JAPAN INTERNATIONAL COOPERATION AGENCY
MINISTRY OF FORESTRY, REPUBLIC OF INDONESIA

THE FEASIBILITY STUDY ON THE SOCIAL FORESTRY DEVELOPMENT PROJECT IN THE UPPER MUSI WATERSHED IN THE REPUBLIC OF INDONESIA

APPENDICES

MARCH, 1998

JAPAN FOREST TECHNICAL ASSOCIATION (JAFTA)
ASIA AIR SURVEY CO., LTD.

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NOVEMBER, 1997

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A. Dispatch of Study Teams

The composition of the Study Teams dispatched to Indonesia for the Phase 1 Study in fiscal 1995 (first year of the Study) and for the Phase 2 Study in fiscal 1996 and 1997 (second and third year of the Study) and their schedules are given below.

(1) Phase 1 Study in Fiscal 1995 (First Year of the Study)

1) First Field Survey

① Field Work Supervisory Team Members

Name	Assignment	Career/Background	Period
Hideki Hirano	Team Leader/Watershed Conservation	Forestry Agency	3/3/96 - 13/3/96
Hiroyuki Abe	Survey Planning	JICA	"

② Main Field Survey Team Members

Name	Assignment	Career/Background	Period
Yutaka Taguchi	Team Leader	JAFTA	29/2/96 - 19/3/96
Ryoya Shimada	Social Forestry Planning	JAFTA	29/2/96 - 3/4/96
Fumio Asaka	Forest Management	JAFTA	29/2/96 - 29/3/96
Kozo Kato	Land Use/Vegetation	JAFTA	26/3/96 - 8/6/96
Jun Kajigaki	Watershed Conservation	JAFTA	29/2/96 - 3/4/96
Nahoko Nakazawa	Rural Development	Pacific Consultants International	29/2/96 - 29/3/96
Sumio Ichikawa	Agroforestry	JAFTA	"
Hiromitsu Kuno	Environmental Impacts/Soil	JAFTA	"
Hajime Goto	Aerial Photography/Surveying	Asia Air Survey Co., Ltd.	29/2/96 - 12/5/96
Shigeru Ono	Work Coordination	Asia Air Survey Co., Ltd.	25/2/96 - 6/3/96

(2) Phase 2 Study in Fiscal 1996 (Second Year of the Study)

1) Explanation of and Discussion of Progress Report

① Field Work Supervisory Team Member

Name	Assignment	Career/Background	Period
Hiroaki Okubo	Survey Planning	JICA	15/7/96 - 24/7/96

② Main Field Survey Team Members

Name	Assignment	Career/Background	Period
Yutaka Taguchi	Team Leader	JAFTA	15/7/96 - 24/7/96
Ryoya Shimada	Deputy Leader/Social Forestry Planning	JAFTA	"
Jun Kajigaki	Watershed Conservation	JAFTA	"
Nahoko Nakazawa	Social Analysis	Pacific Consultants International	"
Hiromitsu Kuno	Environmental Impacts/Soil	JAFTA	15/7/96 - 31/7/96

2) Second Field Survey Team Members

① Main Field Survey Team Members

Name	Assignment	Career/Background	Period
Yutaka Taguchi	Team Leader	JAFTA	17/9/96 - 11/10/96
Ryoya Shimada	Social Forestry Planning	JAFTA	17/9/96 - 20/11/96
Fumio Asaka	Forest Management	JAFTA	22/9/96 - 20/11/96
Kozo Kato	Land Use/Vegetation	JAFTA	16/10/96 - 29/12/96
Jun Kajigaki	Watershed Conservation	JAFTA	17/9/96 - 20/11/96
Nahoko Nakazawa	Rural Development	Pacific Consultants International	17/9/96 - 10/12/96
Sumio Ichikawa	Agroforestry	JAFTA	22/9/96 - 20/11/96
Hiromitsu Kuno	Environmental Impacts/Soil	JAFTA	30/9/96 - 8/12/96
Hajime Goto	Aerial Photography/Surveying	Asia Air Survey Co., Ltd.	21/7/96 - 3/9/96
Hiromi Ogawa	Aerial Triangulation/Mapping	Asia Air Survey Co., Ltd.	25/8/96 - 22/11/96

(3) Phase 3 Study in Fiscal 1997 (Third Year of the Study)

1) Third Field Survey

① Field Work Supervisory Team Member

Name	Assignment	Career/Background	Period
Takashi Kato	Team Leader/Social Forestry	Forestry Agency	6/7/97 - 12/7/97
Hideyuki Katsuta	Survey Supervision	JICA	16/6/97 - 25/6/97

② Main Field Survey Team Members

Name	Assignment	Career/Background	Period
Yutaka Taguchi	Team Leader	JAFTA	16/6/97 - 15/7/97
Ryoya Shimada	Deputy Leader/Social Forestry Planning	JAFTA	16/6/97 - 14/8/97
Fumio Asaka	Forest Management	JAFTA	"
Jun Kajigaki	Watershed Conservation	JAFTA	"
Nahoko Nakazawa	Social Analysis	Pacific Consultants International	16/6/97 - 9/8/97
Sumio Ichikawa	Agroforestry	JAFTA	16/6/97 - 14/8/97
Hiromitsu Kuno	Environmental Impacts/Soil	JAFTA	9/6/97 - 7/8/97
Sadao Ozawa	Economic/Financial Analysis	Overseas Project Management Consultants, Ltd.	16/6/97 - 14/8/97

2) Forth Field Survey Team Members

① Field Work Supervisory Team Member

Name	Assignment	Career/Background	Period
Yasunori Nakayama	Survey Supervision	JICA	2/12/97 - 13/12/97

② Main Field Survey Team Members

Name	Assignment	Career/Background	Period
Yutaka Taguchi	Team Leader	JAFTA	2/12/97 - 13/12/97
Ryoya Shimada	Social Forestry Planning	JAFTA	"
Jun Kajigaki	Watershed Conservation	JAFTA	"
Nahoko Nakazawa	Rural Development	Pacific Consultants International	"
Hiromitsu Kuno	Environmental Impacts/Soil	JAFTA	2/12/97 - 18/12/97

B. Principal Interviewees and Counterparts

The main people interviewed by the Study Team in Indonesia and the counterparts for the Study are listed below.

(1) Main Interviewees

① Ministry of Forestry

(Departemen Kehutanan)

Mr. Hendarsun Suryasanusiputra : Director General of Reforestation and Land Rehabilitaiton

Mr. Hoesodo Soedarisman : Director of Planning and Programming, Directorate General of Reforestation and Land Rehabilitation

Mr. Mursidin : Director of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation

Mr. Soedjadi Martodiwirjo : Director of Reforestation, Directorate General of Reforestation and Land Rehabilitation

Mr. Asep Suwarna : Head of Technical Cooperation Division, Directorate of Planning and Programming, Directorate General of Reforestation and Land Rehabilitation

Mr. Suhardijono : Head of Bilateral and Regional Section, Directorate of Planning and Programming, Directorate General of Reforestation and Land Rehabilitation

Mr. Yudi Soetrisno : Bilateral and Regional Section, Directorate of Planning and Programming, Directorate General of Reforestation and Land Rehabilitation

Mr. Ashadi : Directorate of Planning and Programming, Directorate General of Reforestation and Land Rehabilitation

Mr. Heru Wibowo : Bureau of International Cooperation and Investment, Secretariat General

Mr. M. Ranteallo : Head of Watershed Rehabilitation Division, Directorate of Rehabilitation and Soil Conservation, Directorate General of Reforestation and Land Rehabilitation

Mr. S. Brotohadi	:	Head of Social Forestry Division, Directorate of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation
Mr. Nyoman Yuliarsana	:	Head of Regreening Division, Directorate of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation
Mr. Harjunadi	:	Head of Private Forest Section, Directorate of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation
Mr. Erna Rosdiana	:	Directorate of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation
Mr. Waspodo	:	Directorate of Regreening and Social Forestry, Directorate General of Reforestation and Land Rehabilitation
Mr. Yusup Suhartono	:	Directorate of Reforestation, Directorate General of Reforestation and Land Rehabilitation
Mr. Hadi S. Pasaribu	:	Natural Resources Policy Analyst

② Regional Forestry Office of Bengkulu Province

(Kantor Wilayah Departemen Kehutanan, Propinsi Bengkulu)

Mr. Edi Muchtar Rosjadi	:	Head of Reforestation Division
Mr. R. B. Tandi Bua	:	Head of Land Rehabilitation and Social Forestry Section
Mr. Agus Suhaksa	:	Planning and Programming Division
Mr. Bambang Sochirlan		
Mr. Yuliati		
Mr. Bagus Subiantoro		

③ Provincial Forestry Service of Bengkulu Province

(Dinas Kehutanan Tingkat I, Propinsi Bengkulu)

Mr. Junior Hafis	:	Head of Reforestation Section

Mr. Hidayat Sjahid

Mr. Harijanto

④ Regional Development Planning Agency of Bengkulu Province
(Badan Perencanaan Pembangunan Daerah Tingkat I, Propinsi Bengkulu)

Mr. Syahrir

⑤ Biro Bina Lingkugan Hidup, PEMDA Tingkat I (PEMDA TK I), Propinsi Bengkulu)

Ms. Trimurti

⑥ Sub-Balai Konservasi Sumber Daya Alam (Sub-Balai KSDA) Bengkulu

Mr. Asril Astaman

⑦ Sub-Centre of Land Rehabilitation and Soil Conservation of Ketahun/Bengkulu
(Sub-Balai Rehabilitasi Lahan dan Konservasi Tanah, Ketahun/Bengkulu)

Mr. Suradji Sardju Pranoto : Head of Sub-Centre

Ms. Nurhasnih : Technical Design Section

Mr. Sumarsono

Mr. Hartawani : Technical Design Section

Mr. Kulia Haidi

Mr. Narsis Sambajon

⑧ Forestry and Soil Conservation Service of Rejang Lebong District
(Dinas Perhutanan dan Konservasi Tanah (Dinas PKT), Kabupaten Rejang Lebong)

Mr. Yosvarman : Head of Forestry and Soil Conservation Service

⑨ Regional Development Planning Agency of Rejang Lebong District
(Badan Perencanaan Pembangunan Daerah Tingkat II (BAPPEDA TK II), Kabupaten Rejang Lebong)

Mr. Tri Pradekso

⑩ The World Bank

Mr. Akihiko Nishio

⑪ Itochu Corporation: Jakarta Representative Office

Mr. Eiji Uematsu

(2) Main Counterparts

Name	Assignment	Background
Mr. Suradji Sardju Pranoto	Leader (General Coordination)	Sub-Balai RLKT, Ketahun
Ms. Nurhasnih	Social Forestry Planning	Sub-Balai RLKT, Ketahun
Mr. Junior Hafis	Forest Management	Dinas Kehutanan Tingkat I, Propinsi Bengkulu
Mr. Sunaryo Tasdam	Land Use/Vegetation	Forest Survey/Mapping Centre
Mr. Rocky Batu	Watershed Conservation	Kanwil Kehutanan, Propinsi Bengkulu
Mr. Suradji Sardju Pranoto	Social Analysis	Sub-Balai RLKT, Ketahun
Mr. Sumarsono	Agroforestry	Sub-Balai RLKT, Ketahun
Mr. Yosvarman	Economic and Financial Analyses	Sub-Balai RLKT, Ketahun
Mr. Sumarsono	Environmental Impacts/Soil	Dinas PKT, Kab. Rejang Lebong
Mr. Hartawani	Photography/Surveying	Dinas PKT, Kab. Rejang Lebong
Mr. Hartawani	Aerial Triangulation/Mapping	Dinas PKT, Kab. Rejang Lebong

C. Reference Data for Natural Conditions Survey

C-1 Weather Data for the Project Area

Observation Station: Geofisika Kepahiang (El. 517 m)

	Year	Monthly Rainfall												
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Av.
Mean Temperature (°C)	1986	X	X	X	X	X	X	X	22.9	23.3	23.3	23.2	24.0	X
	1987	23.3	23.8	24.4	24.2	24.4	24.3	23.9	24.2	24.5	24.4	24.1	23.7	24.1
	1988	23.9	24.2	24.4	24.8	24.0	24.7	23.4	23.9	24.0	28.8	23.5	23.2	24.4
	1989	23.5	23.3	23.4	24.0	24.3	23.7	23.2	23.4	23.7	23.5	24.0	23.7	23.6
	1990	23.5	24.1	23.9	24.5	24.7	24.0	24.0	23.6	24.1	24.1	23.7	23.6	24.0
	1991	23.5	24.9	24.2	24.4	24.9	24.7	24.2	23.7	24.1	23.7	22.9	23.3	24.0
	1992	23.8	23.8	24.1	23.7	24.4	24.3	23.9	23.6	23.4	23.6	23.7	23.3	23.8
	1993	23.3	23.6	23.4	24.0	24.3	24.3	23.8	23.5	24.0	23.8	23.9	23.4	23.8
	1994	23.8	23.7	23.6	24.1	24.2	23.6	22.9	22.9	22.9	23.8	24.0	23.4	23.6
	1995	23.3	23.0	23.5	24.0	24.3	24.2	23.4	24.0	23.5	23.6	23.8	23.0	23.6
	Av.	23.5	23.8	23.9	24.2	24.4	24.2	23.6	23.6	23.8	24.3	23.7	23.5	23.9
Mean Maximum Temperature (°C)	1986	X	X	X	X	X	X	X	28.6	28.2	28.8	28.4	29.2	X
	1987	28.1	29.0	30.2	38.2	30.1	30.2	30.0	30.5	30.0	30.0	29.3	29.8	30.5
	1988	29.9	29.7	29.6	30.9	30.8	30.1	29.6	29.7	29.6	29.1	28.4	28.4	29.7
	1989	29.5	28.5	29.5	29.8	30.1	30.0	29.1	29.5	29.6	29.1	29.6	28.6	29.4
	1990	29.0	29.8	30.6	30.4	30.5	30.1	30.0	29.6	29.9	30.3	29.6	28.9	29.9
	1991	29.0	31.2	30.1	29.3	30.3	31.1	30.4	29.5	29.1	29.6	29.0	28.4	29.8
	1992	28.8	29.3	30.1	30.3	29.9	29.5	29.3	29.4	29.2	29.2	29.1	28.3	29.4
	1993	28.1	29.0	28.8	29.4	29.8	29.9	29.4	29.6	30.2	30.0	29.8	28.9	29.4
	1994	29.1	29.1	29.4	30.0	30.3	29.8	29.5	29.4	29.2	30.5	30.2	28.8	29.6
	1995	29.1	29.0	29.8	30.2	30.6	30.7	30.0	30.8	30.3	29.0	28.6	28.2	29.7
	Av.	29.0	29.4	29.8	30.9	30.3	30.2	29.7	29.7	29.5	29.6	29.2	28.8	29.7
Mean Minimum Temperature (°C)	1986	X	X	X	X	X	X	X	19.0	20.0	21.1	20.2	20.7	X
	1987	20.4	20.5	21.1	28.9	20.9	20.7	19.3	19.3	20.0	20.5	20.8	19.6	21.0
	1988	20.9	20.2	20.1	20.2	20.3	18.9	18.5	20.3	20.3	20.5	20.7	20.0	20.1
	1989	19.6	19.5	19.5	19.9	20.3	19.4	18.9	19.3	19.6	19.9	20.7	20.5	19.8
	1990	19.9	20.6	20.1	21.0	20.9	19.8	19.0	19.9	20.1	20.2	20.4	20.6	20.2
	1991	20.4	20.4	20.4	20.8	20.9	19.6	19.2	19.1	19.3	19.2	19.7	20.4	20.0
	1992	19.7	20.1	20.5	20.6	20.2	20.5	19.8	19.5	20.0	20.3	20.3	20.2	20.1
	1993	20.6	20.1	20.9	20.4	21.1	20.1	20.0	19.2	19.9	20.2	20.6	19.5	20.2
	1994	20.8	20.2	20.3	20.6	19.8	18.9	17.6	17.9	18.6	18.7	19.9	19.2	19.4
	1995	19.7	19.0	19.4	19.8	20.1	19.5	18.8	19.2	18.9	19.6	19.8	19.6	19.5
	Av.	20.2	20.1	20.3	21.4	20.5	19.7	19.0	19.3	19.7	20.0	20.3	20.0	20.0
Relative Humidity (%)	1986	X	X	X	X	X	X	X	83	86	86	85	86	X
	1987	87	85	86	87	85	83	82	80	82	84	84	86	84
	1988	87	85	87	83	85	80	78	83	83	84	85	86	84
	1989	86	86	83	82	85	82	79	82	82	85	85	86	84
	1990	85	85	84	82	84	82	84	82	82	82	86	86	84
	1991	88	86	85	85	83	79	80	80	82	82	86	88	84
	1992	85	85	85	85	85	83	83	84	86	84	86	87	85
	1993	89	86	86	86	87	83	85	82	82	85	86	88	85
	1994	87	87	86	86	86	86	84	84	84	83	86	87	86
	1995	88	88	87	87	87	86	84	84	85	87	88	87	87
	Av.	87	86	85	85	85	83	82	82	83	84	86	87	85
Rainy Days (Days)	1986	23	14	26	22	10	11	9	10	19	26	19	16	17
	1987	19	18	18	21	10	16	11	3	9	14	16	20	15
	1988	23	11	22	15	13	9	9	22	18	20	25	23	18
	1989	20	19	14	14	15	16	14	14	16	26	22	22	18
	1990	20	23	24	19	19	18	19	15	15	20	23	23	20
	1991	28	23	25	23	18	4	10	11	4	15	24	29	18
	1992	11	19	25	24	21	11	16	21	24	23	24	26	20
	1993	28	22	24	23	25	12	19	11	13	27	22	27	21
	1994	27	20	28	23	21	13	5	6	3	9	26	28	17
	1995													
	Av.	22	19	23	20	17	12	12	13	13	20	22	24	18
Ratio of Sunshine Duration (Western Indonesia Time between 08:00 and 16:00) (%)	1986	16.3	39.6	28.4	41.5	50.7	47.8	51.6	45.9	28.0	24.2	33.2	38.1	37.1
	1987	23.1	35.9	51.0	44.0	59.0	53.1	59.4	54.0	30.0	45.0	30.0	39.0	43.6
	1988	22.0	44.0	26.0	X	X	57.4	53.9	55.6	47.7	50.1	18.0	29.1	40.4
	1989	23.5	18.3	33.3	52.8	58.2	67.6	58.3	58.9	55.7	34.0	32.6	31.5	43.7
	1990	26.4	47.7	39.7	45.9	60.1	53.6	49.0	62.6	56.3	52.8	42.2	35.4	47.6
	1991	40.9	48.9	48.2	57.0	48.7	77.5	64.5	49.4	35.8	20.0	16.0	13.2	43.3
	1992	41.3	39.9	47.4	55.0	50.0	61.8	53.9	56.7	52.2	43.5	39.0	37.3	48.2
	1993	38.1	45.2	48.6	46.6	52.3	68.0	57.3	72.3	64.4	42.5	41.5	32.1	50.7
	1994	32.5	37.2	32.7	51.8	65.5	59.7	63.3	66.4	34.3	26.8	42.5	44.3	46.4
	1995													
	Av.	29	40	39	49	56	61	57	58	45	38	33	33	45

Note: X = data missing

C-2 Monthly Rainfall by Observation Station in the Project Area

(Unit: mm)

		Monthly Rainfall												Annual
	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Rainfall
BBH Air	1986	593	503	567	516	81	150	304	148	288	486	416	473	4,525
Dingin	1987	586	432	426	538	358	293	174	20	148	326	251	X	X
	1988	658	139	769	464	321	86	83	370	355	336	561	297	4,437
	1989	503	349	511	309	582	107	95	231	273	374	508	340	4,182
	1990	252	235	363	272	223	192	203	132	227	248	344	541	3,232
	1991	733	217	322	283	243	15	45	135	58	134	309	399	2,893
	1992	288	211	347	480	368	214	222	244	334	459	408	444	4,019
	1993	258	259	291	238	336	222	237	158	138	328	393	292	3,150
	1994	292	259	340	368	131	126	33	13	80	90	298	289	2,319
	1995	386	422	351	252	343	328	108	86	120	434	257	254	3,341
	Av.	455	303	429	372	299	173	150	154	202	322	375	370	3,566
BPP Pal VIII	1986	173	258	482	270	X	X	X	X	X	X	X	X	X
	1987	409	239	204	334	218	205	139	49	30	83	245	126	2,281
	1988	301	300	317	208	94	64	135	208	221	226	316	194	2,584
	1989	286	285	195	128	300	100	60	245	167	371	378	372	2,887
	1990	184	199	155	354	221	115	211	84	169	235	235	406	2,568
	1991	364	273	228	191	172	16	59	133	49	86	281	384	2,236
	1992	250	176	176	323	173	49	91	233	267	303	380	251	2,672
	1993	298	176	166	163	171	56	170	132	172	320	232	278	2,334
	1994	205	166	293	253	155	115	42	2	30	118	316	259	1,954
	1995	195	444	305	268	161	144	39	107	120	303	386	424	2,896
	Av.	267	252	252	249	185	96	105	133	136	227	308	299	2,490
BBI Padi	1986	374	307	501	421	104	260	180	145	302	489	436	298	3,817
Kelobak	1987	433	427	223	314	334	123	181	64	70	184	349	484	3,186
	1988	543	307	547	283	119	163	87	118	243	284	569	337	3,600
	1989	739	438	267	337	174	165	132	191	239	405	527	341	3,955
	1990	369	200	263	331	193	272	249	147	217	248	314	688	3,491
	1991	839	373	562	385	331	21	20	50	80	99	532	447	3,739
	1992	129	473	613	271	305	80	167	251	330	508	453	546	4,126
	1993	353	333	732	369	281	145	155	106	124	235	472	515	3,820
	1994	419	453	533	480	237	236	9	X	10	152	251	467	X
	1995	559	501	377	274	303	224	81	63	159	244	468	264	3,517
	Av.	476	381	462	347	238	169	126	126	177	285	437	439	3,695
Geofisika	1986	320	220	526	390	86	183	79	105	370	306	325	248	3,158
Kepahiang	1987	353	491	141	249	126	211	125	61	106	238	396	375	2,872
	1988	636	247	407	202	124	126	74	112	329	243	677	284	3,461
	1989	547	482	251	264	413	184	121	120	237	323	580	323	3,845
	1990	370	168	283	238	167	142	156	175	229	376	272	388	2,964
	1991	629	424	417	312	230	14	78	61	26	139	398	463	3,191
	1992	79	332	522	228	213	49	178	181	327	251	353	605	3,318
	1993	294	343	511	305	276	114	148	75	97	152	426	427	3,168
	1994	298	342	380	314	115	130	8	3	15	107	308	431	2,451
	1995	492	569	358	208	274	118	87	26	183	303	352	250	3,220
	Av.	402	362	380	271	202	127	105	92	192	244	409	379	3,165

Note: X = data missing

C-3 Soil Classification Criteria

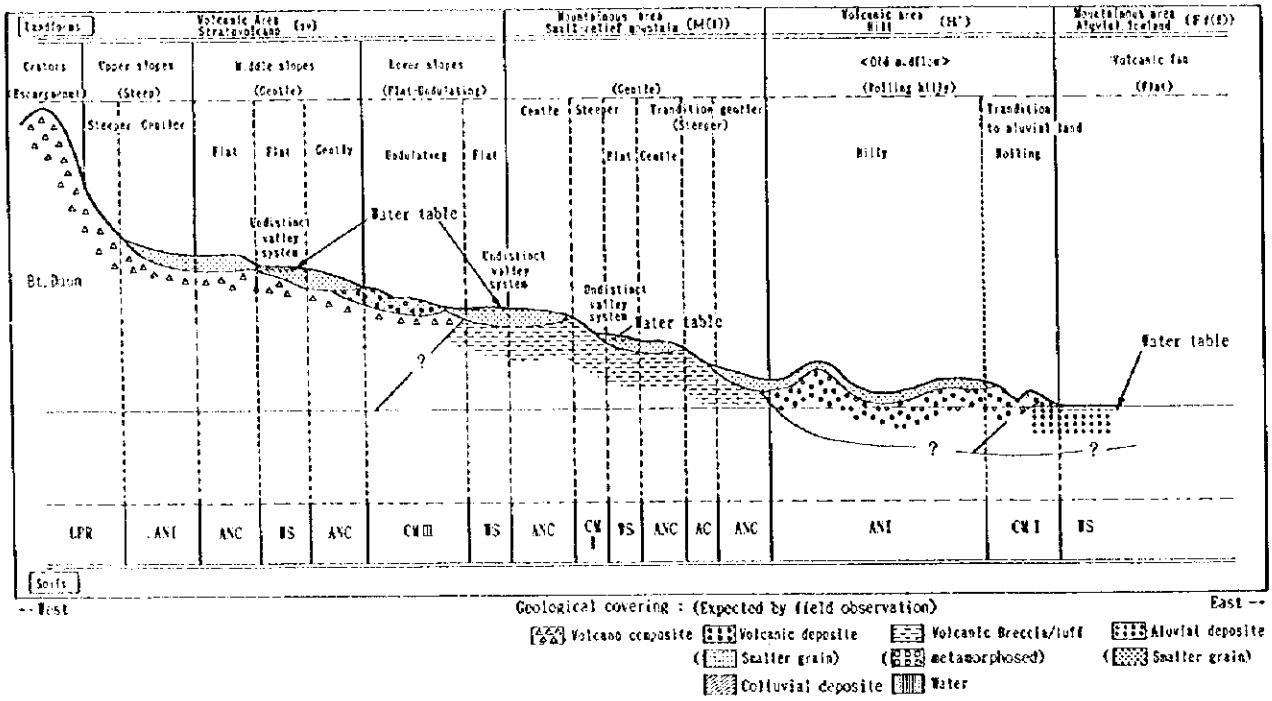
(1)

Soil Class		Soil Unit (Great Soil Grouping)		Distribution Pattern		Main Characteristics of Soil Profile (3) (Upper Column: Surface Horizon; Lower Column: Lower Horizon)					Drain-ability (6)	Hardness of Typical Profile at Hardest Horizon (mm) (7)	
Symbol	Soil Complex	Component (1)	Inclusion (2)	Minor Topography (4)	Micro-topography	Surface Horizon Thickness (Average or Range in cm)	Soil Colour	Field Soil Textural Class	Effective Depth (m) (5)	Gravel (%)			
[Group of Acrisols]													
AC	Acrisols complex	Haplic Acrisols (ACh) [Haplic Alisols (ALh)]	Humic Cambisols (CMu) Chromic Cambisols (CMx)	L/R M S/R M Pd	gradient changing area " convexed steep slope	(thin) 9 [6-13]	very dark brown - brown blackish brown-very dark	SiL-CiL (M) CL-C (F)	1.0 < (very deep)	0-5 (EL) 0-5 (EL)	SP	very hard (22)	EP2
ACC I	Acrisols-Cambisols Complex I	Humic Acrisols (CMu) [Humic Alisols (ALu)] Humic Cambisols (ACu)	Dystric Leptosols (LPd)	volcanic hill (lava flow zone)		(thin) 14 [8-19]	black-brown blackish brown-very dark brown	SiL (M) L-C (M)	1.0 < (very deep)	0-30 (EL-H) 0-50 (EL-VH)	F	very hard (22)	OP23 (OP22)
ACC II	Acrisols-Cambisols Complex II	Ferric Acrisols (ACf) [Ferric Alisols (ALf)] Humic Cambisols (ACu)	Dystric Cambisols (CMd)	Pd hill	convex slope convex site	(thin) 9 [6-24]	dark brown-brown dull reddish brown-brown	L-C (M-F) SiL-CL (M-F)	1.0 < (very deep)	0-5 (EL) 0-7 (EL-L)	F	very hard (22)	EP6 (OP17)
[Group of Cambisols]													
CM I	Cambisols Complex I	Dystric Cambisols (CMd)		L/R M S/R M Pd Pl	gentle slope steep slope gentle slope convex site on plateau	(thin) 9 [2-15]	black-greyish brown dark brown-brown	SiL-CL (M) CL-C (F)	1.0 < (very deep)	0-15 (EL-L) 0-10 (EL-L)	F	hard EPS (21)	OP24
CM II	Cambisols Complex II	Chromic Cambisols (CMx) Dystric Cambisols (CMd)		L/R M Pd hill	steep slope " "	(thin) 11 [9-12]	blackish brown-dark brown dull yellowish brown-brown	SiL-L (M) SiL-C (M-F)	1.0 < (very deep)	0-5 (EL) 0-30 (EL-H)	F	very hard (23)	(OP18) OP27
CM III	Cambisols Complex III	Dystric Cambisols (CMd)		volcanic hill (mudflow zone)	"	(thick) 53	very dark brown-dark brown brown	CL (F) SiL-CL (M-F)	1.0 < (very deep)	0-10 (EL-L) 15 (H)	F	very hard (25)	OP21
CM IV	Cambisols Complex IV	Dystric Cambisols (CMd)		LR/M S/R M alluvial upland	Pd clastic zone " flat land	(thick) 23 [15-31]	black-dark brown dull yellowish brown- brown	CL (F) SiL-C (F-M)	0.8< (very deep)	0 (EL) 0-5 (EL)	SP	consolidated (33)	EP4
[Group of Andosols]													
ANC	Andosols-Cambisols Complex	Umbric Andosols (ANu) Haplic Andosols (ANh) Vitric Andosols (ANv)	Chromic Cambisols (CMx) Gleyic Andosols (ANg)	strato-volcanic body (Expl.) VM S/R M	gentle slope " "	(thick) 27 [13-39]	black-dark brown dull yellowish brown-dark brown	L-C (M-F) L-C (M-F)	1.0 < (very deep)	0-5 (EL) 0-25 (EL-H)	SP	hard (20)	EP1 (OP15)
AN I	Andosols Complex I	Vitric Andosols (ANv) Haplic Andosols (ANh)	Dystric Leptosols (LPd)	(Expl.) volcanic hill cold mudflow zone	steep slope	(thick) 20 [7-28]	black-brown reddish brown-brown	SL-CL (M) G-CL (C-M)	1.0 < (very deep)	0-10 (EL-L) 0-100 (EL-) gravel soil	SP	very hard (22)	OP8 (OP19) (OP13)
AN II	Andosols Complex II	Vitric Andosols (ANv)		volcanic plateau	flat land	(thick) 39 [34-43]	black-blackish brown blackish brown-brown	SiL-L (M) SL-L (M)	0.6 < (slightly deep)	0-5 (EL)	good	consolidated (30)	EP7
LPR	Leptosols-Regosols Complex	[Leptosols (LP)] [Regosols (RE)]	[Cambisols (CM)]	both mountain and volcanic land except for mountainous areas and minor undulating mountain land	steep cliff -	(thin) 0	yellowish brown-reddish brown	G-C (C-F)	0 < (very shallow)	80 gravel soil	Extreme-ly good	very hard (22)	EP3

Soil Class		Soil Unit (Great Soil Grouping)		Distribution Pattern		Main Characteristics of Soil Profile (3) (Upper Column: Surface Horizon; Lower Column: Lower Horizon)					Drain-ability (6)	Hardness of Typical Profile at Hardest Horizon (mm) (7)
Symbol	Soil Complex	Component (1)	Inclusion (2)	Minor Topography (4)	Micro-topography	Surface Horizon Thickness (Average or Range in cm)	Soil Colour	Field Soil Textural Class	Effective Depth (m) (5)	Gravel (%)		
WS	Wetish Soil or Swampy Soils	Paddy Soil [Anthrosols (AT)]		flat volcanic land		(thin) 17	black-blackish brown	SiL-L (M)	0.1 < (shallow)	0-5 (EL)	SP-P	slightly hard (17) OP16
		[Gleysols (GL)] [Histosols (HS)]	[Fluvisols (FL)]	volcanic fan valley bottom (used as paddy field)	micro-convex site	[3-39]	blackish brown-dark reddish brown	S-L (C-M)		25 (H)	*	(CP19) OP25
M	Man-Made Immature Soil	Anthrosols (AT)		settlement, roadside slope								

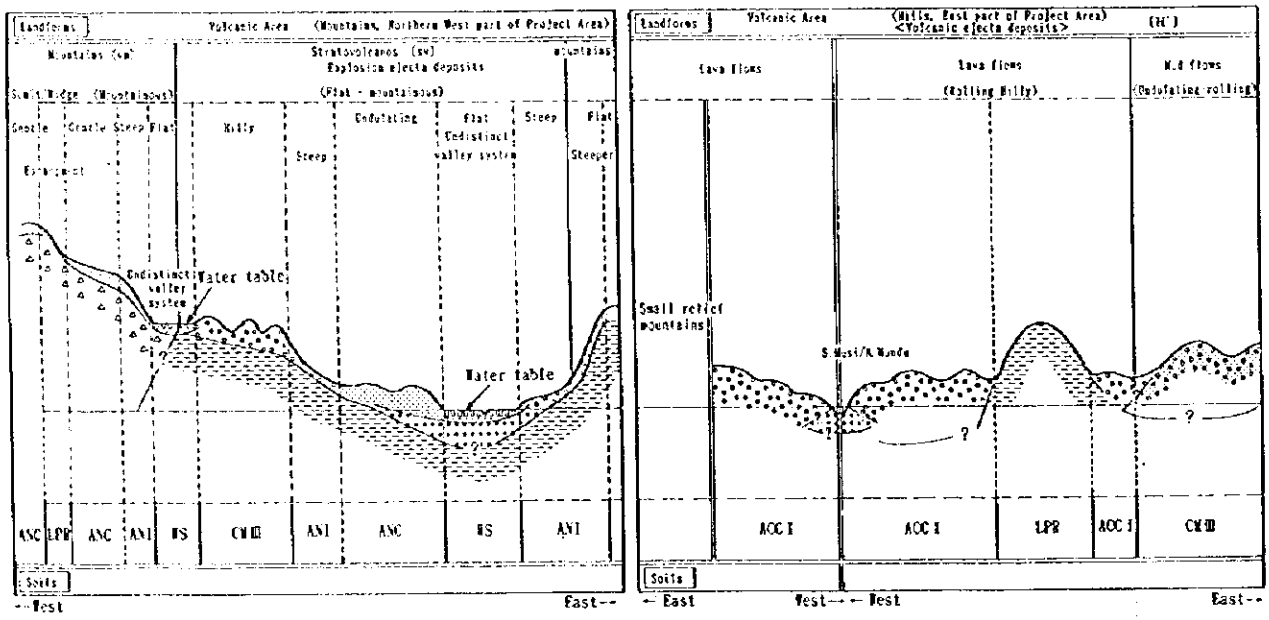
Notes (1) Composition ratio of 20% or more (FAO-Unesco 1990)
(2) Composition ratio of less than 20% but still important soil unit(s) (FAO-Unesco 1990)
(3) See Appendix Table L-5 for classification criteria
(4) L/R M: large relief mountain; S/R M: small relief mountain; Pd: piedmont; Pl: plateau; Expl.: sedimentation site of shattered materials by volcanic explosion
(5) Depth where the degree of hardness indicates the "state of consolidation"
(6) SP: slightly poor; P: fair; P: poor
* The groundwater level approached the surface for a set period in each year.
(7) The analysed profiles consist of EP (depth of 1 m or more), OP (depth of 0.5 m or more) and CP (depth of less than 0.5 m). Main representative profiles are indicated in Appendix L.
(8) Mapping for the soil map:
- The minimum mapping unit consists of an approximate area of 4 ha with a width of 100 m. The mapping unit boundaries are assumed to be the centre lines in the transitional zones.
- No soil class is shown for structures (roads and houses, etc.) and water bodies on the base map.
- OP2 in A-1 is a mistaken entry for CP1.

C-4 Schematic Cross-Section Showing Relationship Between Topographical Categories, Surface Layer Geological Components and Soil Classes (1/2)



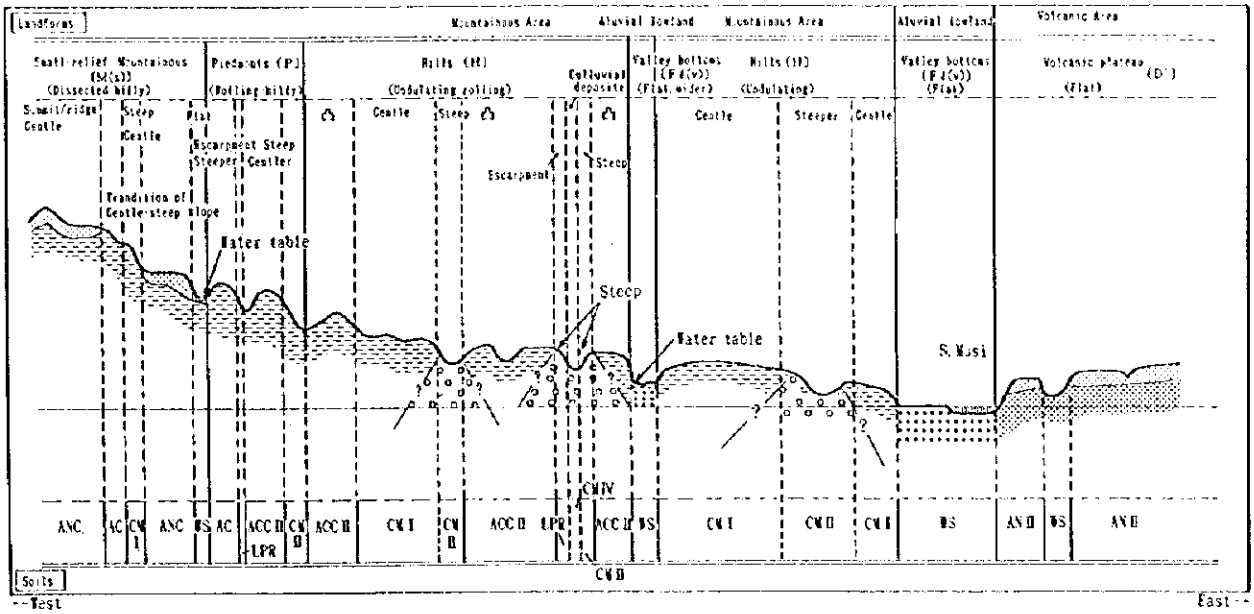
① Schematic Cross-section from Volcanic Area

(Bt. Baunl including Small-relief Mountain)

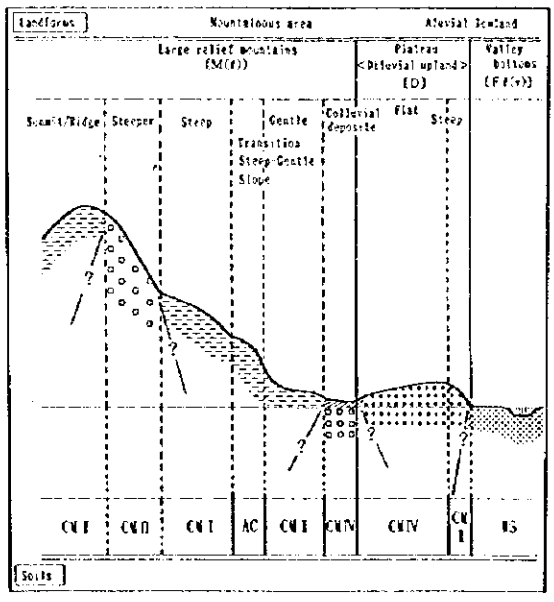


② Schematic Cross-Section through Volcanic Area

C-4 Schematic Cross-Section Showing Relationship Between Topographical Categories, Surface Layer Geological Components and Soil Classes (2/2)



③ Schematic Cross-section through Mountainous Area including Volcanic Plateau-mainly in the Central Part of Project Area



④ Schematic Cross-Section through Volcanic Area

C-5 Outline of Physical and Chemical Properties of Soil

Grouping	Soil class	Horizon	Physical Soil texture	Property Bulk density	Chemical pH (H$_2$O)	Property pH (KCℓ)	Total acidity (meq/100g)	Total C(%)	Total N(%)	C/N ratio	Exchangeable(meq/100g) K	Ca	Mg	Aℓ	Available P$_2$O$_5$(ppm)	CEC	Base saturation (%)	Al saturation (%)
Acrisols	AC	A	SiCL-C (②)	0.9	4.3-4.5 (①)	3.6-3.8 (①)	1.2-4.4	3.6-5.4	0.5	7.6-12.0 (②-③)	0.2 (①)	1.7-1.9 (②)	0.7-0.8 (②)	0.7-3.7	2.6-4.7 (①)	27.7-37.9 (②)	6.9-10.1 (②)	2-13 (②)
		B	C (③)	0.9	4.2-4.5 (①)	3.6-3.8 (①)	2.2-5.7	2.0	0.2-0.5	9.7-13.6 (②-③)	0.1-0.3 (①)	0.4-1.1 (②)	0.4-0.8 (②)	1.7-5.0	0.6-3.9 (①)	31.6-31.7 (②)	3.1-7.1 (②)	6-16 (①)
	ACC I	A	SiL-SiC(②)	-	6.4 (②)	6.0 (②)	0.2	2.9	0.5	6.0 (②)	0.5 (②)	3.0 (②)	2.9 (②)	0.1	11.6 (②)	46.1 (②)	12.2 (②)	<1 (①)
		B	SiCL-SiC (②)	-	6.3 (②)	5.7 (②)	0.1	0.9	0.2	6.1 (②)	0.6 (②)	5.7 (②)	1.9 (②)	0.1	15.3 (②)	40.1 (②)	18.4 (②)	<1 (①)
	ACC II	A	SL-CL(②)	0.7	4.6-4.8 (①)	3.8-4.3 (①)	1.0-3.0	1.8-4.2	0.2-0.5	7.7-10.5 (②)	0.1-0.4 (②)	1.9-2.2 (②)	0.5-2.3 (②)	0.8-2.1	0-8.0 (①)	27.3-31.4 (②)	9.0-13.9 (②)	2-8 (①)
		B	SL-L (②)	0.9	5.0-5.3 (①)	4.6-5.1 (①)	0.2-2.6	0.5-1.3	0.1	3.9-9.2 (②)	0.1-0.2 (①)	0.6-2.5 (②)	0.4-1.7 (②)	0.1-2.2	0.9-3.7 (①)	21.6-37.5 (②)	4.3-23.4 (②)	0-5 (①)
Cambisols	CM I	A	L-SiCL (②)	0.5	4.0-5.0 (①-②)	3.7-4.4 (①)	0.5-5.5	1.8-11.9	0.4-0.7	2.9-18.2 (②)	0.3-0.4 (②)	0.2-3.0 (②)	0.2-3.9 (②)	0.3-4.4	2.8-3.9 (①)	31.5-40.6 (②)	2.3-22.2 (②)	1-14 (①)
		B	SL-C (②)	0.7	4.7-5.2 (①-②)	3.8-4.9 (①)	0.3-4.4	1.0-5.7	0.2-0.4	5.2-16.6 (②)	0.1-0.2 (①)	0.2-0.5 (②)	0.1-1.6 (②)	0.2-4.0	0.7-5.2 (①)	18.7-32.8 (①-②)	1.6-5.8 (②)	0-15 (①)
	CM II	A	L (②)	-	5.0 (①)	4.4 (①)	0.3	1.1	0.4	3.3 (②)	0.2 (①)	6.2 (②)	1.7 (②)	0.2	3.9 (①)	40.0 (②)	21.7 (②)	1 (①)
		B	CL-C (②)	-	4.9 (①)	3.7 (①)	2.3	0.6	0.2	4.1 (②)	0.2 (①)	3.2 (②)	1.7 (②)	2.2	0.4 (①)	30.0 (②)	17.5 (②)	8 (①)
	CM III	A	SiL(②)	-	5.7 (②)	4.9 (②)	1.2	2.0	0.2	9.3 (②)	0.3 (②)	5.1 (②)	2.2 (②)	1.0	1.3 (①)	30.7 (②)	25.3 (②)	3 (①)
		B	SiL-SiCL (②)	-	5.1 (①)	3.9 (①)	0.3	0.4	0.1	2.1 (①)	0.2 (①)	11.1 (①)	2.3 (①)	0.2	2.0 (①)	37.1 (②)	36.5 (②)	<1 (①)
	CM IV	A	L (②)	0.8	4.8 (②)	3.7 (①)	6.3	4.5	0.3	18.6 (②)	0.1 (①)	1.0 (②)	0.4 (①)	5.6	2.0 (①)	55.2 (②)	2.8 (②)	10 (②)
		B	SiL-C(②)	0.9	4.9 (①)	3.9 (①)	4.7	0.6	0.2	3.7 (②)	0.2 (①)	2.5 (②)	0.4 (②)	4.1	5.0 (①)	30.3 (②)	10.0 (②)	8 (②)
Andosols	AMC	A	SL-L (②)	0.8	5.0-5.3 (①)	4.5-4.7 (①)	0.3	6.5-9.1	11.3-15.8	10.1-23.7 (②)	0.2 (①)	2.8-4.5 (②)	0.6-2.9 (②-③)	0.2-0.5	4.4 (①)	37.6-60.7 (②)	9.7-12.5 (②)	1 (①)
		B	LS (①)	-	5.4 (①)	5.0 (①)	0.2	3.5	6.0	12.1 (②)	0.8 (①)	1.4 (②)	0.3 (②)	0.2	4.3 (①)	30.1 (②)	8.5 (②)	1 (①)
	AM I	A	LS-L (①)	-	5.6 (②)	4.7 (①)	0.2	8.8	0.6	14.1 (②)	0.1 (①)	3.6 (②)	0.5 (②)	0.2	4.6 (①)	35.0 (②)	11.1 (②)	<1 (①)
		B	SL (②)	-	5.6 (②)	5.4 (①)	3.2	3.6	0.9	11.8 (②)	0.1 (①)	0.3 (①)	0.1 (②)	2.8	5.3 (②)	40.5 (②)	1.1 (②)	7 (①)
	AM II	A	SiL(②)	0.2	5.5 (①)	5.0 (①)	0.2	3.4	0.6	5.9 (②)	0.2 (①)	2.6 (②)	2.9 (②)	0.1	1.6 (①)	43.5 (②)	12.6 (②)	<1 (①)
		B	SiL(②)	0.5	5.8 (②)	5.4 (①)	0.3	2.0	0.1	17.0 (②)	0.1 (①)	2.5 (②)	0.5 (②)	0.2	<0.1 (①)	45.7 (②)	6.8 (②)	<1 (①)
Immature soils	LPR	BC	CL (②)	-	4.5 (①)	3.6 (①)	8.6	0.7	0.2	3.6 (②)	0.1 (①)	1.2 (②)	1.8 (②)	7.3	<0.1 (①)	25.5 (②)	11.7 (②)	9 (②)
Hettish/swamp soils	HS	A	SiL(②)	-	5.7 (②)	5.1 (①)	0.5	0.2	0.7	0.4 (②)	0.4 (②)	1.1 (②)	1.7 (②)	0.4	7.7 (②)	31.4 (②)	10.1 (②)	1 (①)
		B	SL-SiCL(②)	-	5.8-6.3 (②-③)	5.0-5.3 (①)	0.1-0.3	0.9	0.1-0.2	1.5-1.6 (②)	0.2 (①)	1.0-1.6 (②)	1.5-2.1 (②)	0.1-0.2	4.1-12.3 (②-③)	11.5-22.0 (①-②)	22.3-26.9 (②)	1 (①)

Note 1) Figures indicate horizon averages or average ranges (differences according to boring points)
2) Figures in brackets are results of evaluation conducted using Table L-5 of Appendix L.

C-6 Factors Required to Calculate Soil's Erodibility Index

Grouping	Soil Class	Profile No.	Horizon	Particle Size Classification (%)			Organic Matter		Soil Structure		Permeability	
				Sand (1) 2.0-0.05mm	Silt 0.05-0.002mm	Clay 0.002mm>	%	Class (3)	Type (2)	Class (3)	cm/hr	Class (3)
Acrisols	AC	EP2	A	25.83 (5.33, 20.50)	29.69	44.47	5.39	I	SA.AN/f	2	0.21	5
			B	5.01 (0.93, 4.07)	18.40	76.58	2.03	I	SA.AN/vf.m	1	0.17	5
			mean	15.42 (3.13, 12.29)	(24.05)	(60.53)	(3.71)	I		2	(0.19)	5
		OP11	A	6.41 (1.50, 4.91)	61.94	31.65	3.63	I	SA.AN/vf.m	2	0.58	4
			B	9.83 (4.34, 5.52)	31.17	58.99	2.04	I	SA.m/m	4	0.85	4
			mean	8.12 (2.92, 5.22)	(46.56)	(45.32)	(2.84)	I		3	(0.72)	4
	ACC I	OP23	A	9.63 (2.18, 7.45)	65.12	25.25	2.85	I	SA.AN/vf.f	1	-	
	ACC II	OP3	A	15.16 (3.16, 12.00)	41.47	27.89	3.56	I	SA.AN/vf.m	2	-	
			B	20.25 (4.40, 15.85)	38.42	23.30	1.33	I	SA/m-c	4	-	
			mean	17.71 (3.78, 13.93)	(39.95)	(25.60)	(2.45)	I		3		
Cambisols	CM I	OP24	A	14.62 (4.52, 10.10)	55.86	29.52	5.33	I	AN/vf	1	2.61	3
			B	16.74 (2.14, 14.60)	63.34	18.43	1.01	I	SA/vf	1	2.00	4
			mean	15.68 (3.33, 12.35)	(59.60)	(23.98)	(3.17)	I		1	(2.31)	4
	CM II	OP27	A	32.06 (5.76, 28.30)	46.32	21.62	1.14	I	SA/f	2	-	
	CM III	OP21	A	14.19 (2.72, 8.14)	54.33	31.48	2.00	I	AN/vf.f	1	-	
	CM IV	EP4	A	49.06 (6.66, 42.40)	29.06	21.87	4.49	I	AN/vf.f	1	0.22	5
			B	10.63 (3.34, 7.31)	43.91	44.46	0.57	II	SA-M/vf-vc	4	0.17	5
			mean	29.85 (5.00, 24.90)	36.49	(33.17)	(2.53)	I		3	(0.20)	5
Andosols	ANC	EP1	A	70.19 (6.54, 63.65)	17.79	12.02	9.12	I	C-SA/f.m	2	0.20	5
			B	70.97 (7.89, 63.05)	22.88	8.60	3.47	I	SA/C	4	-	
			mean	70.58 (7.22, 63.35)	(20.34)	(10.31)	(6.30)	I		3		
	AN I	OP8	A	61.46 (7.96, 54.50)	29.34	9.20	15.18	I	SA.AN/f.m	2	-	
	AN II	EP7	A	19.61 (* 2.9, 9.70)	73.58	6.78	3.36	I	AN/vf.m	2	3.28	3
			B	26.84 (3.14, 23.70)	68.88	4.28	2.04	I	M	4	0.19	5
			mean	23.23 (3.02, 16.70)	(71.23)	(5.53)	(2.70)	I			(1.74)	4
Immature Soil	LPR	EP3	C	18.73 (6.43, 12.30)	49.94	31.33	0.65	II	M	4	-	
Wettish/Swampy Soil	WS	OP16	A	25.54 (2.44, 23.10)	61.68	12.78	0.29	II	AN/vf	1	-	

Notes (1) The soil laboratory of the Faculty of Agriculture, University of Bengkulu is currently conducting measurements to establish classification categories for the particle size ranges of 2.0 - 0.1 mm and 0.1 - 0.05 mm.

(2) The soil structure types are based on FAO (1977)
Type SA : Subangular blocky AN : Angular blocky C : Crumb M : Massive
Class vf : very fine f : fine m : medium c : Coarse

(3) Wischmeier & Smith's classification (1: Fast > 12 cm/h, 2: Medium fast 6-12 cm/h, 3: Medium 2-6 cm/h, 4: Medium slow 0.5-2.5, 5: slow 0.1-0.5, 6: Very slow < 0.1)

(4) Reference values
Pure sand: 36-3,600 cm/h, Silt: 0.036-0.36 cm/h, Clay: -0.0036 cm/h, Andosols (Japan): 3.6-36 cm/h

C-7 List of Protected Wild Fauna Which May be Found in the Project Area

Classification & Local Name (1)	Scientific Name	English Name	Main Habitat (2)				Remarks	Diet (2) (Fruit is edible)	Nest Location (2) Material	Red Data Book (3)	CITES (4)
			Forest	Secondary Forest; Shrub	Water Front	Near Settlement					
[Mammals] Beruang madu	*Helarctos malayanus*	Malayan sun bear (Semi-tree-living)	○	◎	–	○		honey, plants (0), insects	tree (branch)	V	○
Harimau sumatera	*Panthera tigris sumatrae*	Sumatran tiger	○	○	○	○	normally altitude 200m or less with area of activity of 100 km²	animals	–	E	○
Kancil, Pelandauk, Napu	*Tragulus javaniscus/T. napu*	Lesser Malay chevrotaion/ Greater Malay chevrotaion	○	–	–	–		plants (0)	–	×	×
Kijang	*Muntiacus muntjac*	Barking deer	○	–	–	–		plants (-)	–	×	×
Kucing hutan, Neong congkok	*Felis bengalensis*	Bengal cat	○	–	○	○		small animals, animals	caves (stone)	×	×
Macan dahan	*Neofelis nebulosa*	Clouded leopard	○ (Semi-tree-living)	○	○	◎		animals, small animals	–	V	○
Landak (raya)	*Hystrix brachyura*	Malayan porcupine	○ (Semi-tree-living)	○	–	–		plants (0)	under-ground	×	×
Musang congo/Linsang	*Prionodon linsang*	Banded linsang	○ (Semi-tree-living)	○	–	–		small animals, plants (0), eggs	ground (branch)	×	×
Rusa (sambar) / Menjangan	*Cervus unicolor*	Sambar	○	–	–	○		plants (0)	–	×	×
Tapir	*Tapirus indicus*	Malayan tapir	○	–	○	–		plants (0)	–	E	○
Tupai galang/Tupai jangiang/Jelerang	*Ratufa bicolor*	Black giant squirrel	○ (Semi-tree-living)	○	–	○		plants (0), insects, eggs	–	×	×
Siamang	*Hylobates syndactylus*	Siamang	◎	◎	–	–	normal altitude 2,000m or less group activity	plants (0), eggs, small animals	–	×	○
[Avis] Elang; Elang serangga/ Layang-layang Ulung/Alap-alap	*Accipiter* spp. (*A. badius*)	Goshawk	○	–	–	◎		–	–	×	×
Kuao (besar)	*Argusianus argus*	Great argus pheasant	○	–	–	–		plants (-)	grass, leaves	×	×
Enggang tinggang/Rangkong	*Buceros rhinoceros*	Rhinoceron hornbill	○	–	–	–	normal altitude 1,200m or less	plants (0), insects, small animals	tree (hall)	×	×
Enggang gading/ Enggang gundun/Enggang tokek	*Buceros vigil*	Helmeted hornbll	○ (tree-living)	–	–	–	normal altitude 1,500m or less	plants (0), insects, eggs, small animals	tree (hal!)	K	○
Jantungan belking kuning	*Acthothera flavigaster*	– –	–	–	–	◎		–	–	×	×
Raja udang pinggiran kepala merah tua	*Lacedo pulchella*	Banded kingfisher	–	–	○	–		–	–	×	×

Notes (1) Local names are given by the villagers interviewed for the socioeconomic and cultural conditions survey. As the list is based on local (common) names, some species have a very low probability of being found in the Project Area. The names of protected species are cited from the following documents.
- KANWIL KEHUTANAN PROPINSI BENGKULU (1994): Daftar Nama Flora/Fauna yang dilindungi di Propinsi Bengkulu s/d T.A. 1992/1993 berdasarkan SK. TK. I No. 4 Tahun 1985 (STATISTIK KEHUTANAN)
- Ministry of Forestry (1991/1992); INDONESIA; A Glimpse of Nature Conservation
- Departmen kehutanan (1993): Mengenal lebih dekat satwa yang dilindungi MAMALIA
- Departmen kehutanan (1993): Mengenal lebih dekat satwa yang dilindungi BURUNG

(2) See the literature shown in 1) and that shown below.
- LIPI (1982): Beberapa Jenis MAMALIA
- LIPI (1982): BURUNG INDONESIA BARAT

○: reported –: unknown ◎: Confirmation of members implementing the current conditions survey in the environmental impact assessment study (including marks)

(3) IUCN (1990): 1990 IUCN Red List of Threatened Animals
V: vulnerable species E: endangered species K: insufficiently known

(4) Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington Convention)
○: designated species by CITES Annex I

C-8 Outline of Flow Conditions and Water Quality of Rivers in the Project Area

River Name	Measurement No.		Village Name	1)	Hydrological Catchment Area (Ha)	Distance (km)	Flow Rate (m^3/s)	Height of Runoff ($m^3/s \cdot ha$)	Water Quality/ Water Temperature (°C)	Color (Unit PtCo)	Electric Conductivity (Umhos cm)	Suspended Solids (Mg/l)	Turbidity (NTU)	pH —	CaCO3 Mg/leg. CaCO3	CO2 Mg/l	DO Mg/l	BOD5 Mg/l	COD Mg/l	N-NH3 Mg/l	N-NO2 Mg/l	N-NO3 Mg/l	PO5 Mg/l	H2S Mg/l	Mn Mg/l	Fe Mg/l	Mg Mg/l	Total Insecticides (Mg/l) 2)
Air Mundu	1	a	Kp. Melayu (5E)	R		10.11 (a-c)	0.16		26.0	4.65	186	2.0	21.0	6.0	34	7.99	6.44	0.25	52.87	0.429	0.013	0.242	0.044	<0.01	0.184	0.679	0.137	0.0003
				D			0.00																					
				R/D																								
		b	Kp. Sajad (5D)	R			0.13		25.0	4.80	204	16.0	1.8	5.6	22	7.00	6.10	5.41	54.94	0.354	0.009	0.321	0.055	<0.01	0.015	0.448	0.323	0.0002
				D			0.00																					
				R/D																								
		c	Sukaramu (5B)	R		10.62 (b-c)	0.09		19.0	4.60	185	22.0	5.5	5.5	30	15.98	7.38	0.25	46.63	0.486	0.007	0.486	0.068	<0.01	0.140	0.597	0.520	0.0004
				D			0.00																					
				R/D																								
		d	Taba Renah (5A)	R	8,135	2.86 (a-d)	5.20	0.00064	24.8	4.45	215	14.0	1.40	6.0	25	15.98	6.96	0.59	48.71	0.347	0.013	0.341	0.066	<0.01	0.088	0.315	0.206	0.0094
				D			1.47	0.00018																				
				R/D			3.56																					
Air Dendan	2	a	Taba Renah (6A)	R	13,294		14.60	0.00110	24.0	4.80	227	14.0	0.80	6.0	26	13.98	7.80	0.76	46.63	0.546	0.008	0.090	0.067	<0.01	0.125	0.099	0.088	0.0011
				D			1.97	0.00015																				
				R/D			7.39																					
Air Pikat Kering	3	a	Air Pikat (2C)	R			1.20		20.0	4.40	258	4.0	0.35	6.0	36	7.99	7.20	0.34	48.71	0.375	0.015	1.373	0.069	<0.01	0.066	0.043	0.216	0.0014
				D			0.00																					
				R/D																								
		b	Tebat Pulau (2B)	R		3.85	2.68		22.0	4.35	250	22.0	2.0	5.5	31	5.99	7.20	0.68	61.17	0.433	0.012	0.702	0.096	<0.01	0.110	0.624	1.010	0.0050
				D			0.00																					
				R/D																								
		c	Bukit Barisan/ Tanjung Dalam (2A)	R	4,896	7.34	7.10	0.00145	22.6	9.80	290	32.0		6.0	53	7.99	7.69	1.02	46.63	0.656	0.008	0.656	0.084	<0.01	0.162	0.408	0.294	0.0002
				D			2.15	0.00044																				
				R/D			3.31																					
Air Lanang	4	a	Air Lanang (1D)	R			0.05		21.0	5.10	390	26.0	3.5	60	25	21.97	6.96	0.34	46.63	0.214	0.011	0.174	0.023	<0.01	0.103	0.670	0.118	0.0005
				D			0.00																					
				R/D																								
		b	Air Lanang (1C)	R		1.19	1.26		21.8	5.10	305	14.0	1.1	6.0	46	19.98	8.14	1.69	46.63	0.138	0.013	0.138	0.099	<0.01	0.110	0.397	0.284	0.0003
				D			0.00																					
				R/D																								
		c	Suro Bali (1A)	R	5,690	7.70	14.80	0.00260	22.0	4.30	225	18.0	2.3	6.0	49	19.92	6.44	2.03	42.48	0.632	0.017	0.117	0.097	<0.01	0.051	0.942	0.294	0.0020
				D			0.98	0.00017																				
				R/D			15.12																					
Air Ketapan	5	a	Tebat Monok (3B)	R			0.08		22.8	4.20	245	6.0	1.5	5.5	40	27.97	6.62	0.85	61.17	0.536	0.010	0.220	0.036	<0.01	0.118	0.324	0.814	0.0003
				D			0.00																					
				R/D																								
		b	Cirebon Baru (3A)	R	1,381	2.85	0.60	0.00043	24.0	4.39	248	14.0	0.71	6.0	40	3.99	7.72	0.51	44.56	0.450	0.015	0.357	0.049	<0.01	0.073	0.096	0.784	0.0004
				D			0.15	0.00011																				
				R/D			3.99																					
Air Tartuk	6	a	Tebat Laut (4C)	R			0.02		25.0	4.65	220	10.0	0.54	6.0	43	29.96	5.34	2.88	40.40	0.439	0.007	0.073	0.070	<0.01	0.088	0.098	0.637	0.0018
				D			0.00																					
				R/D																								
		b	Tabupadang (4B)	R		5.10	1.07		26.3	4.85	230	8.0	1.4	6.0	68	2.00	7.88	0.93	50.79	0.240	0.009	0.240	0.094	<0.01	0.044	0.275	0.637	0.1931
				D			0.00																					
				R/D																								
		c	Lubuk Saung (4A)	R	5,276	1.24	2.10	0.00040	22.6	5.15	270	8.0	1.2	6.0	37	19.98	6.96	1.44	57.02	0.283	0.012	0.283	0.069	0.1931	0.081	0.187	0.657	0.055
				D			1.12	0.00021																				
				R/D			1.87																					
Air Muai	7	a	Seguring (7D)	R			1.43		22.5	4.55	114	6.0	1.0	5.5	25	15.98	7.38	1.69	46.63	0.139	0.015	0.087	0.197	0.1931	0.140	0.148	0.216	0.0014
				D			0.00																					
				R/D																								
		b	Lubuk Penyamun (7B)	R		14.32	10.03		27.0	4.75	348	18.0	2.1	6.0	53	2.00	7.12	0.17	57.02	0.493	0.011	0.530	0.040	0.1931	0.044	0.225	0.931	0.0009
				D			0.00																					
				R/D																								
		c	Ujang Mas Atas (DAM (7B1)	R		9.58				26.0	4.20	340	8.0	2.5	5.5	53	9.99	7.96	0.42	50.79	0.321	0.015	0.629	0.091	0.1931	0.103	0.486	1.029	0.0013
				D																								
				R/D																								
		d	Empung Iuk (7C)	R		38.35	8.65		25.0	4.60	320	4.0	2.5	6.5	34	2.00	7.88	0.34	54.94	0.268	0.140	0.490	0.079	0.1931	0.044	0.396	1.059	0.0015
				D			0.00																					
				R/D																								
		e	Kunduran Baru (7A)	R	114,568	9.40	116.70	0.00102	25.5	4.75	310	8.0	1.5	6.0	69	3.99	7.38	1.94	48.71	0.204	0.019	0.629	0.144	0.1931	0.044	0.225	0.931	0.0002
				D			31.24	0.00027																				
				R/D			3.76																					
Air Selimang	8	a	Air Selimang (4D)	R			0.13		26.5	4.95	440	20.0	1.5	6.0	100	21.97	6.36	0.34	52.87	0.669	0.006	0.669	0.152	0.1931	0.081	0.212	2.176	0.0008
				D			0.00																					
				R/D																								
Rainfall	3)										6.50			6.52	0.14					0.27		0.03					0.05	
											5.67			6.34	0.13					0.18		0.11					0.05	
Standard Value	4)	Max							30.0	50	1,500	500	25	9	30	40		20	50	0.5	1	10	50	0	0.5	5	30	0.1
		Min							16.0					5			3											

Note 1) R: Measured during survey on stream conservation in the rainy season (October-November, 1996)
D: Measured in the environmental impact study and survey of current conditions in the dry season (July-August, 1996)
The self purification concentration reduction coefficient (r) is calculated by the following expression:

2) Total of values (rounded off to 5 decimal places) given in the Water Quality Analysis Certificate (see Appendix I-5)

3) Hasil Analysis Air Hujan Station: Average value for July 10 from P. Buai-Bengkulu (1995)

4) Category B, Peraturan Pemerintah Republic Indonesia Nomor 20 Tahun 1990 tentang Pengendalian Pencemaran Air

5) $r = \frac{1}{x}(\ln M - \ln M')$ Therefore, x: distance between 2 points, M: upstream value, M': downstream value

C-9 Outline of Flow and Water Quality of Groundwater in the Project Area

Topographical Division	Measurement No.	Altitude	Village Name	Hydrology 3)	Well Diameter (m)	Groundwater Level (m)	Well Depth (m)	Flow Rate (m^3/s)	Water Quality/ Water Temperature (°C)	Color Unit PtCo	Electric Conductivity (Umhos cm)	Suspended Solids (Mg/l)	Turbidity (NTU)	pH —	CaCo3 Mg/leg. CaCo3	CO2 Mg/l	DO Mg/l	BOD5 Mg/l	COD Mg/l	N-NH3 Mg/l	N-NO2 Mg/l	N-NO3 Mg/l	P2O5 Mg/l	H2S Mg/l	Mn Mg/l	Fe Mg/l	Mg Mg/l	Total Insecticides (Mg/l) 4)
	1	910	KP. Melayu	W	1.00	4.93	6.33	0.000017	23.5	4.85	183	4.0	0.60	6.0	41	27.97	5.081	3.30	27.94	0.632	0.014	2.476	0.176	<0.01	0.103	0.116	1.225	0.0706
	2	900	Air Pikat (6)	W	0.93	0.80	2.00	0.000020	23.0	4.30	224	4.0	0.45	5.0	21	25.97	4.66	0.59	46.63	0.461	0.014	1.000	0.026	<0.01	0.037	0.048	0.029	0.0001
	3	*2)	Tanj Dalam (13)	W	0.74	—	3.60	—	23.0	4.60	250	6.0	0.70	6.0	74	29.96	3.74	3.98	52.87	0.086	0.012	2.572	0.088	<0.01	0.140	0.035	1.667	0.0971
	4	730	Sukarami (10)	W	0.98	6.06	6.69	0.00008	23.5	4.60	180	16.0	1.30	5.5	28	31.96	4.92	3.72	42.48	0.750	0.007	2.665	0.312	<0.01	0.125	0.101	1.059	0.0302
	5	620	Taharenah (12)	W	1.00	2.99	4.03	—	24.0	4.70	145	16.0	1.50	6.0	33	65.92	3.06	0.42	38.32	0.096	0.012	1.960	0.102	<0.01	0.272	0.147	0.598	0.0231
	6	620	Air Lanang (11)	W	0.93	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				S1	—	—	—	0.000068	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				S2	—	—	—	0.000150	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				S3	—	—	—	0.000076	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
				S4	—	—	—	0.000141	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	7	590	Sumbali (3)	W	0.93	5.83	6.72	0.000018	24.0	4.35	240	2.0	0.71	6.0	33	23.97	6.86	3.47	57.02	0.311	0.014	1.816	0.084	<0.01	0.022	0.076	0.088	0.0010
	8	510	Tebat Monok (4)	W	1.35	5.27	6.06	0.0003035	24.5	4.55	310	10.0	0.75	6.0	37	19.98	6.86	0.51	61.17	0.214	0.020	2.356	0.041	<0.01	0.125	0.043	0.225	0.0047
	9	490	Cirebon Baru (5)	W	0.75	5.25	9.67	0.00083	26.5	4.20	260	8.0	0.92	5.5	25	33.96	4.24	2.45	44.56	0.354	0.020	1.986	0.035	<0.01	0.176	0.058	0.490	0.0045
	10	490	Lubuk Saung	W	1.00	—	4.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	11	620	TalangBahatm	S	—	—	—	0.005825	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	12	690	Tebat Laut (8)	W	0.92	11.02	11.78	0.000120	22.0	4.30	—	10.0	2.2	6.0	34	2.00	0.76	0.59	73.63	1.039	0.009	1.039	0.048	<0.01	3.765	1.267	1.520	0.0011
	13	490	Tabapadang (7)	W	1.21	4.22	4.34	0.000016	24.0	14.45	376	110.0	58.00	6.0	37	15.93	6.62	5.33	69.48	0.579	0.049	2.049	0.031	<0.01	0.353	6.601	0.990	0.0003
	14	600	Air Selimang (1)	S	—	—	—	0.001125	25.0	4.35	300	16.0	1.20	6.0	39	23.97	5.08	4.65	54.94	0.504	0.015	1.813	0.030	<0.01	0.213	0.056	0.588	0
Standard Value 5)	Max.								30.0	50	1500	500	25	9	30	40		20	50	0.5	1	10	50	0	0.5	5	30	0
	Min.								16.0					5			3											

Note 1) Measurement in the environmental impact assessment
2) *: Because location is unclear
3) W: Well S: Spring
4) Total of values (rounded off to 5 decimal places) given in the Water Quality Analysis Certificate (see Appendix 1-5)
5) Category B, Peraturan Pemerintah Republik Indonesia Nomor 20 Tahun 1990 Tentang Pengendelian Pencemaran Air

C-10 Characteristics of Herbicides Frequently Used in the Project Area

Commercial Name	General Name	Main Constituent	Density (g/litre)	Impacts on Human Body (1)		Impacts on Fish (1)		Persistent Toxicity in Ground (2)
				Toxic Substance/ Poison	Toxic Symptoms	Carp (Half-Dead Density)	Water Flea (TLM: ppm)	
Gramoxone	Paraquat Agent	Paraquat 2 Chloride	276	Toxic Substance	Damage to Kidneys/ Liver/Lungs	>10	>0.5	O
Herbatox	"	"	?	"	?	-	-	
Parakol	"	"	?	"	?	-	-	
Polaris	Glyphos-ate Agent	Isopropyl-amine salt	240	Poison	Irritant (to eyes, etc.)	>10 (48 hours; 119 ppm)	>0.5 (3 hours; 192 ppm)	X
Roundup	"	"	"	"	?	>10 (350 ppm)	"	
Spate	"	"	"	"	?	-	-	
Reudamin	"	"	"	"	?	-	-	
SPARK	"	"	160	"	?	-	-	

Notes (1) The table is compiled based on test results involving similar agents in Japan.

(2) Directorate General of Regional Development, Ministry of Home Affairs (Draft Nov. 1996): Bengkulu Regional Development Preparation Report Volume 2; Annex 1.

D. Reference Data for Socioeconomic Environment

D-1 Structure and Contents of the Survey

No.	Survey	Date	Purpose	Method
1	Outline Survey of Study Area (5 villages) (The 1st Field Survey)	March, 1996	•Understanding of regional characteristics and the problems of the Study Area •Collecting basic information to select project area	•RRA (Rapid Rural Appraisal) •Analysis of secondary data, various statistics and references
2	Socioeconomic and Cultural Conditions Survey in the Project Area (10 villages) (The 2nd Field Survey)	October - November, 1996	•Understanding of regional characteristics, people's needs and problems, etc. of the Project Area (50,000ha) •Analysis of the problems in order to implement social forestry development plan	•PRA (Participatory Rural Appraisal) •Analysis of secondary data, various statistics and references
3	Workshop (30 villages) (The 3rd Field Survey)	July, 1997	•Exchange of opinions among participants for the problems found in the results of the2nd field survey •Hearing of opinions of the participants regarding social forestry development plan in the project area	•Group discussions by participants on different themes
4	Supplimentary Survey for the Project Area (20 villages) (The 3rd Field Survey)	July, 1997	•Confirmation of the results of the 2nd field survey and comparison with the results of the 3rd field survey •Supplimentary survey for the people's needs/problems	•RRA

D-2 Demographic Information in the Surveyed Villages

(1) The 2nd Field Survey

Items	Villages									
	TT. Dalam	Dusun Sawah	Air Lanang	Suro Bali	Das Petah	Pager Gunung	Tebat Monok	Kelilik	Kandang	Air Selimang
Total Population	784	2,167	702	283	3,332	853	1,778	489	764	353
Share of Women (%)	48.6	32.7	51.4	55.1	50.3	47.7	49.8	51.1	47.3	56.9
Village Area Size (ha)	800	1,000	780	120	350	300	450	150	550	100
Population Density (persons/km^2)	98	60	94	280	950	280	390	330	140	350
Number of Households	175	120	195	68	795	226	375	121	192	125
Religion (%)	Islam, 100	Islam, 99	Islam, 100	Hindu, 58	Islam, 100	Islam, 100	Islam, 100	Islam, 100	Islam, 100	Islam, 100
Landless Households (%)	15 (8.6)	50 (41.7)	10 (5.1)	17 (45.6)	57 (7.2)	31 (7.5)	40 (10.7)	30 (24.8)	40 (20.8)	70 (56.0)

(2) The 3rd Field Survey

Items	Villages									
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah
Total Population	1,062	2,365	1,379	437	235	2,090	1,130	1,193	2,158	683
Share of Women (%)	37.0	56.4	56.4	49.7	50.2	44.7	50.4	54.5	51.3	52.1
Village Area Size (ha)	1,100	1,350	600	2,079	200	1,200	1,400	–	8,000	2,000
Population Density (persons/km^2)	97	175	230	21	118	174	81	–	27	34
Number of Households	287	475	374	103	75	425	250	288	610	118
Religion (%)	Islam, 100	Islam, 100	Islam, 100	Islam, 97	Islam, 95	Islam, 100	Islam, 100	Islam, 100	Islam, 100	Islam, 100
Landless Households (%)	10 (3.5)	75 (15.8)	50 (13.4)	20 *(4.6)	7 *(3.0)	10 *(0.5)	20 (8.0)	14 (5.0)	55 (9.0)	57 (50)

Items	Villages									
	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Total Population	3,542	1,157	601	555	2,225	407	1,327	1,262	377	863
Share of Women (%)	33.5	51.4	51.6	54.1	48.4	44.2	40.0	58.0	–	66.7
Village Area Size (ha)	160	780	250	38	216	185	350	700	3,000	875
Population Density (persons/km^2)	2,214	148	240	1,460	1,030	220	379	180	13	99
Number of Households	602	313	105	154	538	96	231	311	101	269
Religion (%)	Islam, 100	Islam, 100	Islam, 100	Islam, 100	Islam, 99	Islam, 100	Islam, 99	Islam, 100	Islam, 100	Islam, 100
Landless Households (%)	4 (0.7)	25 (8.0)	0	5 (3.2)	40 *(1.8)	10 (10.4)	40 (17.3)	60 *(4.8)	50 (50.0)	150 (55.8)

Note) * shows persons.

D-3 Ethnic Compositions (The 3rd Field Survey)

Items	Villages						
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Major Ethnic Groups (%)	•Jawa (80) •Rejang •Serawai, Padang	•Jawa(90) •Rejang •Batak, Padang	•Rejang (90) •Serawai •Jawa, Padang	•Jawa(99) •Rejang •Batak	•Jawa(90) •Rejang (10)	•Jawa(75) •Rejang (15) •Sunda, Padang	•Serawai (60) •Rejang (30) •Jawa, Padang

Items	Villages						
	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Major Ethnic Groups (%)	•Serawai (75) •Rejang, Jawa	•Rejang (90) •Jawa	•Rejang (100)	•Rejang	•Rejang	•Rejang	•Jawa (85) •Rejang

Items	Villages					
	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Major Ethnic Groups (%)	•Rejang (90) •Padang •Serawai, Pasmah	•Sunda (50) •Jawa (47) •Rejang	•Rejang (60) •Pasmah •Serawai	•Jawa •Serawai •Rejang	•Jawa •Pasmah	•Pasmah •Jawa •Sunda, Serawai

D-4 Domestic Water Supply Sources

(1) The 2nd Field Survey

(Unit: %)

Items	Villages									
	TT. Dalam	Dusun Sawah	Air Lanang	Suro Bali	Das Petah	Pager Gunung	Tebat Monok	Kelilik	Kandang	Air Selimang
Individually Owned Well	40.0	33.0	0.8	90.0	60.0	51.4	91.0	57.5	67.8	9.9
Other Wells	6.6	0	0	8.3	0	0	2.0	3.8	0	12.1
Springs	10.0	55.0	0	1.7	40.0	35.1	3.0	2.5	1.1	60.5
Ponds	1.1	1.1	0	0	0	7.4	4.0	0	5.6	0
Rivers/Streams	42.2	9.9	99.2	0	0	5.1	0	36.4	25.6	23.1

(2) The 3rd Field Survey

Items	Villages						
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Well (Users: % in total villagers)	80	100	75	80	60	100	20
PU Water Tank (Numbers)	1	0	1	2	4	0	2 (Users share 20% of total villagers)
Others	Springs	Rivers					Rivers
Remarks							Water amount of wells decrease in dry season.

Items							
	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Well (Users: % in total villagers)	25	75	50	100	100	100	100
PU Water Tank (Numbers)	1	0	0	0	0	0	0
Others				Springs			
Remarks			Rivers Water amount decrease in dry season.				

Items						
	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Well (Users: % in total villagers)	20	100	26	100	13 wells in the village.	50
PU Water Tank (Numbers)	0	0	0	2	2	2
Others	Rivers		Rivers, Springs		Springs	Springs
Remarks		Water amount decrease in dry season.	Water amount is not enough.		Water amount is not enough. Ownership of springs is problematic.	Water amount of wells decrease in dry season.

D-5 Economic Conditions (The 3rd Field Survey)

	Villages						
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Major Jobs other than Agriculture in the Owned Land	Agricultural waged labor	Agricultural waged labor Merchant	Go out village for agricultural labor	Go out village for agricultural labor	Nothing	Nothing	Go out village for agricultural labor
Paceklik and its Countermeasures	Oct. - March Agricultural waged labor in the village	Nothing	Sept. - June Agricultural waged labor	Jan. - June Agricultural waged labor outside village	Sept. - Dec.	March - April	Sept. - Dec.
Income Sources of Landless Households (Share-cropping)	Tenant (1/2 of coffee harvest, 2/3 of other products)	Tenant (1/2 of coffee harvest, 2/3 of other products)	Tenant (2/3 of each production of coffee and vegetables)	Tenant (2/3 of each production of coffee and vegetables)	Tenant (2/3 of production of soybeans, chilli, corns)	Tenant (2/3 of coffee harvest)	Tenant (2/3 of coffee harvest)

	Villages						
	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Major Jobs other than Agriculture in the Owned Land		Go out village for construction worker	Go out village for agricultural labor. Various jobs in the village	Nothing	Nothing	Nothing	Go out village for agricultural labor
Paceklik and its Countermeasures	Oct. - March Saving. Selling bananas, fuelwoods and bamboo shoots.	Nov. - Feb. Construction workers. Selling bamboo shoots and fuel-woods.	Sept. - March Go out village for agricultural labors. Agricultural waged labor in the village.	Nothing	Nothing	Nov. - Feb. Go out village for agricultural waged labors.	Sept. - March Women make cracker of cassava. Men go out village for construction/ agricultural worker.
Income Sources of Landless Households (Share-cropping)	Tenant (Paddy field)	Tenant (Coffee). Various kinds of waged labors.	Tenant (1/2 of harvest of coffee) Various waged labors.	Tenant (1/3 of coffee and 1/2 of rice production)	---	---	Tenant (1/2 of each production of coffee and rice)

	Villages					
	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Major Jobs other than Agriculture in the Owned Land	Go out village for industrial workers	Go out village for agricultural / construction worker	Go out village for industrial labors	Nothing	Nothing	Go out village for industrial workers
Paceklik and its Countermeasures	Dec. - March Agricultural waged labors	July- March Construction / agricultural worker in neighboring villages	Sept. - Feb. Go out village for agricultural labors	Oct. - Feb. Go out village for agricultural labors	Aug. - April Borrow money from middlemen and banks	Dec. - March Go out village for agricultural / construction worker. Selling cilli, kapok, and kemiri
Income Sources of Landless Households (Share-cropping)	Tenant (1/2 of coffee harvest). Agricultural waged labor in the village.	Tenant (2/3 of each production of coffee and rice). Agricultural waged labor in the village.	Tenant (1/2 of production of coffee	Tenant (1/2 of each production of coffee and rice)	Tenant (2/3 of coffee harvest)	Tenant (2/3 of coffee harvest)

D-6 Reasons for Coffee Preference by Villagers

No.	Items	Reasons
1	Economic related matters	a. Price is higher than other products. b. Capital is smaller than that used for vegetables. c. Marketing system is stable.
2	Geographical matters	a. Climate is suitable. b. Soil conditions are suitable.
3	Others	a. There is no experience of other crop cultivation. Farmers have an anxiety for introducing other crops than coffee. b. Coffee cultivation has long history and farmers are accustomed. c. Workload such as land arrangement for coffee cultivation is low. d. Most of the neighboring farmers are cultivating coffee.

D-7 Collection of Fuelwoods in the Surveyed Villages

(1) The 2nd Field Survey

Items	Villages									
	TT. Dalam	Dusun Sawah	Air Lanang	Suro Bali	Das Petah	Pager Gunung	Tebat Monok	Kelilik	Kandang	Air Selimang
Self-supply (%)	97.8	84.7	96.7	95.0	87.8	83.4	90.0	96.3	98.9	90.1
(Place for collecting)										
Coffee Plantation (%)	78.9	97.9	100	85.0	84.5	72.9	67.0	97.5	72.6	84.7
Forest (%)	0	1.1	2.2	0	1.1	0	3.0	0	0	0

(2) The 3rd Field Survey

	Villages						
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Kinds	•Coffee	•Coffee •Any things to be available	•Coffee •Shade trees (sengon)	•Coffee •Shade trees (sengon, kemiri, kayu res)	•Coffee •Agricultural wastes	•Coffee	•Coffee
Places for Collection	•Coffee plantations	•Coffee plantations •Forests	•Coffee plantations •Farmlandd	•Coffee plantation	•Coffee plantations	•Coffee plantations	•Coffee plantations
Remarks			Generally amount is enough, sometimes buy a little	Some people buy and some can sell surplus	Enough at present, but tend to decrease the amount		Sometimes sell surplus

	Villages						
	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Kinds	•Coffee	•Coffee	•Coffee •Bush trees	•Coffee	•Coffee •Shade trees (lamtprp, kayu res)	•Coffee	•Coffee
Places for Collection	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations
Remarks	Sometimes sell surplus			1/3 of total households in the village use stove.			

	Villages					
	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Kinds	•Coffee •Any kinds of trees	•Coffee •Shade trees (kayu res. sengon)	•Coffee	•Coffee	•Coffee	•Coffee
Places for Collection	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations	•Coffee plantations
Remarks					Sometimes sell surplus	Sometimes sell surplus

D-8 Kinds of Construction Woods and the Collecting Ways

(The 3rd Field Survey)

Items	Villages						
	Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Species	•Cempaka •Medang	•Cempaka •Medang	•Medang	•Cempaka •Medang	•Cempaka	•Cempaka •Medang	•Cempaka •Medang
Places for Collecting/Aquisition	Forest	Forest	Buy in markets	Buy in markets	Buy in market	Farmland	Buy in market
Remarks			Amount is not enough	Shortage (It is difficult to buy due to long distance to market.)			Demand of woods increases due to cash incomes after coffee harvest.

Items	Villages						
	Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Species	•Medang •Meranti •Durian	•Medang •Meranti	•Medang	•Meranti	•Meranti •Durian	•Medang •Meranti	•Meranti
Places for Collecting/Aquisition	Coffee plantations	Buy in market	Buy in market	Buy in market	•Buy in market. •Own land.	Buy in market	Buy in market
Remarks					As increase of young people, demand for housing increases.		

Items	Villages					
	Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Species	•Meranti	•Meranti	•Meranti	•Meranti	•Meranti •Medang	•Meranti •Kemiri •Durian •Meranbun
Places for Collecting/Aquisition	Buy in market	Buy in market	Buy in market	Buy in market	•Buy in market. •Collecting in any places.	•Buy in market. •Coffee plantation. •Forest
Remarks						Durian that were many before in/around village were mostly cut.

D-9 People's Needs for Improvement Living Conditions (The 2nd Field Survey)

Items	Ranking	Problems (Needs)	Villages										Solutions
			TT	DS	AL	PG	DP	SB	TM	Ke	Kn	AS	
Regional Characteristics	②	(1) Unstable Income	×	×	×		×	×	×	×			• Training for women (AL)
		a.Monoculture of Coffee											• Stabilization of price by government
		• Only annual harvest (SB, DP, AL)											• Expansion of bamboo (DP, TM)
		• Unstable price (SB, DP)											• Introduction of various crops/ high intensification of coffee
		• Old trees, small production (DS)											
		b.Lack of jobs for women after harvest			×								
		c.Lack of jobs(high unemployment)	×						×	×			
		(2) Increase of Protection Forest (BW—BHL)			×					×			• Return HL to village (Border change)
		a.Lack of construction woods			×								• Collecting bamboo in forests
		b.Encroacheres outside of village		×			×				×	×	• Unification of regulations/laws
		c.Decrease of village land		×									
Agriculture	④	(1) Damage by blight, insects and animals (Wild bore, rat, monkey, ant, bird, fungus)	×	×	×		×	×					Intensive eradication (Farmers worry about overuse of chamicals in SB)
	④	(2) Stealing of crops		×		×	×	×			×		
		(3) Thick weeds						×	×				
	③	(4) Land scarcity (because of HL)	×	×	×	×	×	×	×	×	×	×	• Use of HL as farmland
		a.No/small amount of rice production											• Return HL to farmers
		b.Limited ownership (TT, DS)											• Collecting fruits in forests
		c.Rise of land price (SB)											• Tree planting in HL
		(5) Lack of domestic animals						×			×		• Intensive use of land owned by villagers.
		a.Lack of land (DP, Ke)											
		b.Difficulty of collecting feed (Ke)											
		(6) No/low level of technology (traditional farming practice)	×										• PPL is necessary
		(7) Small share of crops to tenant		×									• Set up regulations
Infrastructure, Public Services		(1) Long distance to schools	×	×	×					×			• Construction of schools
		a.Low level of education (DS)											
		b. High transportaion costs (AL)											
		(2) Lack of Bidan Desa (nurse)	×		×								
	②	(3) No/low function of irrigation system	×	×			×	×		×	×		• Development of irrigation system
		(4) Difficulty of collecting water								×			• Development of water supply system (assistance by government)
		a.Long distance to water sources	×		×							×	
		(5) Lack of electricity	×		×							×	
		(6) Lack of administrative organizations, PPL, PLP	×										
		(7) Low level of cooperation, mutual help in villages		×									

D-10 People's Needs for Improvement of Living Conditions (The 3rd Field Survey)

		Villages						
		Sumber Rejo	Air Bening	Sentral Baru	Kampung Sajad	Air Mundu	Baru Manis	Air Pikat
Infra-structure	Roads		•Improvement of roads		•Construction of inter-villages roads	•Construction of inter-villages roads	•Construction of roads transporting agricultural products	•Improvement of roads
	Water related matters		•Repair of irrigation system		•Construction of toilets. •Development of bathing places.	•Development of irrigation system		•Construction of water sullpy system. •Improvement of irrigation system
Agriculture	Production	•Improvement of agricultural productivity (use of fertilizer and chemicals)					•Improvement of agricultural productivity	
	Reasons for Necessary for KUD	•Farming capital. •Fertilizer,chemicals	Collecting products. •Fertilizer,chemicals	•Fertilizer,chemicals	•Fertilizer,chemicals	•Fertilizer,chemicals •Sale of products.	•Fertilizer,chemicals	•Fertilizer,chemicals •Sale of products.
	Technology						•Technology to make good quality crops. •Participation in training •Establishment of processing industry.	•Guidance of agricultural extension workers
	Market/price	•Stability of price	•Establishment of market. •Stability of price.	•Establishment of market			•Stability of price. •Establishment of market.	
Others		•Guidance by forestry extension workers •Many jobless young people	•Many jobless young people	•Many jobless young people		•Establishment of cooperative for borrowing money	•Capital for tree planting provided by Forestry Office	•Many jobless young people

		Villages						
		Tanjung Alam	Ujan Mas Atas	Ujan Mas Bawah	Kelobak	Pelangkian	Taba Tebelet	Karang Anyer
Infra-structure	Roads		•Development of roads in the village	•Construction of access roads to market			•Improvement of roads in the village	
	Water related matters	•Improvement of water supply system	•Improvement of irrigation system	•Establishment of water supply system			•Construction of check dams	
Agriculture	Production	•Increase of agricultural productivity •Eradication of pests. •Poor soil quality. •Shortage of land (desire to cultivate inside forest)						
	Reasons for Necessary of KUD			•Borrow money		•Borrow money for farming	•Fertilizer,chemicals	•Fertilizer,chemicals
	Technology	•Study tour of excellent villages •Guidance by extension workers •Technology for intensive production		•Guidance of extension workers				
Others		•Many jobless young people	•Due to new road to Bengkulu, many encroachers are coming	Many jobless young people				•Many jobless young people

		Villages					
		Dusun Kepahiang	Cirebon Baru	Lubuk Saung	Taba Padang	Tebat Laut	Bunuang Galing
Infra-structure	Roads	•Improvement of roads in the village			•Improvement of roads in the village		•Improvement of roads in the vilalge
	Water related matters		•Improvement of water supply syste (water shortage in dry season)m	•Establichment of water supply system •Establishment of irrigation system			
Agriculture	Production						
	Reasons for Necessary of KUD Technology		•Fertilizer,chemicals	•Fertilizer,chemicals	•Fertilizer,chemicals	•Fertilizer,chemicals	•Borrow money. •Exclude bad middlemen •Guidance by agricultural extension workers
Others			•Many jobless young people			No electricity	Soil errosion

D-11 People's Needs with Priority

	Water Resources for Daily Life	Agriculture				Unemployment
		Fertilizer/ chemicals	Price	Technology	KUD	
Number of Villages	9	13	5	6	16	12

D-12 Outline of Program of Workshop on Social Foretry Development in the Management Area of Upper Musi Watershed

The 1st day (July 8, 1997)

	Program	Agencies in Charge/Moderator (★)
Morning	1) Opening ① Report by Steering Committee	* Chairman (Head of Reforestation Division, Kanwil Kehutanan)
	② Speech by Resident Representative of JICA Indonesia Office	* Substitute 1)
	③ Speech by Director of Regional Forestry Office of Bengkulu Province	* Director of Regional Forestry Office of Bengkulu Province
	④ Sppech by Director of Regreening and Social Forestry	* Director of Regreenign and Social Forestry
	⑤ Speech by Bupati of Kab. Rejang Lebong, Opening Address	* Substitute 2)
	2) Policy of social forestry	* Director of Regreening and Social Forestry
	3) Policy of watershed conservation	* Director of Rehabilitation and Soil Conservation
	4) Questions and answers	* NGO (Bina Swadaya) ★
Afternoon	1) Results of JICA survey	* Technical Cooperation Division, Directorate of Planning and Programming
	2) Question and answers	* Reforestation Division, Kanwil Kehutanan ★
	3) Grouping of participants	* NGO (WARSI)

Note 1) JICA Expert on Forest Planning, 2) The Second Assistant Bupati of Kab. Rejang Lebong

The 2nd day (July 9, 1997)

	Program	Agencies in Charge/Moderator (★)
Morning	1) Explanation of themes for group discussion	* NGO (WARSI)
	2) Group discussion	* NGO (WARSI) ★
	Group I: "Deforestation"	
	Group II: "Trees Suitable for Social Forestry	
	Group III: "Organization"	
	3) Joint discussion of the results of group discussion	
	① Group I	* NGO (WARSI) ★
Afternoon	3) Joint discussion of the results of group discussion	* NGO (WARSI) ★
	② Group II	* Representative of Group II
	③ Group III	* Representative of Group III
	4) Preparation of the summary of group discussion results	* NGO (WARSI) ★
		* Representatives of Groups I, II, and III
	5) Presentation of results of group discussion	* NGO(WARSI)
	6) Closing	
	① Speech by Leader of JICA Study Team	* Leader of JICA Study Team
	② Speech by Chairman of the Steering Committee, Closing Address	* Chairman (Head of Reforestataion Division, Kanwil Kehutanan)

D-13 Summary of the Workshop

(1) Questions and Answers on the Explanation of Survey Results and Countermeasures

No.	Questions in the Workshop	Answers in the Workshop	Countermeasures
1	Trial plot which is planned in Desa Tebat Pulau is located in private land or national forest?	(Answered by JICA Study Team) Planned in private land.	Done
2	Where is the accurate national forest boundary?	(Answered by JICA Study Team) The national forest boundary was pointed on the map.	Done
3	Who will harvest the products of agroforestry? Is there any market for them? Is there any marketing plan?		The inhabitants will harvest the products of agroforestry in private land. Introduction of the products with marketability is planned.
4	How can the people harvest non-timber products such as rattan in national forest?	(Answered by Ministry of Forestry) The villagers are allowed to collect and sell non-timber products, but not allowed to sell land according to social forestry.	Done
5	There is a protection forest in Desa Ujan Mas. Can the villagers manage this forest?		The villagers can participate in the people's participatory activities for afforestation to be planned in the forest.
6	Company of hydroelectric power station project in Musi River bought or rent the land from Ministry of Forestry?	(Answered by Ministry of Forestry) Ministry of Forestry provides the lease when the project use land.	Done
7	When is this social forestry project implemented?	(Answered by Ministry of Forestry) The time of implementation dependson community and government Voluntary of the community is very important. If the community accepts the project, governemnt considers the implementation.	
8	If any conflict occurs on land between settlement plans and Ministry of Forestry, how the problem will be resolved?		In advance of implementaion of the project, concerned agencies will try to coordinate.
9	Who will monitor the implementaion of the project?		Ministry of Forestry
10	People can stay and cultivate national forest before the project is implemented?	(Answered by Ministry of Forestry) The farmers cannnot be allowed to manage their exisitng coffee plantations in the national forest. The exisiting coffee trees are allowed to be harvested according to the limited ways.	Done
11	Is it possible to be reconsidered that all existing coffee trees are cut in the national forest?		Exisiting coffee plantations in the national forest are tried to be converted to other species. Only for 5 years after the project implementaion, harvest from the exisiting plantations can be allowed. Villagers can get fruits from the fruit trees which they planted in national forest.
12	Villagers from Kab. South Bengkulu cultivate national forest of Kab. North Bengkulu near Desa Ujan Mas. There is a possibility that the villagers in Desa Ujan Mas follow this activity.		Agricultural productivity should be increased in private land in order to avoid the villagers from cultivation in protection forest.

(2) Group I: Deforestation

No.	Opinions in the Workshop	Question and Answers	Countermeasures (Reflection to the Plan)
	1 There are many encroachers in protection forest. They went away from protection forest for a while, and they restart cultivation. It worries the villagers that many villagers follow this activity.	1. Planting of species with high profit instead of coffee.	Adopted
	2 Illegal tree cutting in connection with agencies that should manage and control the forest. Also, the problem is that the usage of chainsaws is not controled.	2. Peoples' participation Participation of the local people considering conservation	Adopted
	3 All area of Bt. Basa was converted to coffee plantation. The villagers use upper trees but the people outside village do not plant upper trees.	3. Coffee plantations in private land should be supported by regreening projects to have a protection function.	Adopted
	4 All area of the village is located in protection forest (Air Selimang).	4. Shade trees in private land will be converted to useful and economical species.	Adopted
		5. Actions should be requested to Forestry Office in Kab. North Bengkulu to stop the cultivation in Kab. Rejang Lebong.	Not adopted in this plan.
		6. Forced actions should be taken to users of chainsaws.	Not adopted in this plan.
		7. New coffee trees are not allowed to be planted. However, the villagers will be allowed to use existing coffee plantations for a certain period.	Adopted
		8. New comers should follow the administrative procedures such as reporting to the village head.	Not adopted in this plan.

(3) Group II: Tree Species for Social Forestry

No.	Opinions	Questions and Answers	Countermeasures (Reflection to the Plan)
1	Problems to be faced by farmers (1)Farmland is not enough because of population increase. (2)There are coffee plantations in protection forest. (3)Farmers from Kab. South Bengkulu open the national forest. (4)Farming technique, seedlings and marketing system are not enough. (5)Capital is not enough.		Factors of these social problems are analyzed and will be reflected to various projects consisting this plan.
2	Solutions (Social Forestry Implementation) (1)Criteria for selecting tree species (national forest) A. Conservation function a. Fruit trees b. Good root system c. There is a function of protection of soil run-off caused by errosion. d. Trees are not cut. B. Economic value a. Fruits with marketability are produced. b. Resins with marketability are produced.		It will be reflected to this plan.
	(2)Tree species to be selected	What is the priority for selected species?	Applicability to natural and economic conditions and intension of the local people will be evaluated as a whole and species will be selected.
	A. National forest a. Durian b. Kemiri c. Manggis d. Duku e. Jengkol f. Karet B. Private land a. Sengon Laut b. Kayu Bawan c. Pulai Gading d. Kemiri Note) Durian can be mix-cultured with Manggis. Karet can produce resins throughout year. Kayu Manis has a high possibility of theft.		
	(3)Management in implementaion of social forestry Farmer groups or KUD will be reponsible.		Farmers' groups are necessary at village level. KUD should be reinforced and trained to improve the trading position.
	(4)Necessary inputs in implementaion of social forestry a. Good quality seedlings	Where will seedlings be available?	This will be reflected to various projects.
	b. Fertilizers c. Capital	How will the capital be provided?	This will be reflected to various projects.
	d. Extension workers (Agriculture and Forestry) e. Meeting place for farmers' groups f. Social forestry in national forest will start as soon as possible and all villages participated in the workshop will join.	How will people outside the project area who want to join be treated?	Discussion with Ministry of Forestry is necessary.
	g. The government should investigate actual conditions of encroachers in national forest and take actions according to the regulation. h. Existing coffee trees are allowed to harvest until multi-purpose species will produce non-timber products (fruits, seeds, resins, etc.).		

(4) Group III: Organization

No.	Discussions in the Workshop	Questions and Answers	Actions to be taken (Reflection in the Plan)
1	LKMD is an important organization in village, and LKMD should have responsibility to build up a new organization for the social forestry.		Organization at village level, similar like a committee will be established by LKMD. Adopted
2	Role of the New Organization (1) Prevent encroachement into protection forest. (2) Explain the concept and activities of social forestry to the villagers. (3) Improve welfare of the local people and their community.		Adopted
3	Qualification of Participants (1) To have awareness and will of forest conservation. (2) To have understanding of Hutan Kemasyarakatan (social forestry in protection forest). (3) To observe the regulation of organization.		Adopted This will be applied to Hutan Rakyat (sosial forestry in private land), too.
4	Since many encroachers into the protection forest have received illegal permission, they should be excluded from participants of social forestry or Priority should be given to encroachers.		It should be left to a decision by a new organization in the village.
5	Necessary Inputs for the Organization (1) Approval by Forestry Office (legal certification) (2) Supporting system for organization (wages, uniform, administrative facilities/equipments, work house) (3) Counterparts from Forestry Office for the activites (4) Processing and marketing in cooperation with private sector (5) Clarification of land cultivation right (ways and technique for land division) (6) Training for the organization's activities (7) Regulation of the organization		Partly adopted Discussion with Ministry of Forestry is necessary. They should be simple as much as possible. Implemented by NGO in cooperation with concerned governmental offices.

E. Reference Data for Forestry Survey

E-1 List of Tree Species Observed in Natural Forests

No. 1

No.	Local Name	Scientific Name	Number of Trees Observed
1	Melung	*Macaranga* sp.	3
2	Jahang	*Elaeocarpus* sp.	3
3	Balam	*Palaquium* sp.	10
4	Belingo	*Homalanthus* sp.	1
5	Sematung	*Ficus toxicaria*	10
6	Gelam	*Eugenia* sp.	33
7	Giok	*Eugenia* sp.	5
8	Antoi	*Cyathocalyx* sp.	2
9	Medang	*Lista* sp.	36
10	Benuang	*Octomeles sumatrana*	3
11	Ihis	*Eunonymus javanica*	37
12	Balam durian	*Payena acuminata*	3
13	Ijuh	*Myristica* sp.	4
14	Medang kuning	*Alseodaphne peduncularis*	2
15	Kepahiang	*Pangium edule roin*	1
16	Manik	*Glochidion* sp.	1
17	Sepan	*Artocarpus anisophylus*	2
18	Kandis	*Garcinia* sp.	16
19	Medang telur	*Listea* sp.	10
20	Merkunyit	*Shorea gibosa*	8
21	Laban stapeng	*Vitex pubiscens*	1
22	Sepanas	*Aglaia* sp.	2
23	Letung	*Dysoxylum* sp.	17
24	Semalo	*Altingia exelsa*	1
25	Salak	*Salacca edulis*	2
26	Gango	*Aglaia versteeghii*	2
27	Manggis	*Garcinia mangistana*	1
28	Topis	*Polyalthis* sp.	6
29	Pium	*Adinandra dasyantha*	4
30	Jeti	*Rhodamnia cinerea*	1
31	Mahang	*Macaranga pruinosa*	2
32	Kasai	*Pometia pinnata*	3
33	Asam candis	*Mangifera* sp.	1
34	Mempening	*Quercus* sp.	8
35	Johar	*Cassia siamea*	3
36	Putat	*Gynotrochea axillaris*	1
37	Durian hantu	*Drio* sp.	1

No. 2

No.	Local Name	Scientific Name	Number of Trees Observed
38	Kedondong	*Spondias pinnata*	1
39	Gelam putih	*Xylopia malayana*	2
40	Suluh	*Aglaia argentea*	2
41	Rambutan	*Nephelium lapaceum*	2
42	Merambung	*Melia dubic*	1
43	Tongon	*Crophopetalum beccarienum*	1
44	Medang merah	*Notapholbe macrocarpa*	1
45	Bayur	*Pterospermum javanicum*	1
46	Kenidai gazah	*Pridelia monoica*	1
		46 species	258 trees
47	Keteu	-	1
48	Nango	-	1
49	Kepepak hutan	-	1
50	Medang cabe	-	1
51	Cakung	-	2
52	Medeak	-	5
53	Sea	-	1
54	Benasi	-	1
55	Loloi	-	3
56	Kodok	-	20
57	Jelantang	-	1
58	Lewo	-	1
59	Mosong	-	3
60	Lisoi	-	6
61	Ongoai	-	10
62	Doloi	-	2
63	Nyungnyung	-	2
64	Medan puth	-	3
65	Telan	-	4
66	Sobut	-	10
67	Airair	-	1
68	Manggis rimbo	-	4
69	Stewea	-	3
70	Lapem	-	4
71	Kasie	-	5
72	Tanduk	-	2
73	Ipuh	-	1
74	Tigoraso	-	1
75	Pukut	-	5
76	Atoe	-	21

No. 3

No.	Local Name	Scientific Name	Number of Trees Observed
77	Embeko	-	5
78	Gelam igis	-	1
79	Marpato	-	4
80	Sipoh	-	2
81	Spanes	-	1
82	Sebukit	-	1
83	Landak	-	1
84	Ukeu	-	1
85	Glupang	(*Sterculia cordata*?)	1
86	Gelam udang	-	1
87	Pasak	-	2
88	Kloloy	-	1
89	Kiakep	-	1
90	Tejeem tupua	-	1
91	Rukam	-	1
92	Moson limbo	-	2
93	Sumpai	-	3
94	Mendea	-	6
95	Spaling	-	2
96	Beko	-	1
97	Togoi	-	2
98	Kelupang	-	1
99	Belungo	-	1
100	Lupang	-	2
101	Yambelos	-	3
102	Jempaba	-	3
103	Medang klisk	-	3
104	Kayu beneu	-	2
105	Pagoi	-	2
106	Telgeu	-	3
107	Mogoi	-	2
108	Babak	-	2
109	Mutun	-	1
110	Beneu	-	3
111	Asam kelet	-	1
112	Lapem	-	1
113	Kelisik	-	1
114	Sulae	-	1
115	Ngin	-	1
116	Jakang	-	7

No. 4

No.	Local Name	Scientific Name	Number of Trees Observed
117	Sikoa	-	1
118	Ajai	-	1
119	Pua	-	2
120	Lagen	-	1
121	Mabung	-	1
122	Gia	-	1
123	Letei	-	1
124	Jerur rimbo	-	1
125	Gateng	-	2
126	Temesa	-	1
127	Seloi	-	1
128	Kesei	-	1
129	Medan cabi	-	1
130	Kayu tulang	-	1
131	Duku rimba	-	1
132	-	-	1
		86 species	223 trees
		Total: 132 species	482 trees

E-2 List of Tree Species Observed in Secondary Forests

No. 1

No.	Local Name	Scientific Name	Number of Trees Observed
1	Medang	*Dehaasia pauciflora*	21
2	Gelam	*Eugenia* sp.	3
3	Suluh	*Aglaia argentea*	5
4	Merambung	*Melia dubie*	4
5	Bayur	*Pterospermum javanicum*	3
6	Meranti	*Shorea* sp.	1
7	Delingo	*Homalanthus* sp.	1
8	Belimbing	*Averhoa carambola*	1
9	Medang sako	*Santiria oblongifolia*	1
10	Gelam jambu	*Eugenia sexangulata*	1
11	Kasai	*Pometia pinnata*	1
12	Semantung	*Ficus toxicaria*	65
13	Cempedak	*Artocarpus* sp.	4
14	Melung	*Macaraga* sp.	7
15	Kaning	*Dialim* sp.	1
16	Giok	*Eugenia* sp.	4
17	Kabau	*Dacryodes rugosa*	1
18	Johar	*Cassia siamea*	3
19	Sapat	*Macaranga diopenthorstii*	7
20	Rambatan hutan	*Nephelium lapaceom*	1
21	Ketaping	*Terminallia catappa*	1
22	Pulai	*Alstonia scholaris*	4
23	Ringit dara	*Corrallia brachiata*	3
24	Lantorogung	*Leucaena glanca*	4
25	Bungur	*Lagerstroemia speciosa*	4
26	Bumut	*Callophylun inophyllum*	1
27	Durian	*Durio zibethinus*	6
28	Nangka	*Artocarpus intigrus*	4
		28 species	165 trees
29	Klakep	-	10
30	Nango	-	4
31	Kasai	-	2
32	Medang cabe	-	5
33	Beang	-	1

No. 2

No.	Local Name	Scientific Name	Number of Trees Observed
34	Senangea	-	1
35	Sipoa	-	1
36	Slukup	-	1
37	Mangus emboh	-	1
38	Mendea	-	1
39	Gaten	-	1
40	Lisai	-	18
41	Ongoai	-	5
42	Kodok	-	16
43	Keloi	-	2
44	Meling	-	5
45	Lebuk	-	1
46	Lukut	-	1
47	Pukut	-	7
48	Sonobrit	-	11
49	Ketapong	-	10
50	Muting	-	1
51	Lau	-	1
52	Kepong	-	1
53	Martapong	-	1
54	Pasak	-	1
55	Rajo bunga	-	1
56	Tulang	-	1
57	Manka	-	1
58	Sie	-	1
59	Kukut	-	1
60	Ngin	-	1
		32 species	115 trees
		Total: 60 species	280 trees

E-3 List of Tree Species Observed in Shrub Land

No.	Local Name	Scientific Name	Number of Trees Observed
1	Albisia	*Albizia falcataria*	5
2	Johar	*Cassia siamea*	8
3	Semantung	*Ficus toxicaria*	7
4	Melung	*Macaranga* sp.	41
5	Balik angin	*Mallatus paniculats*	2
6	Ceng keding	*Herandia* sp.	1
7	Nangka	*Artocarpus intigrus*	2
8	Sapat	*Macaranga diepenhrstii*	5
9	Kenidai gajah	*Bridelia monoica*	1
10	Kayu manis	*Cinamonum porthenoxylon*	2
11	Dadap	*Aemandia ovigera*	1
12	Laban stapeng	*Vitex pubiscens*	1
13	Bayur	*Pterospermum javanicum*	1
		13 species	77 trees
14	Pukut	-	1
15	Gaten	-	1
16	Semanik	-	1
17	Nilo	-	1
18	Kodok	-	2
19	Meteneu	-	1
20	Ngin	-	1
21	Telakis	-	2
		8 species	10 trees
		Total: 21 species	87 trees

E-4 List of Sample Plot Survey Sites

(1) Sample Plots in Natural Forests, Secondary Forests and Shrub Land

(Standard Land: 0.1 ha.)

Plot No.		Plot Site (Desa)	Elevation (m)	Gradient (°)	Bearing	No. of Trees Surveyed	Surveyed Volume (m^3)	Main Species Observed
Natural Forest I	1	Air Lanang	1,010	34	S	46	35.601	*Litsea sp., Eugenia sp., Eunonymus javanicas*
Natural Forest I	2	Air Lanang	980	35	S	66	46.764	*Eunonymus javanica, Eugenia sp., Dysoxylum* sp.
Natural Forest I	3	Tebat Monok	700	20	W	53	44.738	*Litsea sp., Listea brachystacha, Eugenia* sp.
					(Average No. of Trees)	55	42.368	(Average Volume)
Natural Forest II	4	Air Lanang	1.060	36	N	48	19.744	*Ficus toxicaria, Litsea sp., Makaronga* sp.
Natural Forest II	5	Air Lanang	960	30	NE	64	22.697	*Eunonymus javanica, Eugenia sp., Litsea sp.*
Natural Forest II	6	Kelilik	920	30	SW	54	20.653	*Eunonymus javanica, Eugenia sp., Dysoxylum* sp.
Natural Forest II	7	Kelilik	930	16	NE	51	20.006	*Garcinia* sp., *Palaquium* sp., *Ficus toxicaria*
					(Average No. of Trees)	54	20.775	(Average Volume)
Natural Forest III	8	Air Lanang	1.010	36	N	36	13.319	*Eunonymus javanica, Eugenia* sp., *Dysoxylum* sp.
Natural Forest III	9	Sentral Baru	1.410	18	S	37	6.199	*Ficus toxicaria, Makaronga* sp.
Natural Forest III	10	Sentral Baru	1.430	25	SW	26	5.626	*Garcinia* sp., *Litsea sp.*
					(Average No. of Trees)	33	8.381	(Average Volume)
Secondary Forest	1	Tebat Monok	670	20	E	59	14.744	*Litsea sp., Eugenia* sp., *Aglaia* sp.
Secondary Forest	2	Air Lanang	640	20	NE	97	5.545	*Ficus toxicaria, Eugema* sp., *Artocarpus* sp.
Secondary Forest	3	Taba Padang	670	10	E	53	11.290	*Macaranga diopenthorstii, Leucaena glanca*
Secondary Forest	4	Taba Padang	720	20	E	45	4.085	*Macaranga diopenthorstii, Lagerstroemia speciosa*
Secondary Forest	5	Air Lanang	840	26	S	26	5.130	*Artocarpus intigrus, Durio zibethinus*
					(Average No. of Trees)	56	8.159	(Average Volume)
Shrub Land	1	Bandung Marga	760	4	E	24	800	*Cassia siamea, Ficus toxicaria, Albizia falcataria*
Shrub Land	2	Bandung Marga	830	4	E	56	3.144	*Macaranga* sp., *Macaranga diepenhrstii*
Shrub Land	3	Kampung Melaga	890	12	S	7	2.544	*Hernandia ovigera, Vitex pubiscens*
					(Average No. of Trees)	29	2.163	(Average Volume)

(2) Sample Plots in Man-Made Forests

Plot No.	Plot Site (Desa)	Elevation (m)	Gradient (°)	Bearing	No. of Trees Surveyed	Surveyed Volume (m^3)	Main Species Observed
Man-Made Forest 1	Taba Padang	670	10	E	40	20.991	*Acacia mangium* (nine years old)
Man-Made Forest 2	Taba Padang	620	14	E	26	16.408	*Acacia mangium* (nine yeears old)
Man-Made Forest 3	Taba Padang	610	10	E	21	14.310	*Acacia mangium* (nine years old)
				(Average No. of Trees)	29	17.236	(Average Volume)
Man-Made Forest 4	Taba Padang	640	16	N	109	13.534	*Pinus merkusii* (eight years old)
Man-Made Forest 5	Taba Padang	560	18	N	65	9.869	*Pinus merkusii* (eight years old)
Man-Made Forest 6	Taba Padang	530	18	S	67	9.357	*Pinus merkusii* (eight years old)
				(Average No. of Trees)	80	10.920	(Average Volume)
Man-Made Forest 7	Pal Tuju	950	10	E	34	41.642	*Swietenia macrophylla* (45 years old)
Man-Made Forest 8	Pal Tuju	950	6	E	34	38.067	*Swietenia macrophylla* (45 years old)
Man-Made Forest 9	Pal Tuju	950	0	-	47	38.336	*Swietenia macrophylla* (45 years old)
				(Average No. of Trees)	38	39.348	(Average Volume)

E-5 Reference Materials for Agroforestry Survey

(1) State of Upper-Storey Trees at Coffee Plantations

No.	Plot Site (Desa)	No. of Upper-Storey Trees/ Plot	Main Species Observed		Average DBH (cm)	Crown Density (%)*	Age (years)
			Species	%			
1	Penanjung Panjung	26	Dadap	53.8	8.8	37.3	-
2	Penanjung Panjung	5	Dadap	80.0	11.8	28.7	-
3	Penanjung Panjung	23	Kayu res	39.1	13.5	53.3	-
4	Kandang	26	Cengkering	46.2	6.2	39.6	6
5	Kandang	23	Dadap	60.9	8.2	77.0	7
6	Kandang	50	Kayu manis	40.0	4.6	77.9	-
7	Kandang	23	Cengkering	34.8	7.7	74.2	-
8	Kandang	28	Cengkering	39.3	4.9	37.5	-
9	Taba Padang	8	Kemiri	25.0	6.1	16.3	-
10	Taba Padang	19	Dadap	42.1	7.4	56.0	-
11	Taba Padang	16	Dadap	56.3	4.0	10.0	-
12	Taba Padang	16	Kayu res	50.0	3.2	8.7	-
13	Taba Padang	26	Kayu res	61.5	2.3	14.2	-
14	Suro Bali	37	Kayu res	94.6	6.4	72.0	-
15	Suro Bali	34	Kayu res	85.3	8.5	76.9	-
16	Suro Bali	28	Kayu res	85.7	7.5	77.0	-
17	Suro Bali	43	Kayu res	79.1	6.3	53.7	-
18	Suro Bali	19	Kayu res	89.5	7.6	67.9	-

Notes

(1) A total of 18 sample plots was established in the Project Area to survey the state of upper-storey trees intercropped or mixed planted in coffee plantations. Each plot is a rectangle of 20 m by 50 m (0.1 ha).

(2) A total of 19 species were identified. The ratios of the dominant species are 46.4% for Kayu res, 15.6% for Dadap, 11.6% for Cengkering, 6.2% for Kapuk and 5.3% for Kayu manis.

(3) * No overlapping of the crown is taken into consideration.

E-6 Differences According to Species in Relative Light Intensity Beneath Crown

No.	Survey Date (Time)	Weather	Site	Land Use	Altitude (m)	Temperature (°C)	Slope	Azimuth	Species	Diameter Breast Height (cm)	Tree Height (m)	Crown Height (m)	Crown Diameter (m)	Planting Density (m x m)	Tree Age (years)	Estimate Light Intensity (lx/h)		Relative Light Intensity (%)
																Outside Crown	Beneath Crown	
1	1997.7.17 (10:50)	Cloudy/Clear	Desa Bukit Sari (Study Area)	Home garden	1,030	29	Flat	—	Kayu manis	4.5	4.5	1.7	2	2×2	2	2,668	430.5	16.1
2	1997.7.17 (11:30)	Cloudy/Clear	Desa Bukit Sari (Study Area)	Home garden	1,090	32	Flat	—	Nangka	45.0	15.0	7.0	8	—	35 ~	1,419	650.1	45.8
3	1997.7.18 (8:35)	Clear	Desa Das Petah	Coffee plantation	590	25	Flat	—	Lamtoro	12.5	8.0	3.0	6	7×7	3	2,776	771.8	27.8
4	1997.7.18 9:50)	Clear	Desa Suro Bali	Coffee plantation	952	27	Flat	—	Manggis	35.0	15.0	4.0	8	—	35	4,012	509.1	12.7
5	1997.7.18 (10:30)	Clear	Desa Suro Bali	Coffee plantation	952	—	Flat	—	Durian	18.0	8.0	2.0	6	—	5	4,872	727.1	14.9
6	1997.7.18 (10:50)	Clear	Desa Suro Bali	Coffee plantation	952	—	Flat	—	Dadap	10.0	7.0	2.2	5	3~5×3~5	2	4,516	866.7	19.2
7	1997.7.21 (9:05)	Clear	Desa Pal Delapan	Clear Sugar palm plantation	930	24	Flat	—	Aren	55.0	15.0	5.0	8	5×10	8	3,080	370.3	12.0
8	1997.7.21 (10:05)	Clear	Desa Bandung Marga	Coffee plantation	865	26	Flat	—	Kayu res	9.0	6.0	3.0	4	6×6	4	4,181	1,853	44.3
9	1997.7.21 (11:20)	Clear/Cloudy	Desa Bandung Marga	Coffee plantation	835	29	Gentle slope	S	Sengon	17.0	10.0	3.0	10	10×10	8	4,790	2,020	42.2
10	1997.7.21 (11:45)	Clear/Cloudy	Desa Bandung Marga	Coffee plantation	835	29	Gentle slope	S	Jenkol	18.0	6.5	2.0	5	10×10	12	3,710	1,139	30.7
11	1997.7.22 (9:10)	Clear	Desa Karang Tinggi (North Bengkulu Prefecture)	Coffee plantation	60	28	Flat	—	Kayu Bawang	8.0	11.0	7.0	3	4×4	3.5	2,953	1,476	50.0
12	1997.7.22 (10:10)	Clear	Desa Karang Tinggi (North Bengkulu Prefecture)	Coffee plantation	60	28	Flat	—	Kayu Bawang	4.5	6.0	4.0	1.5	4×4	1.5	3,663	1,852	50.6
13	1997.7.22 (12:00)	Clear/Cloudy	Desa Karang Tinggi (North Bengkulu Prefecture)	Coffee plantation	375	32	Gentle slope	S	Petai	33.0	14.0	8.0	8	—	15	5,201	2,061	39.6
14	1997.7.23 (9:40)	Clear/Cloudy	Desa Penanjung Panjang	Coffee plantation	962	24	Gentle slope	NE	Kemiri	22.0	13.0	6.0	8	—	5	3,811	1,827	47.9
15	1997.7.23 (10:20)	Clear/Cloudy	Desa Penanjung Panjang	Coffee plantation	962	24	Flat	—	Apokat	8.0	5.0	2.0	3	—	2	4,409	1,713	38.9
16	1997.7.23 (12:00)	Clear/Cloudy	Desa Pal Delapan	Cinnamon plantation	914	28	Flat	—	Kayu manis	8.0	7.0	4.0	2	2×5	3	5,257	1,079	20.5
17	1997.7.23 (13:00)	Clear/Cloudy	Desa Pal Delapan	Coffee plantation	915	29	Steep slope	S	Lamtoro	16.0	10.0	4.0	8	8×10	4	5,952	2,304	38.7

Note) Crown height and all weather estimate light intensity (lx/h) were measured at the same time. The estimate time was 0.06 h, measuring position was approximately 1.3 m above ground, and sun fleck parts were avoided.

$$\text{Relative light intensity (\%)} = \frac{\text{Average estimate light intensity beneath crown (lx/h)}}{\text{All weather average estimate light intensity (lx/h)}} \times 100$$

E-7 Findings of Bamboo Sampling Survey

(1)

No.	Local Name	Scientific Name	RootDia. (m)	Height (m)	Stalk Dia. (cm)	Knot Distance (cm)	Stalk Thickness (mm)	Number of Stalks (per Root)	Cultivation Site	Gradient (°)	Bearing	Elevation (m)	Sample Plot (Desa)	Remarks
1	Aur	*Bambusa vulgaris var. vulgaris*	2.0	10-12	6	33 - 35	8	35	Roadside slope	45	SW	830	Pal Seratus	Naturally grown
2	Betung	*Dendrocalamus asper*	4.0	20	7-8	30	10-12	50	Farm roadside slope along paddy field	25	E	495	Tangjung Alam	Naturally grown
3	Dabuk	*Gigantochloa wrayi*	2.2	20	7-8	28	10-11	50-70	Boundary between dry farmland and paddy field	10	NW	490	Tanjung Alam	-
4	Kuning	*Bambusa vulgaris*	3.0	10	6	28	8	50-75	Domestic garden	flat	-	955	Sindang Jaya	Planted
			1.4	13	7	25	12	18	Riverside	40	SW	515	Suro Muncar	Planted less than 5 years ago
5	Lemang	*Schizostachyum brachycladum*	2.5	18	3-5	38	3	75-100	Roadside flat land	10	S	280	Talang Pito	-
6	Manyan	*Gigantochloa robusta*	2.0	20	7-10	32	10	50	Farm roadside slope along stream	flat	NW	485	Tanjung Alam	Naturally grown
			2.0	23	12	35	15-20	25	Dry farmland boundary	flat	-	430	Pasar Ujung	Planted
7	Pancing	-	0.4	3.5	1	25	1.5	25	Boundary between dry farmland and domestic garden	25	E	495	Tanjung Alam	Planted 2 - 3 years ago
			1.3	5	1.5	35-40	2-3	60-70	Boundary of dry farmland	35	S	755	Tanjung Dalam	Planted some 30 years ago
8	Selepah	-	1.5	7	2-4	35	10	100	Farm roadside slope along stream	29	NW	485	Tanjung Alam	-

No.	Local Name	Scientific Name	RootDia. (m)	Height (m)	Stalk Dia. (cm)	Knot Distance (cm)	Stalk Thickness (mm)	Number of Stalks (per Root)	Cultivation Site	Gradient (°)	Bearing	Elevation (m)	Sample Plot (Desa)	Remarks
9	Serik	-	3.5	12	4-6	45	8	100	Boundary of dry farmland	7	SE	635	Tanjung Dalam	Planted
			3.3	15	5-8	30	12	50	Boundary between dry farmland and paddy field	20	S	960	Sumber Rejo	Planted 3 years ago
10	Suling	*Schizostachyum latifolium*	1.7	10	2	90	3	100	Boundary between dry farmland and stream	50	NW	940	Singang Jaya	Naturally grown
11	Wulung	*Gigantochloa atroviolacea*	1.5	15	5-7	34	15	20	Boundary between dry farmland and paddy field	20	S	960	Sumber Rejo	Planted 3 years ago

Notes 1) According to the interview survey, Apus (*Gigantochloa apus*) grows in the Project Area in addition to those varieties found in the sampling survey.
2) The stalk of Dabuk has light yellow vertical stripes, the stalk of Kuning is yellow and the stalk of Wulung is purple.
3) Wulung was introduced from Java.
4) All varieties grow with clump-forming and no prickle is seen with the branches.
5) There are other bamboo varieties in the Project Area originating from Java, etc., the local names of which are unclear.

E-8 Biological Resources Survey: List of Useful Tree Species

No. 1

Local Name	Scientific Name	Useful Application
Apokat	*Persea americana* Mill	fruit (avocado)
Banboo	*Bambusa* sp.	edible/craftwork/multi-material
Banboo kuning	*Bambusa* sp.	decoration
Bangle	*Zingiber cassumunar*Roxb.	medicine
Bawang daun	*Allium* sp.	vegetable
Brotowali	*Tinospor crispa* (L.)	malaria
Bunga raya	*Hibiscus rosa-sinensis* L.	childbirth
Cabai	*Capsicum fumfescnus* L.	vegetable
Cocao	*Theobroma cacao* L.	drink (cacao)
Dempol		rope
Ekor sipai	*Acalypha* spp.	skin disease
Ganur	*Maranthacera* spp.	fever in children
Garut		food (to make cakes)
Ginseng	*Talinum paniculatum* Willd	skin sores, kidneys
Hennay		nail polishing
Henas	*Ananas comosus* L.	fever (roots are eaten)
Iik		fever (roots are eaten)
Jambu manyet	*Anacardium occidentale* L.	nut (cashew nut)
Jarak	*Jafropha curcus*	dry lips
Jengkol	*Pithecelobium lobata* Benth.	vegetable
Jeruk nipis	*Citrus aurantifolia* Sw.	cough
Jeruk bangkok	*Citrus grandis* Osbeck.	fruit (large lemon)
Kacang panjang	*Vigna unguiculata* (L.)	vegetable
Kapuk	*Gossypium hirsutum* L.	vegetable, fibre (cotton)
Kayu labu	*Lagenaria siceraria* (Mólina)	fruit use for keeping water
Kayu manis	*Cinnamomum burmani* Bl.	odour
Kayu ringgit		leaves used for stomach ache
Kayu tulang		warts
Katu	*Sauropus androgynussieucantha*	vegetable
Kelapa	*Cocos nucifera* L.	food
Kembang tunjung	*Crinum asiatica*	sore bones and joints
Kemiri	*Aleurites moluccana* (L.) Willd	scabs, candles
Kemulo		bandage head temperatur
Kina	*Cinchona ledgeriana* Moens	malaria
Kopi	*Coffea canephora* Pierr. ex Froe. ex Froeh	drink
Kumis kucing	*Orthosiphon aristatus* (Bl) Miq. ex Froeh	kidney stones
Lengkuas	*Alpinca galanga* (L.) Swartz	skin disease
Labu siam	*Cagenana* spp.	vegetable
Lengkuas	*Alpinca galanga* (L.) Swartz	skin disease
Lidah badak	*Cactus* spp.	fever, burns

Local Name	Scientific Name	Useful Application
Liyang		itchy skin
Luma		vegetable
Melinjo	*Gnetum gnemon* L.	nut
Melur	*Fasminum* spp.	fever
Mint	*Mentha arvenis* L.	breathing problems
Nangka	*Artocarpus heterophullus* LAM	fruit
Nenas	*Ananas comosus*	pineapple
Nyaang Merah		stomach
Orok-orok	*Crotalaria mucronata* Desv	fertiliser
Paku bindu		breathing problems
Panjang jima		fever
Papaya	*Carica papaya* L.	breathing problems
Penili	*Vanilla fragrans* Ames	odour
Piung	*Areca catechu* L.	yellow fever, cough
Pissang (fruit)	*Musa sapientum* L.	fruit
(cooked)	*Musa paradisiaca* L.	
Puding mass		clean womb after birth
Rambatan	*Nephelium lappaceum* L.	fruit
Rimbang	*Solanum torvum* Sw.	eye disease
Red zinger	*Zinggiber officinare* Rose	vegetable
Sedingin	*Kalanchoe pinnatum*	body temperature
Selasih	*Ocimum basiliaum* L.	fever
Seluang merah		
Semak		fruit
Senguri		breathing problems
Serai	*Cymbopogon citratus Stapf.*	teeth
Sergaru		headache (leaves)
Serus nipis	*Citrus aurantifolia*	cure cough
Singin	*Kalanchoe pinata* (Lam)	skin
Sipiring		fever
Sireh	*Piper betle* L.	
Sirsak	*Annona muriata* L.	fruit
Suli		green colouring
Suka dunngin		bruising/swelling
Talus	*Colocasia esculenta* (L.)	vegetable (root/leaves)
Tebu	*Saccharum officinarum* L.	sugar
The	*Camellia sinensis* (L.)	drink
Ubi	*Diosccrea* spp.	food
Ubi kayu	*Manihot esculenta* Crantz	food

E-9 Current Conditions of Roads

No.	From	To	Trunk or Branch Road	Length (km)
1	Curup	Air Dingin	Trunk	19.8
2	Curup	Tebat Monok	"	29.0
3	Kepahiang	Kembangseri	"	25.0
4	Ujan Mas Atas	-	"	5.5
5	Babakan Baru	Pal Delapan	Branch	3.8
6	Sentral Baru	Tebat Pulau	"	10.3
7	Taba Renah	Baru Manis	"	8.8
8	Pahlawan	Seguring	"	4.0
9	Tunasharapan	Pusun Sawah	"	2.8
10	Perbo	Lubuk Kenbang	"	1.8
11	Air Putih Lama	Lubuk Penyamun	"	3.8
12	Durian Depun	Bukit Barisan	"	1.0
13	Bumi Sari	Tanjung Alam	"	4.0
14	Tavyun Galam	Suro Bali	"	1.8
15	Tebat Monok	Keban Agung	"	26.5
16	Kelilik	Bt. Dendan	"	3.5
17	Lubuk Saung	-	"	5.6
18	Lubuk Saung	Temdak	"	2.8
19	Benaung Galing	-	"	2.8
20	Kota Agung	-	"	2.5
	Trunk Road Sub-Total			79.3
	Branch Road Sub-Total			85.8
	Total			165.1

F. Reference Data for Watershed Conservation

F-1 Landslide Sites Caused by Earthquake

Site No.		1	2	3	4	5	6	7
Location	Kabupaten	Rejang Lebong	Rejang Lebong	Rejang Lebong	Rejang Lebong	Rejang Lebong	Rejang Lebong	Rejang Lebong
	Kecamatan	Curup	Curup	Curup	Curup	Curup	Curup	Curup
Landslide Size	Area (ha)	3	0.13	0.13	1.94	0.81	3.53	4.69
	Length (m)	480	80	90	430	360	580	480
	Elevational Difference (m)	340	50	70	230	210	300	250
	Maximum Width (m)	90	30	30	80	30	90	110
Elevation (m)		1,750 - 2,090	2,350 - 2,400	2,350 - 2,420	2,180 - 2,410	2,210 - 2,420	2,200 - 2,500	2,140 - 2,390
Gradient (°)		35	32	38	28	30	27	28
Bearing		N74°E	S35°W	S19°E	S42°E	S51°E	S64°E	N60°E
Soil		LPR	LPR	LPR	LPR	LPR	LPR	LPR
Land Use in the Area	Present	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest
	At Time of Disaster	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest	Natural Forest
Inside/Outside National Forest		Inside	Inside	Inside	Inside	Inside	Inside	Inside
Year of Disaster		1979	1979	1979	1979	1979	1979	1979
Distance to Nearest Settlement (km)		8.8	10.9	10.9	9.5	9.5	7.3	9.5

Note: Concerning soil symbols, see Chapter 3, Section 3.3 of the main report.

F-2 Landslide Sites

Site No.		1022-1	1023-1	1024-2	1025-2	1108-3	1108-4	1108-5	1108-7	1023-2	1025-1
Survey Date		22 Oct., 1996	23 Oct., 1996	24 Oct., 1996	25 Oct., 1996	8 Nov., 1996	8 Nov., 1996	8 Nov., 1996	8 Nov., 1996	23 Oct., 1996	25 Oct., 1996
Location	Kecamatan	Curup	Curup	Curup	Curup	Kepahiang	Kepahiang	Kepahiang	Kepahiang	Curup	Curup
	Desa	Taba Renah	Pal Tujuh	Pal Tujuh	Seguring	Temdak	Temdak	Temdak	Temdak	Pal Tujuh	Seguring
Landslide Size	Area (m^2)	460	280	710	340	390	230	190	400	340	500
	Length (m)	25	21	28.9	36.9	28.3	23.1	20.6	27	29	31
	Elevational Difference (m)	26	10.1	13.2	25.8	15.7	11.8	9.6	16.9	19.6	38
	Maximum Width (m)	28	17.6	34.6	14	17.8	15.6	14.3	22.7	18	25
	Mean Depth (m)	0.3	1	2	1.7	0.5	0.5	0.6	0.2	1	0.5
	Collapsed Soil Volume (m^3)	140	280	1,420	580	200	120	110	80	340	250
Elevation (m)		680	900	910	690	540	540	540	550	920	700
Gradient (°)		46	26	25	35	29	27	25	32	34	51
Bearing		S50°E	S10°W	N35°W	S15°W	N86°W	N84°W	S85°W	N74°W	N22°W	S68°E
Soil		AC	ACC II	CM I	AC	CM IV	CM I	CM I	CM I	ACC II	LPR
Land Use in the Area	Present	Dry farmland	Coffee plantation	Young coffee tree site	Shrub land	Regenerated coffee plantation by sprouting	Cut-over site of coffee trees	Cut-over site of coffee trees	Cut-over site of coffee trees	Coffee plantation	Shrub land
	At Time of Disaster	Dry farmland	Secondary forest	Shrub land		Coffee plantation				Young coffee tree site	Shrub land
Inside/Outside National Forest		Outside	Outside	Outside	Outside	Outside	Outside	Outside	Outside	Outside	Outside
Date of Disaster	Year	1996	Before 1976	Around 1976		1995	1994-1995	1994-1995	1994-1995	1996	Around 1991
	Month	Around July									
Remarks		Present site was formerly grassland; underground spring is detected									

Note: Concerning soil symbols, see Chapter 3, Section 3.3 of the main report.

F-3 Existing Check Dams in the Project Area

No.	Location		Year of Construction	Planning Agency	Dam Design Length	Design Height	River Width at Dam Site	Catchment Area	Remarks
	District Name	Village Name							
1	Curup	Pal VIII	1980/1981	Sub BRLKT	70	6	13	71	Pal Viii Air Dingin
2	Kepahiang	Kandang	1982/1983	Sub BRLKT	40	8	13	118	
3	Curup	Purwodadi	1982/1983	Sub BRLKT	40	8	13	17	
4	Curup	Pal VIII	1983/1984	Sub BRLKT	58	8	38	24	Karang Anyar Pal VIII
5	Curup	Tabarenah	1984/1985	Sub BRLKT	59	8	9	26	
6	Curup	Tabarenah	1985/1986	Sub BRLKT	34	10	7	12	
7	Curup	Bandung Marga	1986/1987	Sub BRLKT	50	8	7	31	
8	Curup	Pal 100	1987/1988	Sub BRLKT	60	8	12	3	
9	Curup	Sukarami	1991/1993	Sub BRLKT	43	8	14	47	
10	Curup	Air Pikat	1992/1993	Sub BRLKT	40	8	10	8	
11	Curup	Pal VIII	1992/1993	Sub BRLKT	38	8	8	640	
12	Curup	Sentral Baru	1994/1995	Dinas PKT	40	6		5	
13	Curup	Tabarenah	1994/1995	Dinas PKT	35	7		17	
14	Curup	Tebat Pulau	1995/1996	Dinas PKT	45	7		50	
15	Curup	Pal VII	1996/1997	Dinas PKT	43	6		7	
16	Curup	Purwodadi	1996/1997	Dinas PKT	40	6		8	

F-4 Recorded Large Earthquakes in Propinsi Bengkulu

No.		1	2	3	4
Date		18 Aug., 1938	26 June, 1941	8 Apr., 1971	15 Dec., 1979
Time (WIB)		16:30	04:07	14:45	07:02
Location	°E	102.8	102.5	102.4	102.4
	°S	3.8	4.5	4.3	3.5
Richter Scale		6.9	7.6	6.3	6.0
Depth of Hypocentre		70 km	–	75 km	25 km
Areas Affected/ Damage		Bengkulu; Palembang; West Sumatera; Mentawai Islands/ house walls cracked in Propinsi Bengkulu	Kepahiang; Lais; Manna; Seluma/most brick-built houses were damaged; substantial damage to roads and bridges; no damage to bamboo-built houses; 20 killed and 20 injured	–	Kec. Curup: 1,589 houses, etc. were damaged Kec. Kepahiang: 1,501 houses, etc. were damaged, 4 killed and 14 seriously injured

Notes 1) Observation Station: Stasiun Geofisika KLS III Kepahiang, Bengkulu at 102°35'32.4"E, 3°38'1.8"S and El. 517 m

2) WIB: Western Indonesia Standard Time

G. Data Relating to the Social Forestry Development Project

G-1 Examination Table of Candidate Species for Multi-Purpose Use

(1)

< Main Use > Local Name	Scientific Name	Elevation (m)	Annual Rainfall (mm)	Soil Requirement	Propagation	Others	Suitability for Study Area
< Food > 1-1. Aren	*Arenga pinnatata* Merr	500 s/d 700 - 1,000	1,500 s/d 3,000	volcanic soil; sandy clay	seedling; seedling grown on musk cat dung	suitable as hedge tree; sucrose	◎
1-2. Sukun	*Artocarpus altilis*	0 - 1,000 dpl	1,000 s/d - 4,000	sandy soil Podzols	stick 5 m by 5 m	fruit	◎
1-3. Salak	*Zalacca edulis*	0 - 600 dpl	1,700 - 3,000	various soil types	seedling	tasty fruit	◎
1-4. Pinang	*Areca catechu*	0 - 1,000 dpl	1,000 s/d - 4,000	various soil types	seedling; close planting	chewing	◎
< Fruit > 2-1. Asam	*Tamarindus indica* L.	0 - 1,500 dpl	> 4,000 no flowering	sand ~ clay	-	suitable for areas with steady rainfall and clear dry season	◎
2-2. Durian	*Durio zibethinus* Murr	0 s/d 800 dpl	high humidity with wet climate	various soil types	seedling	tasty fruit	◎
2-3. Duku	*Lansium domesticum* Jacq var duku Jacq	0 - s/d 800 dpl	1,500 s/d - 2,500	various soil types	seedling	raw food; medicine (bark); exported to Hong Kong and Singapore	◎
2-4. Jambu Mente	*Anacardium occidentale* L.	0 - s/d 100 dpl	3,000 s/d 4,000	Latosols; various soil types	seedling	tasty seed	◎
2-5. Jengkol	*Pithecellobium piringa* Prain					seeds for eating; leaves for medicine and hair shampoo	◎
2-6. Kemiri	*Aleurites molucana* Wied	0 - s/d 800 - 1,200	can grow on arid land	sand or Podzols	seedling	seed oil, etc.	◎
2-7. Makadamia	*Macadamia integrifolia* Maiden & Betche	0 - 1,600	1,000 possible in Africa	various soil types; Hawaii is main producing area	seedling (slow growth); grafting	high fat kernel for dessert; promising; similar species in Sulawesi	◎
2-8. Melinjo	*Gnetum gnemon* Gnet	0 - s/d 1,200 dpl	2,000 s/d - 3,000	various soil types	seedling	high starch content of endosperm; stalk for fibre; mushroom as by-product	◎
2-9. Matoa	*Pometia* sp.	0 - 500	1,000 s/d - 2,500	various soil types	seedling	tasty fruit; bark for medicine	◎
2-10. Nangka	*Artocarpus integra* L. f. (*A. heterophyllus*) = jackfruit	1,000 dpl	tropical climate	various soil types	seedling; layering	fruit for food; latex for birdlime; young leaves and flowers eaten raw	◎
2-11. Petai	*Parkia spesiosa* Log		tropical climate	various soil types	seedling; layering	young leaves and flowers eaten raw and pickled; pods seasoned with garlic; seeds eaten raw	◎
2-12. Kapuk	*Ceiba pentandra* Bonn	low flatland 0 - 700 dpl	1,500 s/d - 2,500	volcanic soil; dry land	seedling; layering	prefers dry land; young leaves and flowers eaten raw; seeds fiber	◎

< Main Use > Local Name	Scientific Name	Elevation (m)	Annual Rainfall (mm)	Soil Requirement	Propagation	Others	Suitability for Study Area
2-13. Tengkawang	*Shorea* sp. (some 20 species)	1,000 dpl	tropical climate	various soil types	collection from naturally grown trees	seeds are better than butter for cooking; mixed with other foods	◎
2-14. Apokat	*Persea americana*	0 - 1,500	tropical climate	soil with good drainage, acidity up to 5.8	bud, side grafting dichogamy countermeasures	Fruit is rich in grease and can be used for medicinal purposes	◎
2-15. Manggis	*Garcinia mangostana*	0 - 900	high-temperature high-humidity	drainage good fertile soil	seedling grafting suckering, herbaceous	tasty fruit	◎
2-16. Mempelem	*Mangifera indica*	0 - 900	low-temperature during also possible	drainage good fertile soil	cutting, side grafting	seeds: medicinal, buck: rheumatism, dye, dissentry	◎
< Sap > 3-1. Damar	*Agathis loranthifolia* Salisb	600 - 1,500	1,500 s/d - 2,500	slope with good drainage	collection from naturally grown trees	hard resin amber drops onto the ground (dug up for collection)	◎
3-2. Pinus	*Pinus Merkusii*	400 s/d 1,500	A s/d B	various soil types	seedling	collection of oleoresin	◎
3-3. Jelutong	*Dyera costulata* Hook. f	0 - 400 dpl	tropical climate	various soil types	collection from naturally grown trees	substitute for chicle, a raw material for chewing gum	◎
3-4. Kayu kapur Barus	*Dryobalanops aromatica* Gaertn	1,000 dpl	tropical climate	various soil types	collection from naturally grown trees	camphor from fallen trees (as cardiac, cordial and sedative)	◎
3-5. Gambir	*Uncaria gambir*	400 - 500	around 3,000	sandy loam with rich humus	seedling (one year old); cutting	small climber shrub; gambir from leaves and branches (catechu; 100 kg/ha)	◎
3-6. Kemenyan	*Styrax benzoin* Dryander	planted near paddy fields in Sumatera	tropical climate	various soil types	first harvest in 5 - 6 years from planting and lasts 10 - 12 years	resin: benzoin (aromatic); that produced in Sumatera is unsuitable for medical use)	◎
3-7. Damar mata kucing	*Shorea javanica*	1,000 dpl	tropical climate	various soil types		raw material for industrial varnish	◎
< Leaves and Flowers > 4-1. Kenanga	*Cananga odorata* Hook	0 s/d 500 dpl	1,500 s/d - 2,000 mm	alluvial soil; Latosols; Lithosols	seedling; layering or grafting	flowers for Iran Iran oil (distilled) (dwarf growth); also grows with Legosols	◎
4-2. Panili	*Vanilla fragrans*	400 - 700 dpl	2,000 - 2,500	light and good drainage	cutting	fermented fruit for aromatic, seasoning or perfume use	◎

Notes) The scientific names are mainly taken from the Handbook of Tropical Plants (edited by the Tropical Plants Study Group).