (PIL/No AMDAL)	Categories IV (No AMDAL)
Interval of wells <100 m	Interval of wells <500 m	Interval of wells 500-1,000 m	Operation and Maintenance of Irrigation Network
Pump Capacity >60 liter/sec	Pump Capacity >30 liter/sec or near residence and seashore	Pump Capacity <30 liter/sec	

Source: Petunjuk Teknis Analisis Mengenai Dampak Lingkungan Proyek Irigasi Air Tanah 1990 Departamen Pekerjaan Umum.

Table 6.2 Classification of Surface Water Irrigation Project by Scale

Categories I (ANDAL)	Categories II (PIL/ANDAL)	Categories III (PIL/No AMDAL)	Categories IV (No AMDAL)
Large Scale Irrigation Development >5,000 ha	Medium Scale Irrigation Development 2,000-5,000ha	Small Scale Irrigation Development <2,000 ha	Operation and Maintenance of Irrigation Network
	Upgrading and Rehabilitation >5,000 ha	Upgrading and Rehabilitation <5,000 ha	

Source: Petunjuk Teknis Analisis Mengenai Dampak Lingkungan Proyek Irigasi Air Permukaan 1990 Departamen Pekerjaan Umum.

Table 6.3 Classification of Swamp Irrigation Project by Scale

Categories I (AMDAL)	Categories II (PIL/AMDAL)	Categories III (PIL/No AMDAL)	Categories IV (No AMDAL)
Tidal Irrigation Development >10,000 ha	Tidal Irrigation Development 5,000-10,000ha	Tidal Irrigation Development <5,000 ha	Operation and Maintenance of Irrigation Network
Swamp Irrigation Development >5,000 ha	Swamp Irrigation Development 2,000-5,000 ha	Swamp Irrigation Development <2,000 ha	-
-	Upgrading Tidal Irrigation Development 10,000-60,000 ha	Upgrading Tidal Irrigation Development <10,000 ha	-
-	Upgrading Swamp Irrigation Development 5,000-30,000ha	Upgrading Swamp Irrigation Development <5,000 ha	-

Source: Petunjuk Teknis Analisis Mengenai Dampak Lingkungan Proyek Irigasi Rawa, 1990 Departamen Pekerjaan Umum.

Table 6.4 Classification of Reservoir Project by Scale

Categories I (AMDAL)	Categories II (PIL/AMDAL)	Categories III (PIL/No AMDAL)	Categories IV (No AMDAL)
Large Scale Irrigation Development >5,000 ha or Project of Significant Impact	Medium/Small Scale Irrigation Development <5,000 ha	Planning, Education, and Training about Dam Project	the same as Categories III

Source: Petunjuk Teknis Analisis Mengenai Dampak Lingkungan Proyek Bendungan, 1990 Departamen Pekerjaan Umum.

Each guideline describes the requirement and depth of environmental impact analysis according to the project stage. Since the work activities in many cases differ from one project to another, only general (not specific) description on environmental impacts is given as a matrix in the guideline. An example is shown on Table 6.5, for surface water irrigation project.

As seen in the table, impact on local people is main concern at any project stage. Land acquisition and relocation issues are the most serious impact to be considered explicitly. Compensation cost and circumstances of relocated area often dissatisfy affected people, which cause friction with the government. Participatory approach should be taken at the beginning of the project cycle (planning stage) to avoid such conflict as much as possible so that consent regarding project implementation can be obtained from all or at least majority of affected people. Information extension will also be an important approach to the people.

At the construction stage, unavoidable disturbance such as air pollution (by dust), vibration by transportation device or machinery, etc. is expected with mobilization and construction works. To minimize such annoyance, hearing from the affected people should be required in order to promote well-managed construction implementation.

River water will be turbid during the construction of weir and its appurtenant structure, which may affect people in the downstream area. To what extent the impact will reach is not known, but information regarding duration of the construction works should be notified to those likely affected people prior to the commencement of the work.

Even after the completion of the project, impact of the structures and change in lifestyle on local people will be followed. Once any problem or issue is found, certain measures should be taken. However, in this stage, impacts may be unclear since they will be caused not only by single factor but by other factors. Examples are sedimentation in canals which may related to the change in landuse in the upstream area, and the use of chemicals in the rice field which may affect water quality in the downstream area as well as farmers' health. Joint or coordinated monitoring with other related agencies such as the Ministry of Agriculture should be made.

Table 6.5 Matrix of Technical Guidelines for Surface Water Irrigation (Weir Type) Project

Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Alternatives of impact mitigation	
				Management	Monitoring
Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Management	Monitoring
I. Pre-construction	1. Deciding the dam location and canal traces 2. Land acquisition 3. Relocation of residence	a. Community's socio-economic conditions	Social unrest	Information about the project to the community and concerned agencies	- Issues within the society - Reaction from other agencies
		b. Natural resources and cultural heritages	Substantial damages	- Avoid areas sensitive to deterioration - Adjust to the spatial plan/regional potentials	- Social unrest - Reaction from other agencies
		a. Ownerships of land, crops and buildings b. Community's source of living	- Dissatisfied with the compensation. - Disappointment in the project - Stagnations to the project - Change to/loss of source of living	- Information extension and approach to the community - Reasonable compensation	Community's attitude and perceptions Community's attitude and perceptions
II. Construction	1. Mobilization of material and heavy equipment	a. Residence relocated	- Disappointments in the new location and occupation in the new location	- Initiate change of occupation - Priority for employment for local community - Information extension and approach to the community	Community's attitude and perceptions Community's attitude and perceptions
		b. Residents of the new location	- Social jealousy and frictions	- Suitable location for settlement - New location having about the same socio-economy and cultural conditions	Attitudes and perceptions of the people to be relocated
A. Construction Preparation		a. Environment/neighborhood/dwellings and public buildings	- Increase of air pollution (dust) and noise	- Adjustment of transportation means - Control of vehicle speed - Regular showering	- Community's complaints

Table 6.5 Matrix of Technical Guidelines for Surface Water Irrigation (Weir Type) Project

Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Alternatives of impact mitigation	
				Management	Monitoring
2. Mobilization of manpower	3. Land opening and clearing	<ul style="list-style-type: none"> b. Public infrastructure/roads Community's socio-economic conditions a. Environment/neighborhood/dwellings and public buildings b. Biotic Resources c. Water resources d. Public utilities, telephone, gas, electric lines, etc. 	<ul style="list-style-type: none"> - Damage to public infrastructure/roads - Social unrest and jealousy - Interaction with local customs - Increase of air pollution (dust) and noise - Loss of covering vegetation and change of land functions - Increase of water pollution due to erosion of the land - Effects to public utilities - Increase of air pollution (dust) and noise - Increase air pollution (by dust), and noise - water inundation - pollution to water resources and water bodies - effects on flora and fauna 	<ul style="list-style-type: none"> - Upgrading/repair of public infrastructure/roads used - Suitable transportation 	<ul style="list-style-type: none"> - Social unrest
				<ul style="list-style-type: none"> - Job priorities to local community - Proper implementation - Planting of trees in the substitute location/empty land around the project - Drainage management - Relocation and repair of the damages - Management of the implementation - Regular showering - Arrange the implementation - Use of noise barriers and dust filters - Good drainage - Provide a waste pool - Good drainage system - Waste pool - Dust filters and noise barriers 	<ul style="list-style-type: none"> - Community's complaints - Balance of biotic resources - River water quality - Proper functioning of public utilities - Community's complaints - Community's complaints - Quality of the water resources - Floral and fauna conditions
4. Construction of access road	<ul style="list-style-type: none"> a. Environment/neighborhood/dwellings and public buildings 	<ul style="list-style-type: none"> - Increase of air pollution (dust) and noise 	<ul style="list-style-type: none"> - Increase of air pollution (dust) and noise 	<ul style="list-style-type: none"> - Management of the implementation - Regular showering 	<ul style="list-style-type: none"> - Community's complaints
5. Erection/operation of base camp, workshop, warehouse, etc.	<ul style="list-style-type: none"> a. Neighborhood/housing and public buildings b. Water resources c. Biotic resources 			<ul style="list-style-type: none"> - Increase air pollution (by dust), and noise - water inundation - pollution to water resources and water bodies - effects on flora and fauna 	<ul style="list-style-type: none"> - Good drainage - Provide a waste pool - Good drainage system - Waste pool - Dust filters and noise barriers

Table 6.5 Matrix of Technical Guidelines for Surface Water Irrigation (Weir Type) Project

Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Alternatives of impact mitigation			
				Management	Monitoring		
B. Construction 1. at dam location	6. Quarry management (by project) 6.1 Material quarrying (on land)	a. Neighborhood/housing and public buildings	- Increase air pollution (by dust), noise and vibration	- Arrange the implementation - Arrange work hours	- Community's complaints		
		b. Field resources	- Erosion/landslide	- Implementation by phases - Reclamation of alternative phases - Water resources	- Erosion level - Land stability - Relocation		
		c. Water resources	- Effects on the quality & quantity of water - Shallowing/sedimentation in upstream	- Good drainage - Settling basin	- Sedimentation level - Water quality		
	6.2 Material quarrying (in the river)	a. Water resources	- River water quality - River way erosion - Stability of water structure	- Proper location - Proper amount of quarrying	- River water quality - Structure stability		
		b. Users in the upstream	- Effects on user in the upstream		- Complaints from water users in the upstream		
	1. Draining (partly/whole) the site	- Water resources	- Decrease in the riverflow capacity		- Implementation at low debit	- Higher river level in the upstream	
		2. Earth work (dredging) in riverbody	- Water resources	- Increased pollution to the river water - Effects to water users in the upstream	- Proper construction arrangements - Information to water users in the upstream	- Water quality - Unrest of water users in the upstream	
		3. Construction of dam and facilities	- Neighborhood/housing and public buildings	- Noise & vibration from foundation pile erection	- Proper construction system		- Community's complaints

Table 6.5 Matrix of Technical Guidelines for Surface Water Irrigation (Weir Type) Project

Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Alternatives of impact mitigation	
				Management	Monitoring
2. at the spillway & drainage	4. Earth and building material transportation	<ul style="list-style-type: none"> - Neighborhood/housing and public buildings - Public infrastructure/roads 	<ul style="list-style-type: none"> - Increase air pollution (by dust) and noise - damages to public infrastructure/roads 	<ul style="list-style-type: none"> - Control of vehicle speed - Repair/upgrading of the infrastructure used - Suitable transportation 	<ul style="list-style-type: none"> - Community's complaints - Infrastructure condition
	1. Digging and dredging of canals	<ul style="list-style-type: none"> - Public infrastructure/roads - Water resources (canal rehabilitation) 	<ul style="list-style-type: none"> - damages to public infrastructure/roads - Traffic congestion - increased pollution to water 	<ul style="list-style-type: none"> - Proper implementation - Repair to the damages - Arrangement of work hours - Information to water users in the upstream 	<ul style="list-style-type: none"> - Infrastructure condition - Community's complaints - Water quality
III Operation and Maintenance	1. Drowning in the upstream part	<ul style="list-style-type: none"> - Community's socio-economic conditions - Biotic resources - Field resources 	<ul style="list-style-type: none"> - Effects to agricultural activities - Effects to water users in the upstream - Changes of field aesthetics 	<ul style="list-style-type: none"> - Cropping patterns - Implementation - Repair to damages - Information to water users in the upstream - Cropping patterns 	<ul style="list-style-type: none"> - Infrastructure conditions - Community's complaints - Water quality
				<ul style="list-style-type: none"> - Proper dumpsite location & dump system - Afforestation - Repair to damages 	<ul style="list-style-type: none"> - Field aesthetics - Field use
			<ul style="list-style-type: none"> - Change of community's living pattern - Change of aquatic habitat in the upstream and downstream part - Land stability 	<ul style="list-style-type: none"> - Information and approach to community - Provision of adequate facilities 	<ul style="list-style-type: none"> - Biotic balance
			<ul style="list-style-type: none"> - Land stability 	<ul style="list-style-type: none"> - Enforcement of labil areas 	<ul style="list-style-type: none"> - Landslides

Table 6.5 Matrix of Technical Guidelines for Surface Water Irrigation (Weir Type) Project

Stage	Activities likely to cause impacts	Environment to be affected by the impacts	Impact assessment and evaluations	Alternatives of impact mitigation	
				Management	Monitoring
2. at the spillway	2. Dam operations	<ul style="list-style-type: none"> - Water resources - River morphology 	<ul style="list-style-type: none"> - Conflicts in water use - Change of riverway and riverbody - Effects to river infrastructure 	<ul style="list-style-type: none"> - Priority of water use - Arrange cropping pattern - Reef enforcement 	<ul style="list-style-type: none"> - Community's unrest - River body stability
	<ul style="list-style-type: none"> 1. Operations of irrigation canals/structure 2. Maintenance of irrigation canals/structure 	<ul style="list-style-type: none"> - Community's socio-economic conditions - Water resources 	<ul style="list-style-type: none"> - Effects to riverside community's mobility - Increased turbidity of irrigation water - Effects to activities in rice fields 	<ul style="list-style-type: none"> - Enforcement of infrastructure - Crossing bridge at proper location - Proper implementation - Cropping pattern arrangement 	<ul style="list-style-type: none"> - Infrastructure functions - Community's complaints - Agricultural activities - Water quality
3. Canals	<ul style="list-style-type: none"> - Maintenance of canals 	<ul style="list-style-type: none"> - water resources 	<ul style="list-style-type: none"> - Increased turbidity of irrigation water - Effects to activities in the upstream 	<ul style="list-style-type: none"> - Proper arrangements 	<ul style="list-style-type: none"> - Water quality
4. In the rice fields	<ul style="list-style-type: none"> - Application of pesticides 	<ul style="list-style-type: none"> - Farmers 	<ul style="list-style-type: none"> - Effects on health of farmers 	<ul style="list-style-type: none"> - Use of masks - Good implementation - Information 	<ul style="list-style-type: none"> - Farmers' health conditions
	<ul style="list-style-type: none"> - Improper management of river basin 	<ul style="list-style-type: none"> - water resources - Biotic resources - Water resources 	<ul style="list-style-type: none"> - increased pollution to spilled water - Weeds along the structure - Effects to habitat - Increased levels of erosion/sediments/wastes - Shorter lifetime of dam 	<ul style="list-style-type: none"> - Information - Use proper pesticides/chemicals - Information - Information - Reforestation, terraces, checkdams 	<ul style="list-style-type: none"> - discharged water quality - plant diseases - Sedimentation/pollution levels
5. Along the river basin		<ul style="list-style-type: none"> - Field resources 	<ul style="list-style-type: none"> - Deteriorated upstream 	<ul style="list-style-type: none"> - Proper agriculture system in the upstream 	

Annex I

Database and its Management

ANNEX I

DATABASE AND ITS MANAGEMENT

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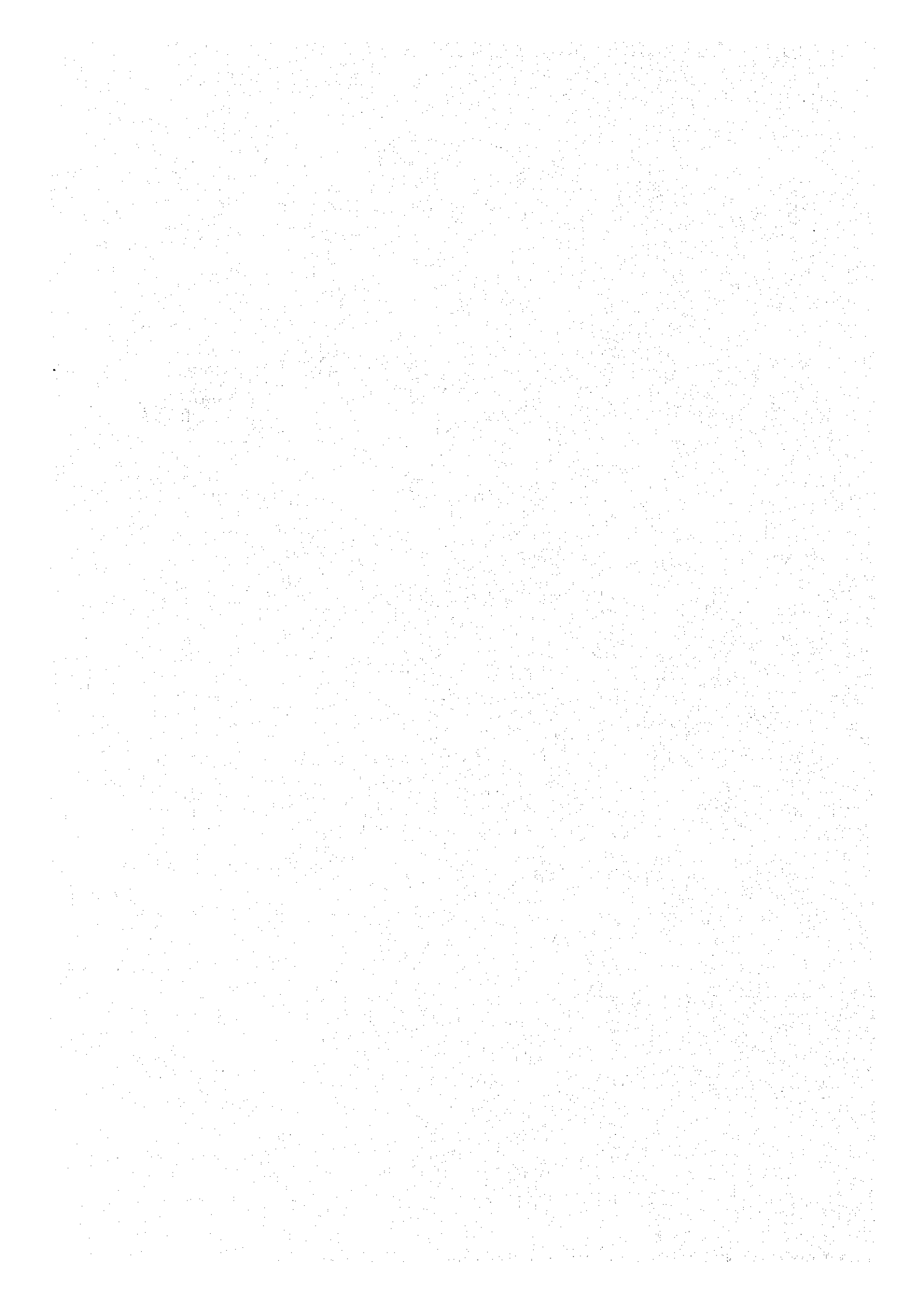
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Text



1. Introduction

A Computer database is very powerful tool to store collected information in proper manner and to get information whenever it may required. In connection with the study, the database was prepared basing upon data obtained throughout the inventory survey and fully utilized to analyze present status of irrigation schemes and formulation of future development planning.

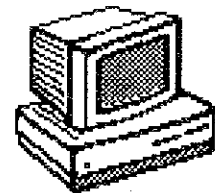
Directorate of Water Resources Planning (BPP), Directorate General of Water Resources Development, which have understood necessity of integrated database management for irrigation system, intended to update the stored data periodically for future management. Then BPP requested the team to hand over the database system for planning and programming. In response to the request by BPP, the team hands over the system containing computer program for data storage and retrieval, collected data.

This annex, first, explains what the computer database can do, making a telephone directory a sample. Secondly, in Chapter 3, the computer database in the study is outlined. Consequently, operation manual of computer database and system reference are presented in detail in Chapter 4 and Chapter 5, respectively.

A person in a management level will get what the system can do, by going through chapter 3. A person who operate the system and who is responsible for data maintenance, can move to Appendix - 1, that describes how to operate the system. On the other hand, Appendix - 2 will be very useful for a person who have knowledge of database system and will maintain the system.

2. What Database Can Do?

Database is computer jargon for a familiar and essential item in our everyday lives. A database is a collection of information organized and presented to serve a specific purpose.



One of the more familiar database examples is the telephone directory. This common printed database contains the names, addresses, and telephone numbers of individuals, businesses, and government agencies. The addresses and telephone numbers have little value by themselves. They are useful only when they are related to a name.

The number of databases in common use is astonishing. Some common databases are a dictionary, a cookbook, a mail-order catalog, an encyclopedia, a library's card catalog, your

checkbook, and so on. Other familiar databases are stock market reports in newspaper, an accounts receivable ledger, and a personnel file.

Why are these examples databases? Why isn't the newspaper or a nonfiction book considered a database? After all, these also contain information. The reason is specific. In case of the examples given above, information is presented in a manner that makes it easy for you to locate some particular piece of information.

In the telephone directory, the telephone numbers and addresses are related to the name. The names are presented in alphabetical order so you can find them easily. Find the name and you can find both the address and the telephone number. The name is the Key to using the phone book. A dictionary works similarly : There is a word and a definition. The words are listed alphabetically so that they can be found, and the definition is related to the word. The key to the dictionary is the word.

The common element in all of the examples is organized information presented in a way that makes it easy to find by use of a key. In other words, any information that can be presented as tables (rows and columns) can be a database. Some examples of column headings in tables that could be considered databases are shown in following figure:

Examples	Column Headings			
PHONE BOOK:	NAME	ADDRESS	PHONE NUMBER	
DICTIONARY:	WORD	DEFINITION		
CATALOG:	ITEM	DESCRIPTION	SIZE	PRT NO. COST
STOCK REPORT:	STOCK	SHARES	HIGH	LOW

What's a database?

By now, you should have a general concept of a database and you might be asking, "okay, but what's a computer database file? What can I do with it that I can't do without it?" The computer database file can't do anything you couldn't do yourself from a printed database. However, many things are just more practical to do with a computer than without a computer.

We have all found a scrap of paper with a phone number on it - no name, just a number. If we want to discover the name that belong to the number, the telephone book isn't much help. If, However, the telephone directory is a computer database file, we can ask the computer to check the phone number and the name will promptly appear.

Suppose you want the phone number of someone named Smith who lives on Santa Monica Boulevard in Los Angeles. You can ask the computer's Los Angeles phone book file for the names, addresses, and phone numbers of all the Smiths on Santa Monica Boulevard. It may not give you a single name and numbers, but it will surely narrow down the search.

The computer is no panacea. It can't do anything you can't. but, it can help you do the things you want to do quickly and easily. It is a tool to help you accomplish things that are simply not practical without it.

Using a personal phone book as an example, a simple database might resemble the one shown in next figure. Of course, a real database file can contain many more items of information. In fact, this database is much better kept in a small notebook than in a computer. You can carry it around with you, make notes in it; and it's a lot cheaper. To get value from a computer you need to have a lot of information - in general, so much information that you can't use it efficiently without the computer.

Conceptually, a computer database file is just like one that you could create from paper and pencil. Because both a paper database and a computer database file exist to be used, an appropriate question is: What do you actually do with your phone book?"

Name	Address	Phone Number
Byers, Robert A Sr	9999 Glencrest, Standale	555-9242
Byers, Robert A Jr	48 N. Catalina, Pasedena	555-9540
Cassidy, Butch	4800 Rimrock Ct. Sunland	555-1121
Goose, Sil E.	21809 Cottage Ln., Montecito	555-8667
Prague, Burton	67343 301 Trail N., Boca Del	555-4665
Prague, Cary	60 Crosskey, Windsor	555-6887
Zeus, Thor T.	25 Lightning Lane, Greece	555-6878

A Simple Database

You write in new acquaintances, perhaps change the addresses or telephone numbers of people who move or get phone. Maybe you cross some people out (or erase them, if you've had enough foresight to keep your record in pencil). When you want to use the information stored there, you may be trying to make a call, data - reflects a process of change and, at any given time, will supply you with the information you are looking for. The same is true of a computer databases file. You can easily add, remove, or change the information in a computer database file. Likewise, you can easily view information from your database file.

In your everyday activities, you are always adding and subtracting from information at hand, changing it, selecting what you want to see, and ignoring what you don't want to see. This activity is basic to the thinking process. But, you are going to put all this information that you are so accustomed to having strewn about - where you can see it and touch it - into a computer database file.

Now, there will be something holding this information, something between you and data. Once you begin to use the computer you need to become comfortable with the idea that the data is inside the "blinking box." Even though you can no longer "touch" the information, it is there when you need it. After you become comfortable with this knowledge, you will be amazed at how many ways a computer database file can fulfill your information needs.

Using your computer will become as easy as using your phone book. It will take some thought, some planning, and some "how-to" knowledge. You need to know how to create, how to use, and how to change your store of information. In the learning process, you won't have to reinvent the wheel. You are only learning a new function - a new set of mechanics for a new machine - designed to support your efforts to perceive and process information already familiar to you.

3. Database System in FIDP

This chapter outlines the computer system used in the study and presents what is input and output of the system.

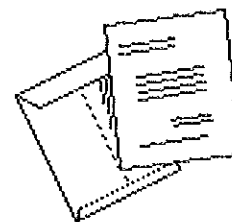
3.1 General

Data that consist the system are based on the inventory survey conducted from July to August, 1992 in all Provinces in Indonesia. The objectives of the survey are (1) to collect data on all the irrigation schemes for the study and (2) to clarify the status of irrigation development, especially real development potential and/or necessity of upgrading or special maintenance works for existing schemes and on the study stage and depth for the new development schemes. As for result of analysis in the survey, refer Annex - E, "Inventory Survey."

Inventory survey was carried out for three categories ; (i) surface irrigation scheme, (ii) swamp irrigation scheme and (iii) groundwater irrigation scheme.

3.2 Questionnaire

Questionnaires for inventory survey were prepared and finalized after trial inventory survey in Jawa Barat. The following three (3) kinds of questionnaires were prepared according to the type of development;



- Surface irrigation development,
- Swamp development, and
- Groundwater development.

Data items collected by the inventory survey are as follows;

Location of scheme
Classification of Scheme
History
Present status of scheme, especially area
Future status after implementing construction / rehabilitation Works
Feature of irrigation facilities
Construction / rehabilitation cost, if any
Environmental Aspects

Questionnaire is attached to Appendix 2 in this Annex.

3.3 Selection of Scheme

Selection of inventoried scheme was made in following manner;

Surface irrigation development scheme

Existing scheme : schemes indicated in "Rekapitulasi Inventarisasi Daerah Irigasi Pemerintah, 1991". However, scheme which planned area is less than 150 ha were excluded from the inventory survey since PU intends to transfer all small scale scheme up to 150 ha to farmers' group.

On-going and Proposed scheme : all schemes indicated in the list of on-going scheme and proposed scheme obtained at Provincial Office.

Swamp development scheme

Existing scheme : schemes indicated in "Inventarisasi Luas Pemamfaatan Lahan Rawa Pasang Surut (PRS) dan Rawa non Pasang Surut (PNPS)" (Inventory of Land Potential on Tidal Swamp and Non-Tidal Swamp). Schemes that function as only fishery were excluded.

On-going and Proposed scheme : all schemes indicated in the list of on-going scheme and proposed scheme obtained at Provincial Office.

Groundwater development scheme

Only data and information of On-going scheme and Proposed scheme will be collected based on scheme list available at Provincial Office.

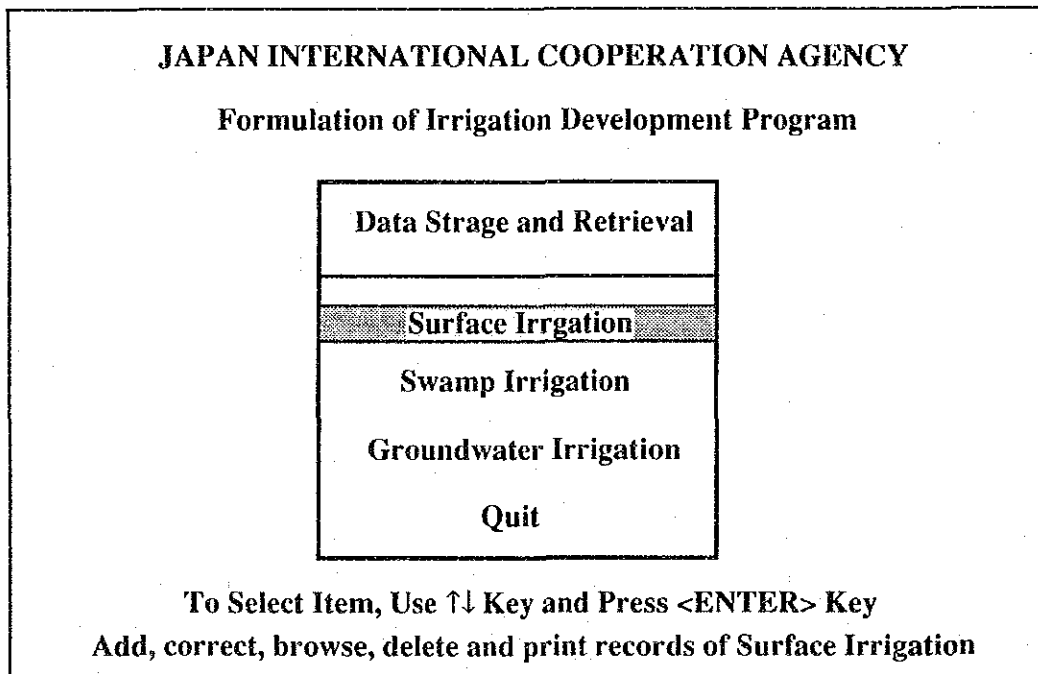
Procedure of Selection of the inventoried scheme is given in Figure 3.1.

3.4 Description of the System

This section is main part of the chapter and gives you what the system can do.

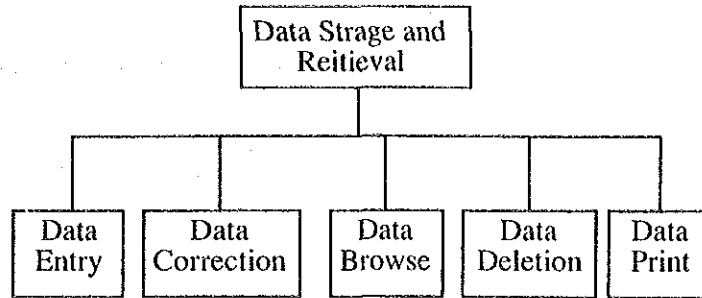
The database system consists of three sub-system; (i) Data storage and retrieval (ii) Print report, and (iii) System maintenance.

User-friendly interface is considered in this system so that even user, who has no knowledge of computer database system, can operate it easily. Most operation can be made by selecting menu as shown below;



3.4.1 Data Storage and Retrieval Sub-system

Sub-system of data storage and retrieval is further divided into five (5) menus, that are shown below;



Data Storage and Retrieval Menu

Data entry sub-menu is used when you want to register data of new irrigation scheme. When following instruction appears on the display, you can proceed data entry. First of all, you are prompted to enter an identification code (I.D.Number) of irrigation scheme. In this system, code no. of inventory of irrigation system made by Directorate Irigasi I is adopted. Note that this I.D.Number is important to identify schemes and no change is allowed. And then, enter scheme name and relevant data. After confirmation if the entered data is correct, data is added to the master file.

Once data is registered, you can correct the data whenever you may require. Further, you can delete, browse, print entered record, if necessary. In any case, select particular menu and enter I.D.Number to search. The computer searches the record in which same code as specified one is contained. Data to meet the condition is retrieved from the master file and appears on the display. Otherwise, message of "**I.D.Number xxxxxxxx is not found**" should appear on the display and ask you to re-enter the code number. After retrieving data, you may proceed such session as data correction, data deletion, data reference, and data printout. In case of data correction and data deletion, computer asks whether the corrected data is to be re-registered into the master file. If you don't want to change contents of record, quit without update the data. Note that contents of remains unchanged in both data reference and data printout sessions.

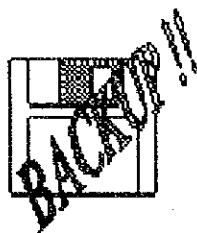
3.4.2 Report Sub-system

Once the records are stored into database system, you can utilize the data freely and print out data by any format you want. In the system, following kinds of output formats are provided for each category of irrigation;

- | | | |
|-----|-------------------------------|----|
| (1) | Surface irrigation scheme | 12 |
| (2) | Swamp irrigation scheme | 7 |
| (3) | Groundwater irrigation scheme | 2 |

These print out can be obtained just only selecting Province and the Format No. Sample of Printout format is presented in Table 3.1.

3.4.3 System Maintenance Sub-system



This system maintenance sub-system is used to keep data and the system in proper condition. Frequent backup of stored data is essential for preventing some accident because crash of computers and infection by a computer virus could result in damage of stored data. Therefore, program to make data backup from a hard disk drive of computer set to floppy disk drive is attached to the system. Furthermore, in reverse, function to restore data from floppy disk drive to hard disk drive is also installed.

3.5 Maintenance of The Computer Database

As stated in the preceding section, stored data in the system is based upon the inventory survey conducted in whole Indonesia in July, and August, 1992. Since receiving raw data the JICA Study Team have been making much effort to verify and correct data with other data source and developed computer program, but there may be, nevertheless, some discrepancy and error in the data. Meanwhile, status of irrigation schemes may vary year by year especially in irrigated area, record of construction / rehabilitation, and so on. Therefore, periodical data updating is vital to keep the computer database valuable.

The JICA Team strongly recommends BPP to check and update entered data at least once a year. BPP will request to Province to check and correct information of existing scheme and add information of new irrigation scheme to be implemented. The Team believes the first step to formulate future development plan is to collect fresh data from Province constantly and keep them in proper manner. It should be understood that value of a computer database depend on quality of information, such as (i) correctness, (ii) frequency of update data, and (iii) quickness to add latest data. Thus, it is recommended for BPP to establish organization to keep the data information system efficiently.

Tables

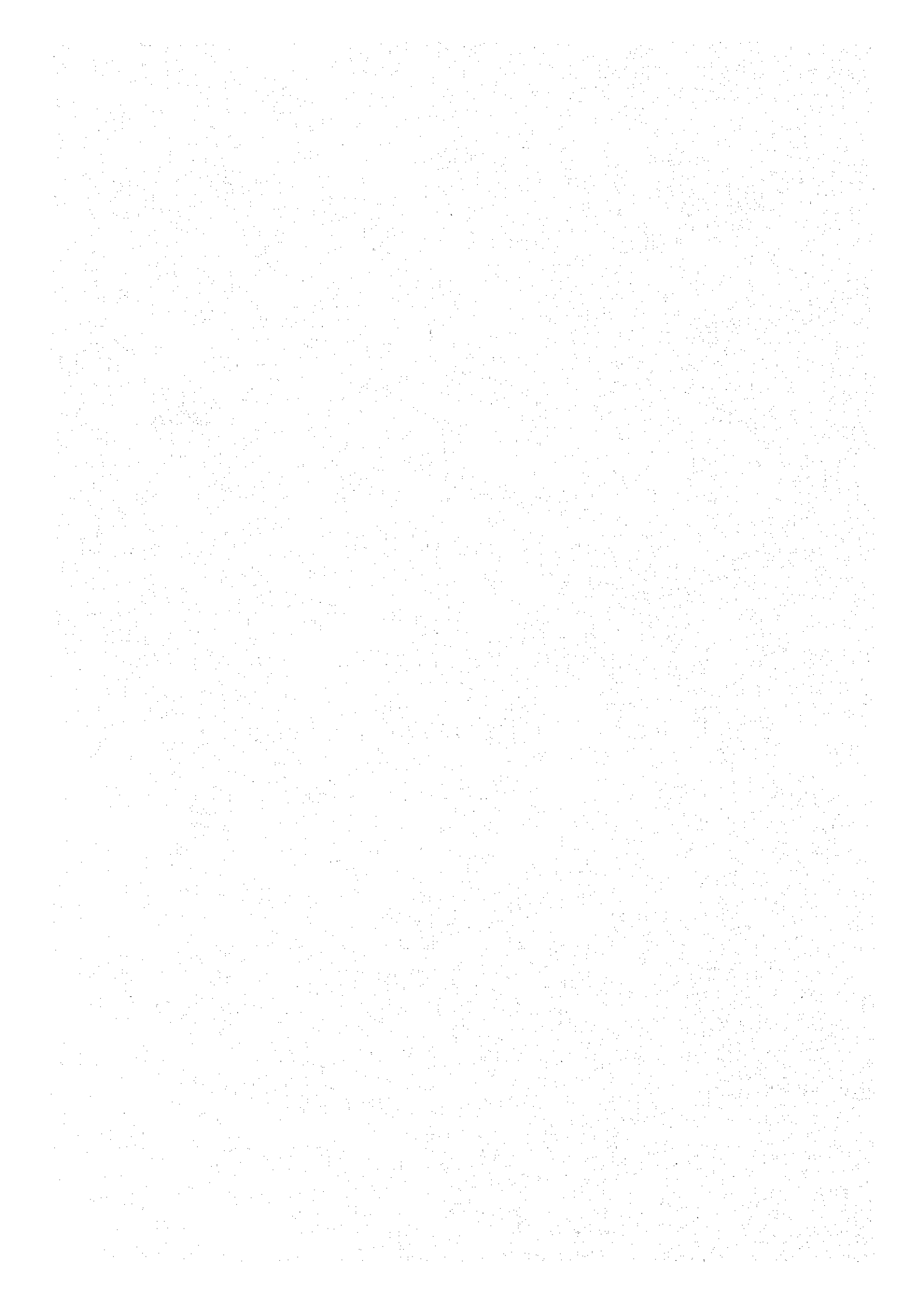
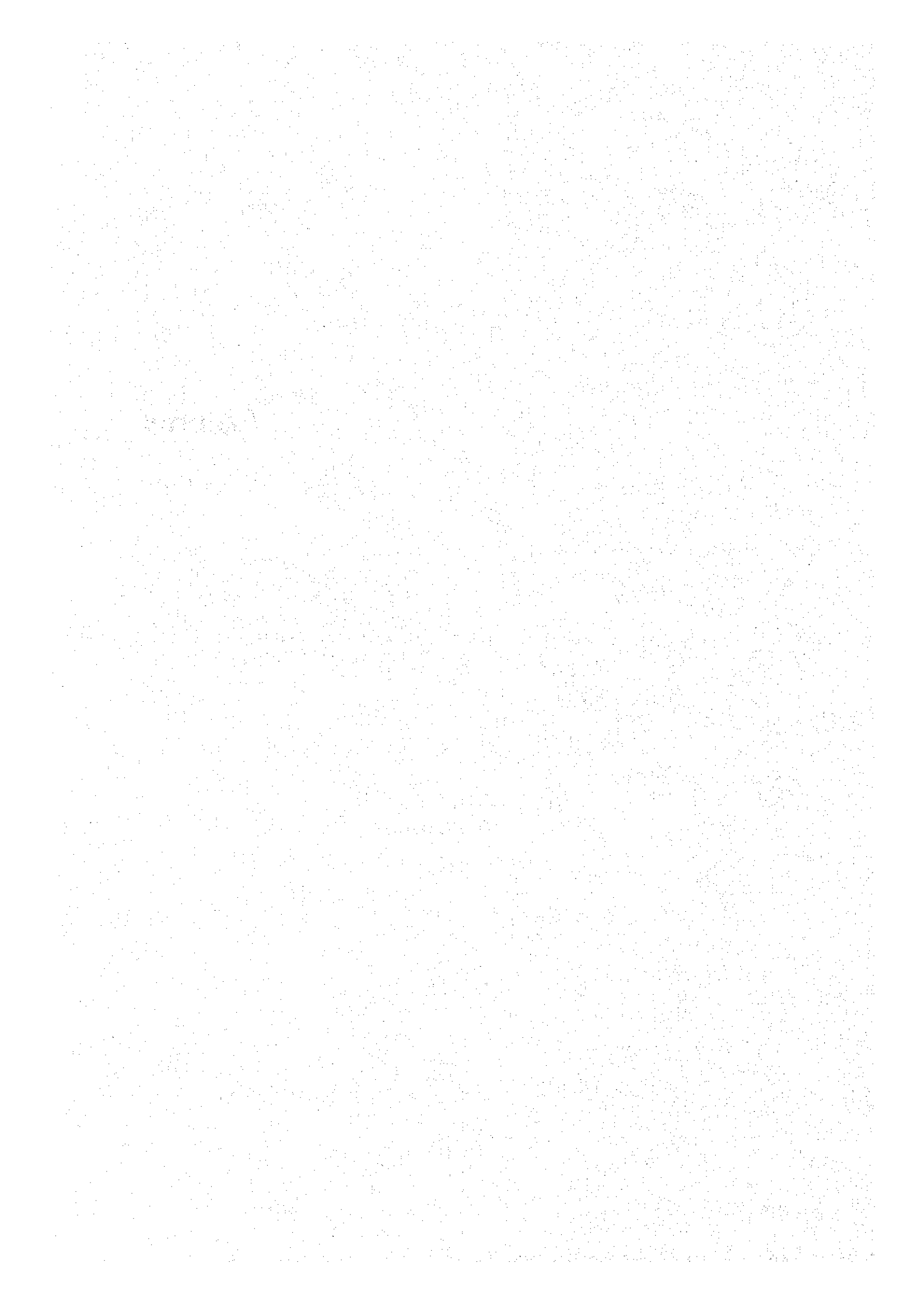


Table 3.1 Sample of Computer Printout

Printed on August 10, 1993
 Directorate General of Water Resources Development
 Formulation of Irrigation Development Program (FIDP)
 Summary Sheet of Swamp Irrigation Scheme for Inventory Survey
 Form No. : ROS
 Province : D.I. Aceh

NO.	ID. NO.	NAME OF SCHEME	ALREADY COMPLETED			TO BE CONSTRUCTED			TO BE REHABILITATED			
			DRAINAGE CANALS			DRAINAGE CANALS			DRAINAGE CANALS			
			MAIN CANALS	SECONDARY CANALS	TERTIARY CANALS	MAIN CANALS	SECONDARY CANALS	TERTIARY CANALS	MAIN CANALS	SECONDARY CANALS	TERTIARY CANALS	
1	1100010000P	Rawa Blang Ara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1100020000P	Rawa Simpang Kiri	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	1100030000P	Rawa Semenbok Padang	0.00	11.00	0.00	0.00	11.00	0.00	0.00	0.00	0.00	0.00
4	1100040000P	Rawa Yui Feuria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	1100050000P	Tata Air Tambak Simpang U	4.71	20.00	0.00	4.71	20.00	0.00	4.71	20.00	0.00	0.00
6	1100060000P	Tata Air Tambak Jeumpa	23.00	0.00	0.00	23.00	0.00	0.00	23.00	0.00	0.00	0.00
7	1100070000P	Tata Air Tambak Samalanga	10.00	8.76	0.00	10.00	8.76	0.00	10.00	8.76	0.00	0.00
8	1100080000P	Tata Air Tambak Seumendon	18.40	8.00	0.00	18.40	8.00	0.00	18.40	8.00	0.00	0.00
9	1100090000P	Tata Air Tambak Julok	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	1100100000P	Rawa Babas Nipah	3.00	0.00	0.00	3.00	0.00	0.00	3.00	0.00	0.00	0.00
11	1100110000P	Rawa Kentengger	17.00	0.00	0.00	17.00	0.00	0.00	17.00	0.00	0.00	0.00
12	1100120000P	Rawa Trumon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	1100130000P	Rawa Bakongan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	1100140000P	Rawa Kuala Bate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	1100150000P	Rawa Tripa Kanan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	1100160000P	Rawa Teupin Ara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Figures



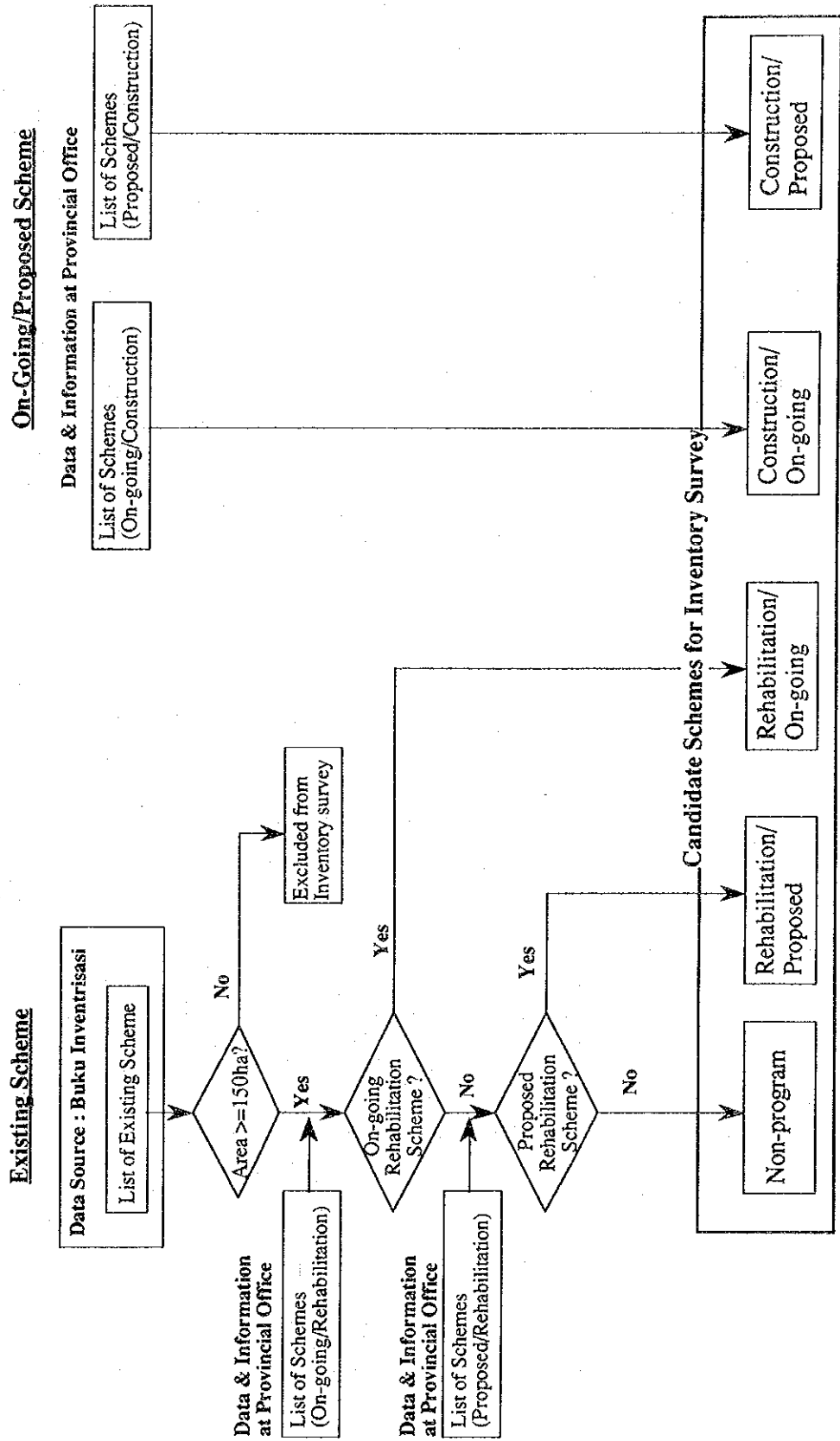


Figure 3.1 (1/3) Selection of Candidate Scheme for Inventory Survey (Surface Irrigation Scheme)

Existing Scheme

On-Going/Proposed Scheme

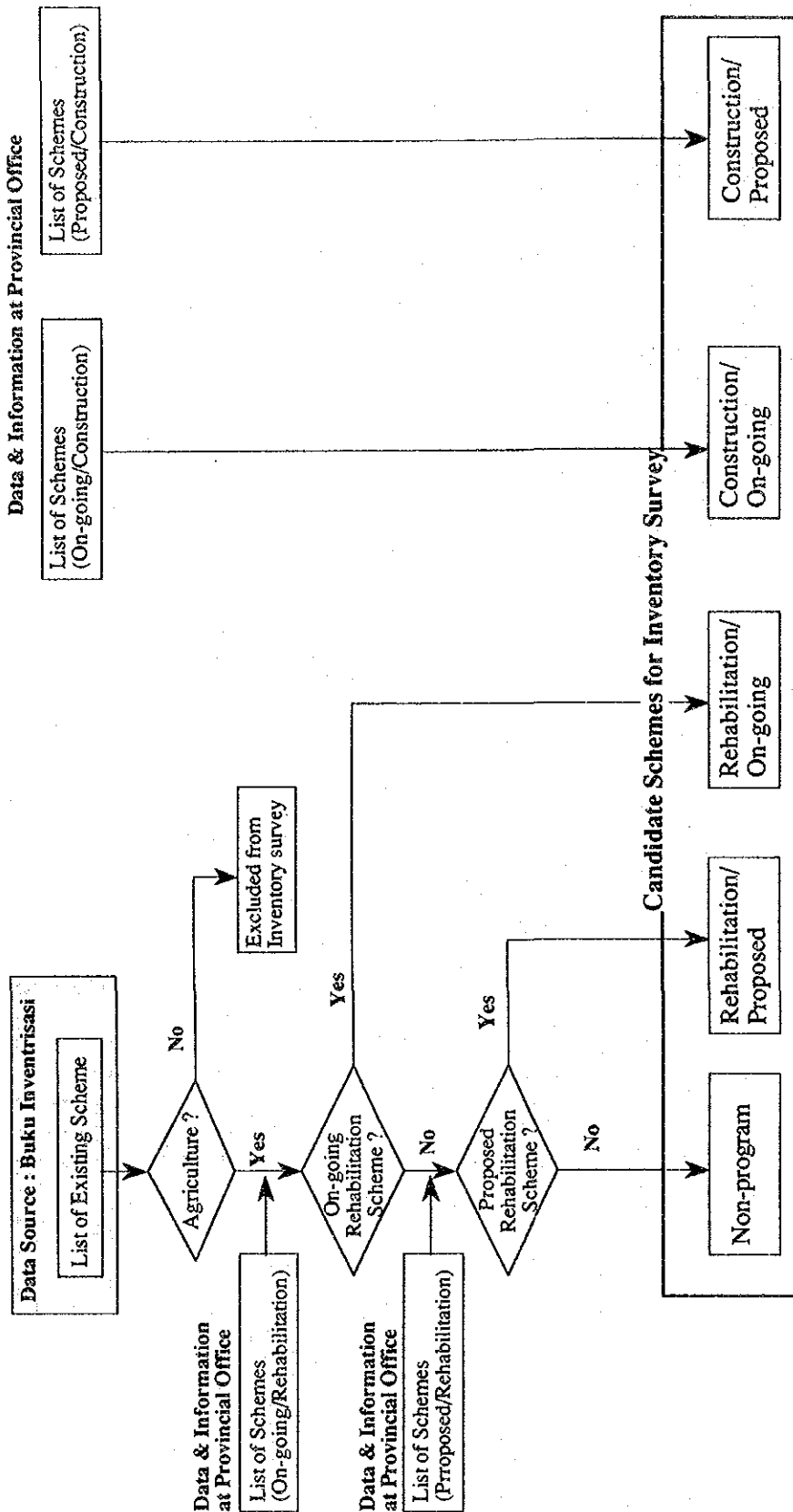


Figure 3.1 (2/3) Selection of Candidate Scheme for Inventory Survey (Swamp Irrigation Scheme)

MINISTRY OF PUBLIC WORKS
FORMULATION OF IRRIGATION DEVELOPMENT PROGRAM
JAPAN INTERNATIONAL COOPERATION AGENCY

On-Going/Proposed Scheme

Data & Information at Provincial Office

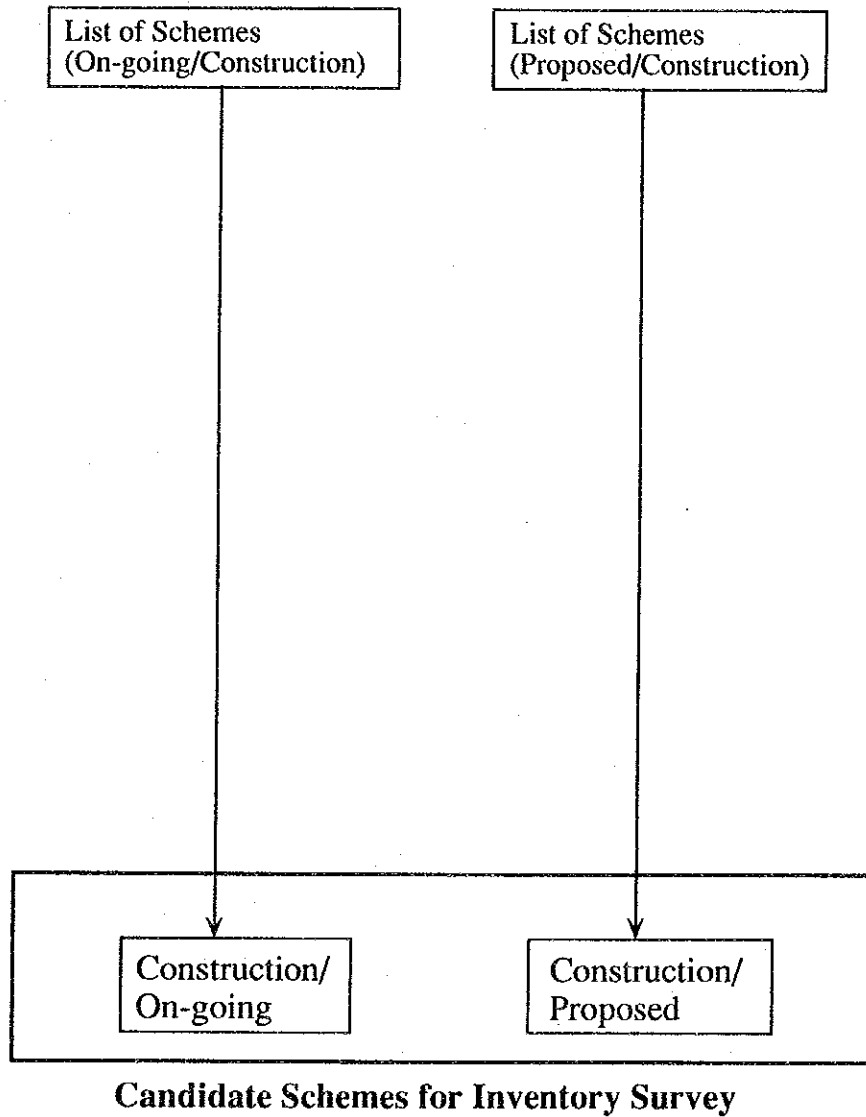


Figure 3.1 (3/3) Selection of Candidate Scheme for Inventory Survey (Groundwater Development)

MINISTRY OF PUBLIC WORKS
FORMULATION OF
IRRIGATION DEVELOPMENT PROGRAM
JAPAN INTERNATIONAL COOPERATION AGENCY

