

付 表

表 11-1.4.1 土地利用基本計画ガイドラインの概要

No.	S P A T I A L P L A N (<i>RENCANA TATA RUANG WILAYAH, RTRW</i>)		
	NATIONAL LEVEL	PROVINCIAL LEVEL	DISTRICT LEVEL
COVERAGE	Strategic and recommended policy of the national spatial utilization that consist of: a. national objectives of spatial utilization for improving community welfare and security defense. b. Structure and pattern of national spatial utilization c. Criteria and pattern of the management of protected zone, cultivation zone and specific zone.	Spelling out of the strategic and recommended policy of the national spatial utilization into structure and strategy of provincial spatial utilization that consist of: a. Provincial objectives of spatial utilization for improving community welfare and security defense. b. Structure and pattern of provincial spatial utilization c. Guidance for provincial spatial utilization control	Spelling out of the provincial spatial utilization into the implementation strategy of provincial spatial utilization that consist of: a. District objectives of spatial utilization for improving community welfare and security defense. b. Structure and pattern of district spatial utilization plan c. General plan and spatial plan of district d. Guidance for controlling district spatial utilization
CONTENT	a. National protection zone, cultivation zone, and specific zone b. Condition and criteria of spatial utilization c. Guidance for spatial utilization control	a. Recommendation of the management of protection and cultivation zone, b. Recommendation of the management of rural zone, urban zone, and specific zone. e. Recommendation of zone development for settlements, forestry, agriculture, mining, industry, tourism and others. f. Recommendation of central system development for rural and urban settlements g. Recommendation of regional infrastructure systems: transportation, telecommunication, energy water resources, and environment management, h. Recommendation of the priority zone, i. Recommendation policies of land use plan, water use plan, space use plan, other natural resources use plan, and pay attention for the integrity of human and artificial resources.	a. The management of protection zone and cultivation zone b. The management of rural zone, urban zone, and specific zone, c. Systems of development activities and rural and urban settlements d. Infrastructure systems of transportation, telecommunication, energy, water resources, and environment management e. Land use plan, water use plan, space use plan, other natural resources use plan, and pay attention for the integrity of human and artificial resources.
GUIDELINES FOR	a. Formulation of integrity, interrelatedness, and balance of inter-region development and inter-sector harmony b. Creating integrity, interrelatedness, and balance of inter-region development and inter-sector harmony c. Recommendation of investment place d. Provincial and district planning	a. formulation of main provincial spatial plan policies b. Creating integrity, interrelatedness, and balance of inter-provincial development and inter-sector harmony c. Recommendation of investment place d. District spatial planning which is a basis for controlling the permission of development location	a. formulation of main district spatial plan policies b. Creating integrity, interrelatedness, and balance of inter-district development and inter-sector harmony c. Determining location of investment d. Formulating detailed district spatial plan e. Using land/space for development activities
PERIOD	25 years	15 years	10 years
REGULATION	Government regulation (<i>peraturan pemerintah</i>)	Regional regulation (<i>peraturan daerah</i>)	Regional regulation (<i>peraturan daerah</i>)
SCALE/INTENSITY	Minimum 1 : 1.000.000	Minimum 1 : 250.000	Minimum 1 : 100.000

表 11-1.4.2 地方開発企画局によるトンダノ流域の土地利用基本計画 (1/2)

No	ZONES	Location according to		
		Provincial Spatial Plan (<i>RTRW Propinsi</i>) by <i>BAPPEDA PROPINSI</i>	District Spatial Plan (<i>RTRW Kabupaten</i>) by <i>BAPPEDA Minahasa</i>	Zonation of TWS by <i>PU Pengairan</i>
A	RECOMMENDATION OF STABILIZING PROTECTED ZONE			
A.1	ZONE FOR PROTECTING ITS LOWER AREA 1. PROTECTED FOREST ZONE 2. WATER ABSORPTION ZONE	Mt.Klabat, Mt.Manimporok Protected forest and Tondano watershed	Mt. Klabat, Mt. Lembean, Mt. Mahawu, Mt. Masarang, Mt. Tampusu, Mt. Lengkoan, Mt. Kawatak, Mt. Soputan Protected forest and Mt. Manimporok	Districts of Tompaso, Langowan, Kakas, Remboken, Eris, Tondano, Tomohon, Pineleng, Kauditan, Airmadidi -----same as above----- -----
A.2	IN-SITU PROTECTION ZONE 1. RIVER BANK ZONE 2. SURROUNDING LAKE ZONE 3. SURROUNDING WATER SPRING ZONE	River Tondano Lake Tondano Not yet indicated	River Tondano (100 m of left-right side), River Tikala (50m of left-right side) Lake Tondano (50 – 100 m surrounding lake), Lake Sendow (50 m surrounding lake) Not yet indicated	River Tondano and River Tikala Lake Tondano All water spring in the catchment (in radius of 200 m)
A.3.	NATURAL AND CULTURAL RESERVE ZONE 1. NATURAL RESERVE ZONE 2. CULTURE RESERVE ZONE	Not indicated Not indicated	Not indicated Ancient Tomb in Sawangan-Airmadidi	Tomohon and around the lake (ecotourism park) Not indicated
A.4.	SENSITIVE NATURAL DISASTER ZONE 1. VOLCANOES ERUPTION 2. MASS MOVEMENT/LANDSLIDE 3. FLOODING	Mt.Mahawu, Mt.Soputan Not indicated Not indicated	Mt. Mahawu, Mt.Soputan Telap – Tasuka Not indicated	Not indicated Not indicated Cities of Manado and Tondano
B	RECOMMENDATION OF DEVELOPMENT OF CULTIVATION ZONE			
B.1	PRODUCTION FOREST ZONE	-	-	
B.2	AGRICULTURE ZONE 1. WETLAND CEREAL CROPS ZONE 2. ESTATE AND CEREAL DRYLAND FARMING ZONE 3. ANIMAL HUSBANDRY ZONE 4. FISHERY ZONE		Tondano, Kakas, Remboken, Langowan Clove cultivation: Kombi, Eris, Kakas, Tomohon, Tondano, Pineleng; Coconut cultivation: Airmadidi, Pineleng, Dimembe; Coffee cultivation: Tomohon, Langowan, Tompaso, Kakas, Kawangkoan; Nutmeg cultivation: Kauditan, Airmadidi; Cinnamon cultivation: Langowan Fruit trees: Dimembe (<i>Nephelium</i> , <i>Durian</i>); Vegetables: Tomohon, Remboken, Kawangkoan; Floriculture: Remboken Poultry commodity (Ducks): Remboken, Kakas, Tondano Livestock: Langowan (Goat) Animal Husbandry: Langowan, Tomp[aso, Tondano (Sapi, Kuda) Freshwater fish: Kakas, Eris, Tondano (around lake Tondano)	Tompaso, Kakas, Tondano, Eris, Airmadidi, Langowan <u>Cereal dryland farming</u> : Tompaso, Langowan, Eris, Remboken, Tondano, Airmadidi <u>Estates Crops</u> : Langowan, Eris, Remboken, Tondano, Airmadidi, Mapanget, Kauditan, Tomohon, Pineleng <u>Animal Husbandary</u> : Tondano, Langowan, Remboken, and Tomohon Lake Tondano, Airmadidi, River Tondano
B.3	ZONE OF MINING	Not indicated	Digging (<i>Galian C</i>): Maumbi, Noongan, Districts of Langowan, Dimembe (Klabat) have to be monitored periodically	-

表 11-1.4.2 地方開発企画局によるトンダノ流域の土地利用基本計画 (2/2)

No	ZONES	Location according to		
		Provincial Spatial Plan (<i>RTRW Propinsi</i>) by <i>BAPPEDA PROPINSI</i>	District Spatial Plan (<i>RTRW Kabupaten</i>) by <i>BAPPEDA Minahasa</i>	Zonation of TWS by <i>PU Pengairan</i>
B.4.	ZONE OF INDUSTRY	Not indicated	Tourism industry (mountain, lake tourism) and agroindustry: Districts of Tomohon, Langowan, Kakas, Eris, Tondano, and Remboken	
B.5.	ZONE OF TOURISM		Main tourism zone of Tomohon – Tondano and its surrounding: Water tourism, ecotourism (agritourism)	Langowan, Tompas, Remboken, Tondano, Tomohon, Airmadidi, Manado
B.6.	ZONE OF SETTLEMENTS		Development of planned housing: Airmadidi, Pineleng, Tondano, Kauditan, Remboken, Langowan, Kawangkoan; Resting places: Tondano, Remboken, Kakas; Labor housing: Kauditan, Airmadidi	All kecamatan
C.	RECOMMENDATION OF DEVELOPING RURAL ZONE			
D.	RECOMMENDATION OF DEVELOPING URBAN ZONE			
E.	RECOMMENDATION OF SPECIFIC ZONE			
E.1.	INTEGRATED ECONOMIC DEVELOPMENT ZONE (<i>KAPET</i>) MANADO - BITUNG		Manado – Bitung corridor (core zone of <i>KAPET</i> industry)	
F.	RECOMMENDATION OF DEVELOPING AND MANAGING PRIORITY ZONE			
F.1.	DEVELOPING STRATEGIC ZONE 1. WATER TOURISM: LAKE TONDANO		Integrated with other tourism activities as like <i>FESBUDATON</i> (in Paleloan village), Pottery handicraft industry (Pulutan village)	
F.2.	DEVELOPING GROWTH REGIONAL TRIGGER ZONE		-	
F.3.	DEVELOPING FAST GROWTH AREA 1. CORRIDOR OF MANADO – BITUNG 2. CORRIDOR OF MANADO – TOMOHON		Along corridor Manado – Bitung Along corridor Manado – Tomohon	
G.	DEVELOPING SPECIAL ZONE 1. MANADO – BITUNG HIGHWAY 2. TONDANO RIVER DAM		Along the planned highway Not yet indicated	

Sources :

1. Review of Spatial/Land Use Plan of North Sulawesi (Review *Rencana Tata Ruang Wilayah Propinsi Sulawesi Utara*). 2000. Regional Government of Province of North Sulawesi. Manado.
2. Review of Spatial/Land Use Plan of District of Minahasa (Review *Rencana Tata Ruang Wilayah Kabupaten Minahasa*). 1997. Regional Government of District of Minahasa. Tondano
3. Zonation of Tondano Watershed (*Pekerjaan Penataan Kawasan DAS Tondano*). 1997. Dinas Pekerjaan Umum Propinsi Sulawesi Utara. Manado.

**表 II-1.4.3 Pola RLKT においてゾーニングに使用された
スコア換算表**

1. Classification of Intensity of Daily Rainfall and its Score

No	Intensity of daily rainfall (mm/day)	Class	Score
1.	< 13.60	very low	10
2.	13.6 – 20.7	low	20
3.	20.7 – 27.7	moderate	30
4.	27.7 – 34.8	high	40
5.	> 34.8	very high	50

2. Classification Soil Type and its Score

No	Soil Type (Center for Soil Research, Bogor)	Classification	Score
1.	Aluvial, Gley Planosol, Hidromorf Kelabu, Laterik Air	Not sensitive	15
2.	Tanah	Low sensitive	30
3.	Latosol	Moderately sensitive	45
4.	Brown Forest Soil, Non Calcic Brown, Mediteran		60
5.	Andosol, Laterit, Grumusol, Podsol, Podsolik	Sensitive	75
	Regosol, Litosol, Organosol, Renzina	Very sensitive	

3. Classification of Slope and its Score

No	Slope gradient (%)	Classification	Score
1.	00 - 08	Flat	20
2.	08 – 15	Gentle	40
3.	15 – 25	Moderate	60
4.	25 – 40	Steep	80
5.	> 40	very steep	100

表 II-1.4.4 州地方開発企画局によるトンダノ流域保全計画の構想

No.	Main activities	Description	Executing agency
1.	Protecting sedimentation	Reforestation/Planting: 1. Nursery/sedling: a. Reforestation b. Planting 2. Rearing 3. Construction of check dam 4. Maintaining of the dam	Kanwil Forestry & Estates Crops Dinas Kehutanan Propinsi Dinas Kehutanan Kabupaten Dinas PU (Pengairan)
2.	Water Use	Water use retribution	Reg. Govn. Propinsi & Kabupaten, Dipenda, DPRD
3.	Water lake pollution	1. Garbage management and weeds control 2. Hadycraft industry (Eceng gondok) 3. Controlling of Liquid garbage, fertilizer, pesticide, detergent, etc (extension service for floating net fishery)	Dinas PU (pengairan) Kanwil industry and commerce BAPEDALDA Dinas Perikanan Propinsi
4.	Sempadan Danau dan sungai (surrounding lake and river bank zone)	1. delimiting boundary of zone 2. Extension and sosialization	BAPPEDA Minahasa BAPPEDA Minahasa
5.	Spatial Plan of the Watershed	1. Detailed spatial plan Second year: legalization and sosialization 2. Definiting forest boundary	UNSRAT, BAPPEDA, PU (cipta karya) Dinas Kehutanan Propinsi
6.	Demography/ pressure on the watershed	1. Resettlement 2. application of appropriate technology for conserving land (training) 3. Diversification and supplement livelihood (seeds assistance) 4. Research in demography and ecosystem. The activities: 1 st year : preliminary study on community perception 2 nd year experimental study (pilot project) 3 rd – 4 th year : implementation 5. improving community awareness and attitude changing 1 st year: extension/training 2 nd year:developing environmental human resources 3 rd year: improving capability and participation of NGOs 4 th year: giving appreciation 5 th year: evaluation 6. Training on environmental aspects 7. Funds assistance for farmers	Regional government (Prop. & Kab.) Politeknik, Kanwil Pertanian Kanwil industry & commerce UNSRAT BAPEDALDA BAPEDALDA BAPEDALDA
7.	Watershed Management Institution	1. Formulating the Management Board 2. Formulating and revising the regulation 3. Extension services for stakeholders 4. Formulating integrated watershed management 5. Obtaining environmental geology data/information 6. Supervising/ law enforcement 7. Evaluation	BAPPEDA, LAW BUREAU OF REGIONAL GOVNT. NGOs Related agency Kanwil Pertambangan (mining office) Police Department BAPPEDA

Table II-1.5.1 トンダノ流域における造林事業の実施状況（1976-1999 年）

Fiscal Year	Location	Area (ha)	Failure				Success	Grown species
			Fired	Fail	Cleared Away	Total		
1976/1977	Mt. Potong Noongan	71	71	0	0	0	0	Pine, etc
		529	0	297	0	297	232	Pine, etc
1977/1978	Mt. Soputan Kayuwatu	2.400	0	1.786	614	2.400	0	Pine, etc
		200	0	0	200	200	0	Pine, etc
1980/1981	Mt. Masarang Mt. Mahawu	175	175	0	0	175	0	Pine, etc
		200	65	135	0	200	0	Pine, etc
1981/1982	Mt. Mahawu	170	78	92	0	170	0	Pine, etc
1983/1984	Mt. Soputan	100	100	0	0	100	0	Pine, etc
1984/1985	Mt. Soputan	500	115	0	0	115	385	Pine, Nantu
	Mt. Kawatak	100	0	0	35	35	65	Pine, Nantu
	Tumaratas	100	0	25	0	25	75	Pine, Nantu
1985/1986	Makalonsow Mt. Lembean	200	0	30	0	30	170	Pine, Nantu
		100	100	0	0	100	0	Pine, Nantu
1986/1987	Mt. Lembean	300	0	0	0	0	300	Pine, Nantu
1988/1989	Makalonsow	100	0	0	0	0	100	Nantu, etc
1991/1992	Ranolambot	150	0	50	0	50	100	Nantu, etc.
1992/1993	Mt. Soputan	150	0	0	0	0	150	Nantu, etc.
1993/1994	Ranolambot Noongan	100	0	0	0	0	100	Nantu, etc.
		200	0	0	0	0	200	Nantu, etc.
1994/1995	Makalonsow	200	200	0	0	200	0	Gmelina, Nantu
1995/1996	Makalonsow	400	0	0	0	0	400	Gmelina, Nantu
1996/1997	Makalonsow	600	0	0	0	0	600	Gmelina, Nantu
1998/1999	Rerer	100	0	0	0	0	100	Gmelina, MPTS

*Source: Statistics of Dinas Kehutanan Dati I Sulawesi Utara, 1999.
Personal communication with Katuuk, 2000*

表 II-1.5.2 トンダノ流域における緑化事業の実績(1999/2000年)

No.	Location	Activities	Area/Unit
I.	Tondano Sub-district		
1	Kelurahan' Rinegetan	Private Forest / Estate	50 ha
2	Kelurahan' Sumalangka	Private Forest / Estate	50 ha
3	Kelurahan' Wewelen	Private Forest / Estate	25 ha
4	"Kelurahan' Tataaran II	Private Forest / Estate	25 ha
5	Kelurahan' Tataaran II	Private Forest / Estate	50 ha
6	Kelurahan' Paleloan	Private Forest / Estate	25 ha
7	Kelurahan' Tuutu	Private Forest / Estate	50 ha
		KBD	0,5 ha
8	Kelurahan' Wawalintowan	Private Forest / Estate	50 ha
II.	Toulimambot Sub-district		
1	Kelurahan' Kiniar	Private Forest / Estate	50 ha
		UP-UPSA'	1 unit
2	Kelurahan' Taler	Private Forest / Estate	50 ha
III	Eris Sub-district		
1	Desa' Touliang Oki	Private Forest / Estate	50 ha
		UP-UPSA	1 unit
2	Desa' Tandengan	Private Forest / Estate	50 ha
3	Desa' Eris	Private Forest / Estate	50 ha
IV	Kakas Sub-district		
1	Desa' Simbel	Private Forest / Estate	50 ha
2	Desa' Toulimambe	Private Forest / Estate	50 ha
3	Desa' Tounumomei	Private Forest / Estate	50 ha
4	Desa' Kaweng	UP-UPSA	1 unit
V	Remboken Sub-district		
1	"Desa' Talikuran	Private Forest / Estate	50 ha
2	Desa' Paslaten	Private Forest / Estate	50 ha
3	"Desa' Sionia	Private Forest / Estate	50 ha
4	Desa' Kaima	Private Forest / Estate	50 ha
VI	Tomohon Sub-district		
1	"Desa' Rurukan	Preventor / Check Dam	1 unit
VII	Langowan Sub-district		
1	Desa' Teep	Private Forest / Estate	50 ha
2	Desa' Touneiei	Private Forest / Estate	50 ha
3	Desa' Manembo	Private Forest / Estate	50 ha
4	Desa' Winebetan	Private Forest / Estate	50 ha
5	Desa' Kaayuran Atas	Private Forest / Estate	50 ha
		KBD	1 unit
6	Desa' Waleure	KBD	0,5 unit
7	Desa' Temboan	Private Forest / Estate	25 ha
8	Desa' Noongan	KBD	0,5 ha
VIII	Tompaso Sub-district		
1	Desa' Toure	Private Forest / Estate	50 ha
2	Desa' Tonsewer	Private Forest / Estate	50 ha
IX	Pineleng Sub-district		
1	Desa' Sawangan	Private Forest / Estate	50 ha
		Preventor / Check Dam	1 unit
2	Desa' Ramangia	Private Forest / Estate	50 ha
		KBD	1 unit
3	Desa' Tombuluan	Private Forest / Estate	50 ha
4	Desa' Kembes	Private Forest / Estate	50 ha
5	Desa' Koka	Private Forest / Estate	25 ha
X	Airmadidi Sub-district		
1	Kelurahan' Sukur	Private Forest / Estate	50 ha
2	Kelurahan' Sarongsong I	Preventor / Check Dam	1 unit
3	Desa' Tanggari	Private Forest / Estate	50 ha
		KBD	1 unit
4	Desa' Rumengkor	Private Forest / Estate	25 ha
5	Desa' Kembuan	Private Forest / Estate	50 ha
6	Desa' Kolongan	Private Forest / Estate	50 ha
XI	Dimembe Sub-district		
1	Desa' Paniki Atas	Private Forest / Estate	50 ha
		Preventor / Check Dam	1 unit
2	Desa' Matungkas	Private Forest / Estate	50 ha
		Preventor / Check Dam	1 unit

Notes: * KBD = Kebun Bibit Desa (Village Nursery)

** UP-UPSA (Unit Percontohan Usaha Pelestarian Sumber Daya Alam) = Demonstration Plot for Conservation of Natural Resources

表 II-1.6.1 主要作物の生産

(1) Harvested Area of Food Crops in the Study Area (1998)										unit: ha
Sub-district	Lowland paddy	Upland paddy	Maize	Cassava	Swee potatoes	Ground nuts	Green grams	Soybeans	Total	
Longowan	1,400	0	870	2	3	12	0	0	2,287	
Kakas	2,070	40	874	0	12	0	0	0	2,996	
Tompaso	1,028	0	2,201	2	4	21	0	0	3,256	
Remboken	604	0	1,483	39	13	62	0	0	2,201	
Eris	344	0	282	3	0	0	0	0	629	
Tondano	1,926	0	2,764	8	6	55	0	0	4,759	
Toul imambot	2,310	0	2,787	3	0	36	0	5	5,141	
Tomohon	49	0	89	6	6	7	0	0	157	
Kauditan	454	0	245	19	0	4	0	0	722	
Airmadidi	329	35	1,080	0	0	20	0	8	1,472	
Pineleng	56	18	958	6	8	4	0	0	1,050	
Study Area	10,514	75	12,675	82	44	217	0	13	23,620	

(2) Production of Food Crops in the Study Area (1998)										unit: tons
Sub-district	Lowland paddy	Upland paddy	Maize	Cassava	Swee potatoes	Ground nuts	Green grams	Soybeans		
Longowan	7,840	0	2,696	54	30	15	0	0		
Kakas	9,936	84	2,526	0	0	1	0	0		
Tompaso	6,029	0	6,709	26	100	24	0	0		
Remboken	2,947	0	5,339	585	65	59	0	0		
Eris	1,664	0	1,008	39	0	0	0	0		
Tondano	8,628	0	9,508	134	23	65	0	0		
Toul imambot	9,471	0	5,379	49	0	39	0	5		
Tomohon	239	0	196	66	83	8	0	0		
Kauditan	2,146	0	649	273	0	4	1	0		
Airmadidi	1,582	74	2,268	0	0	20	0	8		
Pineleng	224	33	3,399	71	37	5	0	0		
Study Area	50,482	158	36,278	1,226	301	235	1	13		

(3) Yield of Food Crops in the Study Area (1998)										unit: kg/ha
Sub-district	Lowland paddy	Upland paddy	Maize	Cassava	Swee potatoes	Ground nuts	Green grams	Soybeans		
Longowan	5.600		3.099	27.000	10.000	1.250				
Kakas	4.800	2.100	2.890		0.000					
Tompaso	5.865		3.048	13.000	25.000	1.143				
Remboken	4.879		3.600	15.000	5.000	0.952				
Eris	4.837		3.574	13.000						
Tondano	4.480		3.440	16.750	3.833	1.182				
Toul imambot	4.100		1.930	16.333		1.083			1.000	
Tomohon	4.878		2.202	11.000	13.833	1.143				
Kauditan	4.727		2.649	14.368		1.000				
Airmadidi	4.809	2.114	2.100			1.000			1.000	
Pineleng	4.000	1.833	3.548	11.833	4.625	1.250				
Study Area	4.801	2.107	2.862	14.951	6.841	1.083	1.824	1.058		

Source: Laporan Tahunan, Dinas Pertanian Tanaman Pangan Kab. Minahasa

表 11-1.6.2 主要農園作物の生産

(1) Area of Estate Crops in the Study Area (1998)							Unit:ha
Sub-District	Coconut	Clove	Coffee	Vanilla	Nutmeg	Cocoa	Total
Langowan	256	265	8	44	2	6	581
Kakas	215	609	18	29	2	17	890
Tompaso	78	72	52	4	5	0	211
Remboken	20	80	118	15	0	2	235
Eris	13	342	13	10	0	4	382
Tondano	12	60	266	55	0	0	393
Toulimambc	14	605	36	19	0	0	674
Tomohon	25	56	8	5	0	0	94
Kauditan	1,760	195	12	28	122	21	2,138
Airmaditi	8,698	998	38	76	24	49	9,883
Pineleng	3,179	899	7	37	3	8	4,133
Study total	11,091	3,282	569	285	155	99	15,481
Minahasa	130,755	35,540	2,378	2,936	885	2,451	174,945

(2) Number of Trees of Estate Crops in the Study Area (1998)						
Sub-District	Coconut	Clove	Coffee	Vanilla	Nutmeg	Cocoa
Langowan	28,813	66,454	9,176	105,874	494	5,717
Kakas	26,313	189,908	18,494	71,531	3,536	17,094
Tompaso	5,401	5,906	52,429	11,644	431	0
Remboken	2,200	16,010	117,988	37,250	0	2,000
Eris	1,083	65,529	12,960	21,242	0	4,050
Tondano	1,232	12,137	265,000	72,670	0	0
Toulimambc	1,584	121,800	39,142	47,000	0	0
Tomohon	3,026	13,010	8,219	4,866	58	627
Kauditan	244,267	38,922	7,966	51,189	22,650	21,173
Airmaditi	1,128,947	199,600	43,699	150,000	4,800	50,430
Pineleng	476,567	127,719	7,112	76,930	0	8,292
Study Area	1,442,866	729,276	575,073	573,266	31,969	101,091
Minahasa	16,348,456	7,766,672	2,399,458	6,486,902	162,244	2,322,235

(3) Number of Productive Trees of Estate Crops in the Study Area (1998)						
Sub-District	Coconut	Clove	Coffee	Vanilla	Nutmeg	Cocoa
Langowan	22,637	66,454	8,117	105,873	494	5,717
Kakas	26,313	185,136	16,862	68,811	0	16,999
Tompaso	4,855	4,519	44,100	10,306	991	0
Remboken	2,200	16,000	113,002	37,250	0	2,000
Eris	357	64,800	12,234	21,121	243	4,050
Tondano	931	10,230	250,000	59,970	400	0
Toulimambc	1,213	118,427	35,000	29,600	0	0
Tomohon	2,970	10,400	7,888	3,373	58	406
Kauditan	232,408	37,147	7,036	51,189	21,345	17,549
Airmaditi	1,119,955	199,600	27,699	150,000	3,200	30,630
Pineleng	468,221	126,900	3,515	47,263	409	4,576
Study Area	1,413,839	712,713	521,938	537,493	26,731	77,351
Minahasa	14,848,794	7,379,128	2,149,944	5,691,897	150,188	2,004,462

(4) Production of Estate Crops in the Study Area (1998)							Unit:tons
Sub-District	Coconut	Clove	Coffee	Vanilla	Nutmeg	Cocoa	
Langowan	198	46	9	17	na	2	
Kakas	231	131	15	11	na	5	
Tompaso	42	3	48	2	na	0	
Remboken	19	11	125	5	na	0	
Eris	3	49	15	4	na	2	
Tondano	8	6	255	63	na	0	
Toulimambc	10	82	37	3	na	0	
Tomohon	26	7	5	3	na	0	
Kauditan	2,220	26	7	9	na	5	
Airmaditi	9,823	139	28	26	na	10	
Pineleng	4,107	92	4	23	na	1	
Study Area	12,580	500	544	143	na	24	
Minahasa	130,246	5,132	2,200	456	na	624	

Source: Laporan Tahunan, Dinas Perkebunan Kab. Minahasa

表 11-1.6.3 スタディエリアにおける家畜頭数

(1) Animal Population in Minahasa District

	1994	1995	1996	1997	1998	Average
Cattle	44,171	44,877	45,397	46,986	47,409	46,167
Horse	9,697	9,289	9,391	9,532	9,837	9,512
Goat	8,456	8,315	8,666	9,446	7,434	8,465
Pig*	397,075	357,246	82,945	102,851	119,307	165,587
Local chicken	1,271,697	1,275,507	1,328,877	1,354,126	1,150,736	1,277,312
Duck	151,818	169,257	163,546	141,141	42,634	129,145
Chicken for egg	349,300	197,488	238,072	232,800	204,438	218,200
Chicken for meat ²	145,175	145,175	194,785	217,359	232,987	197,577

*: Pig population 1996 is decreased by pig cholera

**.: Production per month

Source: Laporan Tahunan, Dinas Peternakan, Tondano 1999

(2) Animal Population in Related Sub-district (1999)

Sub-district	Cattle	Horse	Pig	Goat	Chicken	Duck
Longowan	1,548	794	3,649	901	82,965	8,703
Kakas	1,706	433	4,761	116	46,229	1,922
Tompaso	2,766	772	2,286	0	18,823	2,860
Remboken	1,014	404	637	39	16,283	951
Eris	133	85	927	24	15,380	2,013
Tondano	2,392	1,225	1,264	151	54,304	4,296
Toul imambot	2,861	1,201	726	391	38,455	3,375
Tomohon	3,162	1,464	11,733	129	87,353	1,969
Kauditan	1,885	211	7,311	231	92,818	1,592
Airmadidi	2,120	327	10,502	861	55,039	129
Pineleng	1,374	154	13,109	488	63,638	1,281
Study Area total	20,961	7,070	56,905	3,331	571,287	29,091

Source: Laporan Tahunan, Dinas Peternakan, Tondano 1999

表II-1.7.1 スタディエリアにおけるアグロフォレストリーのタイプ

Type	Woody perennials					Herbaceous crops	Major Area
	Woody trees	Estate crops			Fruit trees		
		Coconut	Clove	Others+			
I-1	△	⊙	△	X	△	△	Northern part of Airmadidi and Pineleng
I-2	△	△	⊙	X	△	△	Tondano, Tompasso, Remboken, Touliambot,and southernpart of Airmadidi and Pineleng
I-3	○	⊙	○	X	○	△	Relatively steep slope area of Langowan, Kakas, Eris, Airmadidi and Pineleng
I-4	○	○	⊙	X	X	△	Relatively steep slope area of Langowan, Kakas, Eris, Airmadidi and Pineleng
I-5	○	○	X	⊙	X	X	Tondano, Tompasso, Remboken, Airmadidi and Pineleng
I-6	○	○	○	○	○	○	Housing area of all the Study Area and Airmadidi (along Bitung road)
II-1	△	○	△	X	△	⊙	Southern and western part of the study area
II-2	△	△	○	X	△	⊙	Southern and western part of the study area
III-1	△	⊙	X	X	△	⊙	Flat area of Airmadidi, Pineleng, Tompasso and Remboken
III-2	△	X	⊙	X	X	⊙	Flat area of Airmadidi, Pineleng, Tompasso, Remboken, Tondanoand Toulimumbot

Note: * : Others include coffee, cocoa and vanilla.
 ⊙ : Pre-dominant ○ : Dominant △ : Frequent X : Negligible
 ▲ : shows the limited area.

表 11-1.7.2 スタディエリアにおけるアグロフォレstryシステム

Sub-District	Location	Flat (Less than 8%)		Slope I (8% to 25%)		Slope II (More than 25%)	
		Majority	Minority	Majority	Minority	Majority	Minority
1 Langowan	Tumaratas-Rarinis	II-1	III-2	III-1	III-2	I-11	
	Noogan	I-1, II-1	III-2	I-1			
2 Kakas	Kawang			III-1		I-4	
	Totolan-Panasen-Kalawiran	II-2		II-2		I-4	
3 Tompaso	Tempot	II-2	I-2, -5, III-2	III-1, -2			
	Tonsewer-Touure	III-1	III-1	III-1, -2			
4 Remboken	Palestan-Tampusu	III-2	III-2	III-2	I-3		
	Tampusu-Kasuratan	III-1,2				I-3	
	Kasuratan	I-2, II-2	I-5, III-2				
	Kasuratan-Parepei	I-2, II-2	I-6, III-1	III-2	III-1	I-4	
	Parepei	III-1,2		III-2	III-1	I-4	
	Parepei-Pulatan	II-2	I-2, II-1			I-4	
	Pulutan	III-1,2					
5 Tomohon	Rurukan-Temboan	II-1, -2		II-1		II-1	I-4
	Kumelembau	II-1, -2		II-1		II-1	
6 Tondano	Ruaukan-Sumalangka	III-2	I-2, II-2	II-2	I-2	II-2	
	Sumalangka-sasaran-Suluan	I-2, III-2	I-6	I-2, III-2		I-3	
	Tataaran	8, 11		III-1,2		I-3	
	Tataaran-Palesten	III-1, -2		II-2	I-1, -5	I-3	
7 Toulimambot	Papakalan-Makalonsouw	III-2	III-1	I-2, III-2	III-2	I-4	
8 Eris				I-4		I-4	
9 Kauditan		III-1	I-1	I-3		I-4	
10 Airmadidi	Suluan-Kembuan	I-1, -2, I-5	III-1, -2	III-1, -2	I-3	I-3	
	Suluan-Rumengkor	I-2, I-5	I-1, II-1, -2	I-1,2	III-1	I-3	I-4
	Rumenkor	I-1, I-3	III-1, -2	III-1, -2	I-1	I-4	I-1
	Airmadidi Atas-Maunbi	I-1,I-6	I-5, III-1	I-1		I-4	
	Airmadidi Bawah-Tanggari	I-1	I-6, II-2	I-1, -3		I-4	
	Tanggari-Tonsealama	I-2	II-2, III-2	I-4		I-4	
11 Pineleng	Rumengkor-Kembes	I-1	I-2, III-1, -2	I-3, III-1		I-4	
	Kembes-Tombuluan	I-1, III-1	II-1, -2, III-2	I-3	I-1, -2	I-4	
	Tombuluan-Kumangata	I-1, III-1		I-3	I-1, -2	I-4	
	Kumangata-Sawangan	I-1	I-5, -6, II-1	I-1	III-1	I-4	
	Kembes-Koka	I-1, II-1	III-1	I-3	I-1, -2	I-4	

Source: Field reconnaissance by JICA Study Team

Note : Gothic letter shows predominant system in the Study Area.

表 II-1. 11. 1 本調査の主たる関連政府機関とその責務

Agencies	Duties	Functions
1. Directorate General of Land Rehabilitation and Social Forestry	To implement the duties of the MOFEC (Ministry of Forestry and Estate Crops) in the sector of land rehabilitation and social forestry according to the policy as stipulated by MOFEC and based on the existing legislative regulation (Article 87 of the Decree of Ministry of Forestry and Estate Crops no.002/Kpts-II/2000, dated on January 7,2000).	(a). Formulation of technical policy in land rehabilitation and social forestry sector; (b). Plan and program, as well as technical control, social forestry, forest product diversification development, and forest crops seedling; and; (c). Development, which covers the training guidance, and standard preparation in the sector of land rehabilitation and conservation, social forestry, forest product diversification development and forest crops seedling.
2. Regional Office of Ministry of Forestry and Estate Crops	To make and coordinate various plans on forestry activities.	-
3. Office of Land Rehabilitation and Soil Conservation (BRLKT)	Implement the compositions of micro-planning, monitoring, evaluation of watershed management, successful land rehabilitation and soil conservation;	(a). Prepare the long term plan (pattern of land rehabilitation and soil conservation) and the medium term plan (field technical plan of land rehabilitation and soil conservation); (b). Execute the monitoring and evaluation on watershed management; (c). Execute the monitoring and evaluation on successful land rehabilitation and soil conservation; (d). Examine the technical arrangement of land rehabilitation and soil conservation; (e). Examine the technical plan of greening and reforestation; and (f). Perform the administration matters.
4. Forestry Service Office of North Sulawesi Province	(a). Lead and coordinate all forestry activities at provincial level; (b). Execute the technical policies in forestry affairs in accordance with the guidelines and / or technical policies prepared by the central government; (c). Prepare the plans on forestry affairs at provincial level in accordance with the national forestry development plan; (d). Control the forest use including its protection and maintenance; and (e). Perform other duties given by the central government, as the provincial leader.	To fulfil the whole exertions and activities for: (a). Planning, preparing, processing, analyzing; (b). Implementing the duties of Forestry Service Office in accordance with the applicable laws; (c). General administration, civil service, and logistic and financial matters; (d). Arranging and establishing some cooperations, integrating and synchronizing whole organizational activities of the Forestry Service Office, including the implementation of technical coordination with other relevant agencies for smooth execution of the Office duties; and (e). Implementing the technical security.
5. Estate Crops Office of North Sulawesi	Execute the household affairs at provincial level in the estate crops section;	(a). Implement the general establishment in accordance with the policies prepared by the Ministry of Home Affairs; (b). Execute the technical program in the estate crops; (c). Provide the permit enterprise establishment; (d). Execute the extension and enlightenment services; (e). Execute the research ; (f). Execute the technology examination in the framework of establishment of recommended technology; (g). Perform the office administration matters; (h). Carry out the management of Technical Implementation Unit.
6. Forestry Service Office of Minahasa District	To support the Governor for the household matters at district level on the forestry affairs, about ways of: (a). Sale and distribution of forest products; (b). Forest protection; (c). Greening and conservation of soil and water; (d). Sericulture; (e). Apiculture; (f). Community forest and private forest; (g). Enlightenment of importance of forestry, which are supported by the central and regional governments.	(a). Control the distribution and sale of forest products; (b). Protect the forest damage; (c). Prepare the program on monitoring, evaluation, and other administration matters; (d). Support the communities and Self-Supporting Community Institutions in planting, and protection /maintenance of community forest and private forest; (e). Execute the implementation and improvement of apiculture and sericulture; (f). Implement the greening, soil, and water conservation; (g). Execute the enlightenment activities and train the extension workers; (h). Support the community and community organization in recovering and maintaining function of forest, soil, and water; and (i). Provide technical guidance for Technical Implementation Unit.
7. Estate Crops Office of Minahasa District	(a). Examination and application of technology; (b). Land resources utilization; (c). Seedling preparation; (d). Fertilizer supply; (e). Pesticides supply; (f). Establishment of Method of use for machinery equipment; (g). Establishment of farm enterprise management; (h). Products management; (i). Establishment of marketing.	(a). Perform the development by the approach to the natural resources, human resources, agri-business, and integrity concept of inter sector / sub sector; (b). Implement the development pattern consisting of various patterns such as self-supporting / partial establishment, economic enterprise, and investor; (c). Partnership / joint venture of economic enterprise and joint venture; (d). Partnership / joint venture of investor and economic enterprise; (e). BOT (built, operate, transfer); (f). BTN (the estate is made / constructed by the investor / entrepreneur, which the payment is made by the farmers in installments; (g). Execute the main cultivation activities consisting of intensification, extensification, rehabilitation / replanting, diversification, and land conservation; (h). Implement agriculture commodity development; and (i). Application of the commodity policies on various estate crops such as cocoa, clove, nutmeg, coffee, cacao, vanilla, cashew, cassiavera, candlenut, cardamom, and ginger.

表 11-3. 4. 1 適切なアグロフォレストリーシステム決定のための要素

Slope	Access	Soil erodibility	Herbaceous cultivation*	Erosion	Required Resistant to erosion	Applicable system	Required Hedge crops*	Required Ridge*	Application of new practice*	Inter cropping*	Recommendable system
0--8	good	low	easy	strongly resistant	medium	All the system	slightly	slightly	easy	easy	I-5,6, II-1,2, III-1,2
		medium	easy	strongly resistant	medium	All the system	slightly	slightly	easy	easy	I-5,6, II-1,2, III-1,2
	poor	low	easy	strongly resistant	medium	All the system	slightly	slightly	easy	easy	I-5,6, II-1,2, III-1,2
		medium	easy	strongly resistant	medium	All the system	slightly	slightly	easy	easy	I-5,6, II-1,2, III-1,2
8--15	good	low	easy	resistant	medium	All the system	slightly	medium	easy	easy	I-5,6, II-1,2, III-1,2
		medium	easy	medium	medium-resistant	I-1,2,3,4,5,6, (II-1,2), III-1,2	slightly	medium	easy	easy	I-5,6, (II-1,2), III-1,2
	poor	low	easy	resistant	medium	All the system	slightly	medium	easy	easy	I-5,6, II-1,2,3, III-1,2
		medium	easy	medium	medium-resistant	I-1,2,3,4,5,6, (II-1,2), III-1,2	slightly	medium	easy	easy	I-5,6, (II-1,2), III-1,2
15--25	good	low	medium	medium	resistant	I-1,2,3,4, III-1,2	medium	strongly	medium	medium	I-1,2, I-5, (III-1,2)
		medium	medium	susceptible	Strongly resistant	I-1,2,3,4, (III-1,2)	medium	strongly	medium	medium	I-1,2,3,4, (III-3)
	poor	low	medium	medium	resistant	I-1,2,3,4, III-1,2	medium	strongly	medium	medium	I-1,2, (II-3), (III-1,2)
		medium	medium	susceptible	Strongly resistant	I-1,2,3,4, (III-1,2)	medium	strongly	medium	medium	I-1,2,3,4, (III-1,2)
25--40	good	low	difficult	susceptible	Strongly resistant	I-1,2,3,4	strongly	strongly	difficult	difficult	I-1,2,3,4
		medium	difficult	susceptible	Very strongly resistant	I-3,4, (I-1,2)	strongly	strongly	difficult	difficult	I-3,4, (I-1,2)
	poor	low	difficult	susceptible	Strongly resistant	I-1,2,3,4	strongly	strongly	difficult	difficult	I-1,2,3,4
		medium	difficult	susceptible	Very strongly resistant	I-3,4, (I-1,2)	strongly	strongly	difficult	difficult	I-3,4, (I-1,2)
40<	good	low	very difficult	very susceptible		Permanent tree complex	strongly	strongly	very difficult	very difficult	Permanent tree complex
		medium	very difficult	very susceptible		Permanent tree complex	strongly	strongly	very difficult	very difficult	Permanent tree complex
	poor	low	very difficult	very susceptible		Permanent tree complex	strongly	strongly	very difficult	very difficult	Permanent tree complex
		medium	very difficult	very susceptible		Permanent tree complex	strongly	strongly	very difficult	very difficult	Permanent tree complex

Numerals in parenthesis shows optionally applicable or recommendable.

Soil: Andsols; medium, Other soil; less

Access: Distance from the village. Good : less than 1 km. Poor; more than 1km

In case that farming activities are excuted at more than40% sloped area, it is proposed to employ hedgerow cropping by considering soil erosion.

For recommendation of agroforestry system, it is necessary to pay regard to farmers opinion and requirement.

Erosion: Relative value

* : Determined by field inspection.

Type	Woody perennials					Herbaceous crops	
	Woody trees		Estate crops		Fruit trees		
		Coconut	Clove	Others			
I-1	△	◎	△	X	△		△
I-2	△	△	◎	X	△		△
I-3	○	◎	○	X	○		△
I-4	○	○	◎	X	X		△
I-5	○	○	X	◎	X		X
I-6	○	○	○	○	○		○
II-1	△	○	△	X	△		◎
II-2	△	△	○	X	△		◎
III-1	△	◎	X	X	△		◎
III-2	△	X	◎	X	X		◎

Note: * : Others include coffee, cocoa and vanilla.

◎ :Pre-dominant ○ : Dominant △ : Frequent X:Neglesible

Category I is tree crop dominant, Category II is herbaceous crop dominant, Category III is non dominant.

II-3:Hedge cropping applied to type II-1 and II-2

表 11-3. 4. 2 各アグロフォレストリーシステムの特性

Type	Productivity					Resistance to Soil erosion	Application of new practice
	Trees	Estate C	Fruit	Herbaceous	Evaluation		
I-1	neglesible	high	neglesible	neglesible	medium	resistant	relatively difficult
I-2		high	neglesible	neglesible	medium	resistant	relatively difficult
I-3	Low	medium	neglesible	neglesible	Low	very resistant	difficult
I-4	Low	medium	neglesible	neglesible	Low	very resistant	difficult
I-5	medium	high			high	very resistant	easy
I-6	medium	medium	medium	medium	high	very resistant	relatively easy
II-1	neglesible	low	neglesible	high	high	resistant	easy
II-2	neglesible	low	neglesible	high	high	resistant	easy
III-1	neglesible	high	neglesible	medium	high	resistant	easy
III-2	neglesible	high	neglesible	medium	high	resistant	easy

表 11-3.4.3 スタディエリアにおいて適切なアグロフォレストリーシステム

Type	Woody trees	Woody perennials			Fruit trees	Herbaceous crops	Recommended area
		Estate crops					
		Coconut	Clove	Others			
I-1	△	⊙	△	X	△	△	Gentle to relatively steep slope area of northern part of the Study Area
I-2	△	△	⊙	X	△	△	Gentle to relatively steep slope area of southern part of the Study Area
I-3	○	⊙	○	X	○	△	Relative steep to steep slope area
I-4	○	○	⊙	X	X	△	Relatively steep to steep slope area
I-5	○	○	X	⊙	X	X	Gentle slope area where it located not far from settle ment area
I-6	○	○	○	○	○	○	Home garden, and fruit production area
II-1	△	○	△	X	△	⊙	Flat to gentle slope area of northern part of the Study Area, close to the housing area
II-2	△	△	○	X	△	⊙	Flat to gentle slope area, close to the housing area
II-3	○	△	○	X	△	⊙	Slopy area, close to the settlement area, trees used as hedgerow
III-1	△	⊙	X	X	△	⊙	Flat to gentle slope area of northern part of the Study Area
III-2	△	X	⊙	X	X	⊙	Flat to gentle slope area of southern part of the Study Area

Note: *: Others include coffee, cocoa and vanilla.
⊙ :Pre- d ominant ○ : Dominant △ : Frequent X:Neglesible
Category I is tree crop dominant, Category II is herbaceous crop dominant, Category III is non dominant.

表 11-3.4.4 各ゾーン毎の保全計画

Zones	Land Use	Slope Gradient (%)	Area (ha)	Recommended Conservation Measures		
				Forest	Agroforestry	Protection Works
P Zone	Forest	> 40	4,361	◎ Reforestation ◎ Prevention of reforestation ◎ Community forest	-	-
Bw Zone	Farmlands, forest, wetland	—	3,266	○ Green belt	○ Tree dominate type ○ Multistory tree garden	○ Control of fishing in the lake, ○ Erosion control measures (Vegetative measures, riverbed revetment, check dam)
Bm Zone	Estate	25-40	4,030	◎ Expansion of private forest	◎ Tree dominate type ◎ Multistory tree garden	◎ Erosion control measures (terracing, contour dikes, diversion ditches) ○ Road improvement ○ Erosion control farming (contour ridge cultivation, hedge cropping)
		15-25	7,734	◎ Expansion of private forest	◎ Tree dominate type ◎ Multistory tree garden	◎ Erosion control measures (diversion ditches, contour dikes, infiltration trenches) ○ Road improvement ○ Erosion control farming (contour ridge cultivation, hedge cropping)
	Arable upland	25-40	443	◎ Expansion of private forest	◎ Tree dominate type ◎ Multistory tree garden	◎ Erosion control measures (terracing, contour dikes, diversion ditches) ○ Road improvement ○ Erosion control farming (contour ridge cultivation, hedge cropping)
		15-25	3,825	◎ Expansion of private forest	○ Tree dominate type ○ Multistory tree garden	◎ Erosion control measures (diversion ditches, contour dikes, infiltration trenches) ○ Road improvement ○ Erosion control farming (contour ridge cultivation, hedge cropping)
		8-15	3,447	◎ Expansion of private forest	○ Non dominant crop type ○ Multistory tree garden ○ Multi-purpose tree ○ Hedgerow cropping w/ leguminous trees	◎ Erosion control measures (infiltration trenches, contour dikes, drains) ○ Road improvement ◎ Erosion control farming (contour ridge cultivation, hedge cropping)
		8-15	4,747	◎ Expansion of private forest	△ Non dominant crop type △ Multistory tree garden △ Multi-purpose tree △ Hedgerow cropping w/leguminous trees	○ Erosion control measures (infiltration trenches, contour dikes, drains) ○ Road improvement ◎ Erosion control farming (contour ridge cultivation, hedge cropping)
F Zone	Estate	<8	5,647	◎ Expansion of private forest	△ Non dominant crop type △ Herbaceous dominant type	△ Erosion control measures (drains) △ Road improvement ◎ Erosion control farming (contour ridge cultivation, hedge cropping)
		<8	3,782	◎ Expansion of private forest	△ Non dominant crop type △ Herbaceous dominant type	△ Erosion control measures (drains) △ Road improvement ◎ Erosion control farming (contour ridge cultivation, hedge cropping)
	Arable upland	<8	3,782	◎ Expansion of private forest	△ Non dominant crop type △ Herbaceous dominant type	△ Erosion control measures (drains) △ Road improvement ◎ Erosion control farming (contour ridge cultivation, hedge cropping)

Note : Priority in implementation ◎:High ○:Medium △:Low
Paddy field (6,007 ha) under F Zone is not included in the table.

表 III-1.1.1 代表地点の土壌断面（南部地域）(1/3)

Horizon/Layer	Depth (cm)	Explanation
A	0-30	Color: black (7.5yr 2/1), Structure: Crumb, Size: very fine to medium, Texture: sandy loam, Consistency: very friable to friable, Root condition: dense
C	30-49	Buried horizon; Sandy fraction
I	49-82	Color: brownish black (10yr 2/2), Structure: Crumb, Size: very fine to fine, Texture: sandy loam, Consistency: friable, Root condition: lacked
II	82-97	Color: black (10yr 2/1), Structure: crumb, Size: very fine to fine, Consistency: friable
III	97-100	Color: black (10yr 2/1), Structure: Crumb to blocky, Size: fine to medium, Texture: sandy loam, Consistency: friable

表 III-1.1.1 代表地点の土壌断面（東部地域）(2/3)

Horizon/Layer	Depth (cm)	Explanation
A	0-15	Color: very dark brown (7.5YR 2/3), Structure: blocky Size: fine to medium, Texture: clay, Consistency: friable to firm, Root condition: dense
B	15-77	Color: brownish black (7.5YR 4/3-4/6), Structure: blocky Size: medium-coarse, Texture: clay, Consistency: friable to firm, Root condition: lacked
BC	77-115	Color: brown (7.5YR 4/4-4/6), Structure: crumb to blocky Size: fine to medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lacked

表 III-1.1.1 代表地点の土壌断面（西部地域）(3/3)

Horizon/Layer	Depth (cm)	Explanation
Ap	0-10	Color: brownish black (7.5YR 3/2), Structure: Crumb to blocky, Size: fine to medium, Texture: clay loam, Consistency: friable, Root condition: dense
BA	10-31	Color: dark brown (7.5YR 3/3), Structure: crumb to blocky, Size: medium, Texture: clay, Consistency: friable to firm, sticky, Root condition: lack
B	31-86	Color: brownish black to dark brown (10YR 3/2), Structure: crumb to blocky, Size: medium to coarse, Texture: clay, Consistency: friable to firm, Root condition: lack
BC	86-102	Color: dark brown (7.5YR 3/4), Structure: blocky, Size: fine to medium, Consistency: firm and sticky, Root condition: lack

表 III-1.3.1 各地域の土地利用区分別面積

Upper: Area (ha) Lower: Ratio (%)					
No.	Legend	East Area	South Area	West Area	Intensive Area
1	Natural/Semi/natural forest	327	735	66	1,128
		9.8	21.6	1.3	9.5
2	Secondary forest	70	478	52	600
		2.1	14.1	1.0	5.0
3	Planted forest (Timber)	11	12	1	24
		0.3	0.4	0.0	0.2
4	Planted forest (Firewood)	83	6	359	448
		2.5	0.2	7.0	3.8
5	Bush	120	48	74	242
		3.6	1.4	1.4	2.0
6	Estate (Clove)	731	19	200	950
		22.0	0.6	3.9	8.0
7	Estate (Others)	684	269	1,491	2,444
		20.5	7.9	29.0	20.6
8	Mixture of estate and arable upland	461	742	618	1,821
		13.8	21.7	12.0	15.3
9	Arable upland	368	859	1,895	3,122
		11.0	25.2	36.8	26.3
10	Pasture	0	0	36	36
		0.0	0.0	0.7	0.3
11	Paddy field	388	125	125	638
		11.6	3.7	2.4	5.4
12	Swamp	10	2	8	20
		0.3	0.1	0.2	0.2
13	Water body	1	0	5	6
		0	0	0.1	0.0
14	Settlement and others	85	105	216	406
		2.5	3.1	4.2	3.4
	Total (ha)	3,339	3,400	5,146	11,885
	Total (%)	100.0	100.0	100.0	100.0

表 III-1.4.1 インテンシブエリアを含むスタディエリアの保安林境界

No.	Registration No.	Location	Decrees (No., Date)	Area (ha)	Structuring		Year of Restructuring	Map Scale
					Year	Boundary code		
1	42	Mt. Sopotan	GB.No.8; July 5, 1930	13,440	1932	G.1 - G.333	-	1:20,000
2	46	Mt. Lengkoan	GB.No.3; Nov. 22, 1932	56	1935	G.1 - G.11	-	1:5,000
3	47	Mt. Tampusu	GB.No.17; July 15, 1933	29	1938	B.1 - B.29, G.1-G.10	1985/1986	1:2,500
4	48	Mt. Kawatak	GB.No.3; July 5, 1930	980	1934	G.1-G.12	-	1:20,000
5	50	Mt. Mahawu	GB.No.17; July 15, 1933	550	1939	G.1-G86	1986/1987	1:10,000
6	52	Mt. Lembean	GB.No.3; Jan. 5, 1932	2,700	Not Clear	B.1-B.130	1977/1978	1:20,000
7	54	Mt. Klabat Mt. Masarang	GB.No.38; April 2, 1932	5,670	Not Clear	B.1-B.183	1996/1997	1:20,000
8		Mt. Kaweng	Decision of Forestry Minister, No.250/Kpts-II/UM/1984; Feb. 20, 1984	146.97	1996	Not Clear	-	1:50,000
9			Decision of Forestry Minister, No.250/Kpts-II/UM/1984; Feb. 20, 1984	417.86	1996	Not Clear	-	1:25,000

GB: Gouvernementsbesluit (Governer's decision)

Source: Bub BIPHUT Manado, 2000

表III-1.4.2 木材の価格

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Linggua (<i>Pterocarpus indicus</i>)	1.750,000	2.250,000	Plank
Cempaka (<i>Elmerillia sp.</i>)	700,000	950,000	Plank
		850,000	Beam
Nantu (<i>Palaquium obtusifolium</i>)	450,000	600,000	Plank/Beam
Pulutan (<i>Palaquium obovatum</i>)	450,000	600,000	Beam
Mahoni (<i>Swietenia macrophylla</i>)	450,000	600,000	Beam
Durian (<i>Durio zibetinus</i>)	400,000	550,000	Plank/Beam
Wusel (<i>Pometia tomentosa</i>)	400,000	550,000	Plank/Beam
Wolo (<i>Pterospermum celebicum</i>)	300,000	450,000	Plank
Wakan (<i>Lithocarous celebicus</i>)	300,000	450,000	Plank
Kananga (<i>Cananga odorata</i>)	300,000	450,000	Plank

Source : 1. Toko / Timbunan di Tomohon (the owner: Mr.Piet Oroh)

2. Mr. Nico Polii (forestry officer / KRPH Tomohon)

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Cempaka (<i>Elmerillia sp.</i>)		1,000,000	Plank/Beam
Nantu (<i>Palaquium obtusifolium</i>)		500,000	Plank/Beam
Wakan (<i>Lithocarous celebicus</i>)		500,000	Plank/Beam

Source : Usaha Karya Woloan Village

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Linggua (<i>Pterocarpus indicus</i>)		2,000,000	Plank
Cempaka (<i>Elmerillia sp.</i>)		800,000	Plank/Beam
Nantu (<i>Palaquium obtusifolium</i>)		500,000	Plank/Beam

Source : UD Purna Yudha Kinamang Leilem Village

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Linggua (<i>Pterocarpus indicus</i>)		2,000,000	Plank
Cempaka (<i>Elmerillia sp.</i>)		800,000	Plank/Beam
Nantu (<i>Palaquium obtusifolium</i>)		500,000	Plank/Beam

Source : UD. Reymond Leilem Village

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Cempaka (<i>Elmerillia sp.</i>)		900,000	Plank
Nantu (<i>Palaquium obtusifolium</i>)		600,000	Plank/Beam
Lower quality than Nantu		375,000	Plank/Beam

Source : Walian Jaya (Timber Shop) Tomohon

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Linggua (<i>Pterocarpus indicus</i>)		2,500,000	Plank
Cempaka (<i>Elmerillia sp.</i>)		925,000	Plank/Beam
Nantu (<i>Palaquium obtusifolium</i>)		625,000	Plank/Beam
Lower quality than Nantu		425,000	Plank/Beam

Source : UD. Kalpataru Manado

Species	Selling price from farmer (Rp / m3)	Selling price at the shop (Rp / m3)	Remarks
Linggua (<i>Pterocarpus indicus</i>)		2,000,000	Plank
Cempaka (<i>Elmerillia sp.</i>)		900,000	Plank/Beam
Nantu (<i>Palaquium obtusifolium</i>)		500,000 - 550,000	Plank/Beam
Lower quality than Nantu		350,000	Plank/Beam

Source : Dinas Kehutanan Minahasa (Mr. Esry Wowor)

表 III-1.4.3 インテンシブエリアを含むスタディエリアにおける有用樹種

No	Latin Name	Lokal Name	Usage
1	2	3	4
1	<i>Agathis celebica</i>	Agatis / Damar	Construction, Plywood, Furniture, Music and sports instruments, matches, pulp, pencil
2	<i>Annona mucikata</i>	Sirsak	Fruits
3	<i>Artocarpus integra</i>	Nangka	Fruits, Vegetables
4	<i>Aleurites moluccana</i>	Kemiri	Spice, Cosmetics
5	<i>Areca oxycarpa</i>	Palem	Land conservation
6	<i>Areca cathecu</i>	Pinang	Medicine, Ornamantal purpose
7	<i>Arenga undulatifolia</i>	Aren/enau	Sugar, Alkohol, Broom, rope
8	<i>Averrhoa carambeia</i>	Belimbing	Fruits
9	<i>Albizia falcataria</i>	Sengon	Construction, Wrapping materials
10	<i>Casuarina sumatrana</i>	Cemara	Land conservation
11	<i>Casuarina junghuniana</i>	Cemara	Land conservation
12	<i>Casuarina equisetifolia</i>	Cemara	Land conservation, Ornamental
13	<i>Cananga odorata</i>	Kenanga	Construction
13	<i>Cinnamomum burmanii</i>	Kayu manis	Spice
14	<i>Cocos nucifera</i>	Kelapa	Oil, Flour, Firewood, Furniture
15	<i>Cordia blancoi</i>	Kanonan	Fuel wood, Paste
16	<i>Durio zibethinus</i>	Durian	Construction, Fruits
17	<i>Dysoxylum caulestachium</i>	Tombawak	Construction
18	<i>Excocoria agalloca</i>	mapopok	Construction
19	<i>Elmerillia celebica</i>	Cempaka wasian	Construction, Door and window frame
20	<i>Elmerllia ovalis</i>	Cempaka	Construction, Door and window frame
21	<i>Eugenia aromatica</i>	Cengkih	Fruits
22	<i>Eugenia aquatica</i>	Jambu air	Fruits
23	<i>Eugenia malaccensis</i>	Jambu	Fruits
24	<i>Erytrina cristagali</i>	Dadap	Land conservation
24	<i>Ficus celebensis</i>	Beringin	Land conservation
26	<i>Ficus benyamina</i>	Beringin	Land conservation
27	<i>Gnetum genemon</i>	Melinjo/ganemo	Vegetable
28	<i>Garcinia mangostana</i>	Manggis	Fruits
29	<i>Koordersiodendron pinatum</i>	Kayu bugis	Construction
30	<i>Lansium domesticum</i>	Lansat	Fruits
31	<i>Lithocarous celebicus</i>	Wakan	Construction
32	<i>Livistona rotundivolia</i>	Woka	Land conservation, Wrapping materials
33	<i>Metroxylon sagu</i>	Rumbia	Sago flour, Roofing materials
34	<i>Myristica fragrans</i>	Pala	Fruits, Spece
35	<i>Mangifera indica</i>	Mangga	Fruits
36	<i>Nephelium lappacium</i>	Rambutan	Fruits
37	<i>Octomeles Sumatrana</i>	Binuang	Construction, Door and window frame
38	<i>Palaquium Abovatum</i>	Pulutan	Construction, Door and window frame
39	<i>Palaquium Obtusifolium</i>	Nantu	Construction, Door and window frame
40	<i>Pangium Edule</i>	Pangi	Vegetable
41	<i>Pinus merkusii</i>	Pinus	Construction, Firewood, Pulp, Resin
42	<i>Pingafetha Filaris</i>	Nibong	Land conservation
43	<i>Pterocarpus indicus</i>	Angsana/Linggua	Furniture, Door and window frame
44	<i>Pterospermium Celebicum</i>	Wolo	Construction
45	<i>Parsia Speriosa</i>	Petai	Vegetable
46	<i>Parsia Americana</i>	Alpoket	Fruits
47	<i>Pometia Tomentosa</i>	Wusel	Construction
48	<i>Sivietenia Macrophylla</i>	Mahoni	Furniture, Door and window frame
49	<i>Spondias pinata</i>	Kedondong	Fruits
50	<i>Toona Celebica</i>	Lalumpek	Construction

表 III-1.5.1 傾斜度別、営農タイプ別の農地面積

Location	Sub-district	Farming Type	Steep slope	Moderate slope	Gentle slope	Flat	Total	Location	Sub-district	Farming Type	Steep slope	Moderate slope	Gentle slope	Flat	Total
East	Toulimambot	AGF.- I	294	0	0	0	294	West	Remboken-E	AGF.- I	0	30	0	0	30
		AGF.- II	0	20	0	0	20			AGF.- II	0	0	60	0	60
		AGF.- III	79	70	0	0	149			AGF.- III	0	105	20	0	125
		Upland-F	0	31	0	7	38			Upland-F	0	0	0	53	53
		Lowland-F	0	0	0	169	169			Lowland-F	0	0	0	0	0
		Total	373	121	0	176	670			Total		135	80	53	268
	Eris	AGF.- I	874	0	0	0	874		Kakas-W	AGF.- I	0	175	0	0	175
		AGF.- II	13	49	0	0	62			AGF.- II	0	30	15	35	80
		AGF.- III	88	0	0	0	88			AGF.- III	0	135	0	0	135
		Upland-F	0	23	0	6	29			Upland-F	0	0	0	50	50
		Lowland-F	0	0	0	100	100			Lowland-F	0	0	0	7	7
		Total	975	72	0	106	1,153			Total		340	15	92	447
	Kakas-E	AGF.- I	297	218	0	0	515		Tondano	AGF.- I	140	281	0	0	421
		AGF.- II	0	75	0	32	107			AGF.- II	0	450	0	0	450
		AGF.- III	0	36	0	0	36			AGF.- III	0	570	0	0	570
		Upland-F	0	0	0	32	32			Upland-F	0	20	440	81	541
		Lowland-F	0	0	0	119	119			Lowland-F	0	0	0	88	88
		Total	297	329	0	183	809			Total	140	1,321	440	169	2,070
South	Langowan	AGF.- I	101	100	0	0	201	Total	Remboken-W	AGF.- I	0	351	0	0	351
		AGF.- II	0	0	209	232	441			AGF.- II	0	59	260	0	319
		AGF.- III	0	260	79	0	339			AGF.- III	0	400	0	0	400
		Upland-F	0	0	0	398	398			Upland-F	0	0	320	160	480
		Lowland-F	0	0	0	105	105			Lowland-F	0	0	0	30	30
		Total	101	360	288	735	1,484			Total	0	810	580	190	1,580
	Tompaso	AGF.- I	15	13	0	0	28		Total	AGF.- I	1,721	1,168	0	0	2,889
		AGF.- II	0	8	98	111	217			AGF.- II	13	691	642	410	1,757
		AGF.- III	0	125	0	0	125			AGF.- III	167	1,701	99	0	1,968
		Upland-F	0	0	6	134	140			Upland-F	0	74	766	921	1,761
		Lowland-F	0	0	0	20	20			Lowland-F	0	0	0	638	638
		Total	15	146	104	265	530			Total	1,901	3,634	1,507	1,969	9,012

Note: AGF-I; Agroforestry type I, AGF-II; Agroforestry type II, and AGF-III; Agroforestry type III

Steep slope: Slope more than 25%, Slope; slope 15-25%, Gentle slope; slope 8-15% and Flat; slope 0-8%

表 III-1.5.2 インテンシブエリアにおける作物生産現況

Location		Tree crops							Herbaceous crops					
		Coconut	Clove	Coffee	Cocoa	Cinnamon	Vanila	Fruits	Maize	Ground nuts	Cowpeas	Cassava	Vegetables*	Paddy
East	Area (ha)	83	846	55	3	26	18	64	623	3	9	3	1	620
	Yield (kg/ha)	1,200	200	950	600		100		2,900	1,080	900	15,000	7,000	4,800
	Production (ton	100	169	52	2	0	2	0	1,807	3	8	45	7	2,976
South	Area (ha)	49	201	19	0	3	7	19	1,785	19	83	1	155	328
	Yield (kg/ha)	1,200	200	950	600		100		2,900	1,080	900	15,000	7,000	4,800
	Production (ton	59	40	18	0	0	1	0	5,177	21	75	15	1,085	1,574
West	Area (ha)	54	424	69	29	0	24	146	2,935	301	37	29	185	200
	Yield (kg/ha)	1,200	200	950	600		100		2,900	1,080	900	15,000	7,000	4,800
	Production (ton	65	85	66	17	0	2	0	8,512	325	33	435	1,295	960
Total	Area (ha)	186	1,471	143	32	29	49	229	5,343	323	129	33	341	1,148
	Yield (kg/ha)	1,200	200	950	600		100		2,900	1,080	900	15,000	7,000	4,800
	Production (ton	223	294	136	19	0	5	0	15,495	349	116	495	2,387	5,510

* Yield is estimated by yield of tomato.

表 III-1.6.1 アグロフォレストリーに使用される樹種

Species	Suitable	Rain fall	Suitable Soil			Production age	Adaptability
	Altitude (m)	(mm/year)	pH	Depth (cm)	Type		
Estate crops							
Clove (Eugenia aromatica)	200-600	1500-4700	3.0-7.0		Well drained	5-6	o
Coconut (Cocos nucifera)	0-600	1200-2000	4.3-8.3	75		4	o
Coffee (Coffea sp.)	0-600	1550-1800	4.5-5.5	150	Loomy	3	o
Vanilla (Vanilla fragras)	0-800	2000-2500		Deep	loomy sand	3	o
Cinnamon(Cinnamommmum zeylanicum)						5-6	o
Cocoa (Theobroma cacao)	0-500 (1000)	1000-3000		Deep	Loamy sand	3	o
Nutmeg (Myristica fragrans	0-700	1400-2450	4.5-7.5		Sandy soil		o
Candle nuts (Aleurites moluccana)	0-700	1000-2500			Volcanic	5-6	o
Cashew (Anacardium occidentale)	0-700 (800)	500-3200	5-8	Deep	Sandy	5-6	o
Sugar palm (Arenga pinnata)	700-1000				Volcanic	3	o
Pepper (Piper nigrum)	0-500(1000)	1500-2000	4.3-7.4		Loomy		x
Rubber (Heveabrsiliensis)	0-500	Rain forest	Acidic-nutral			5	x
Fruits							
Durian (Durio zibethinus)	1-1000	1500-2500	5.5-7		Well drained	5-10	o
Mango (Mangifera indica)	0-500(600)	760-2000	5.5-7.5	Deep	Loam	4	o
Mangostin (Garcinia mangostana)	0-500	1500-2500	Acidic	Deep	Loam	10-15	o
Avogado (Persea americana)	0-500	1500-3000	5.5-6.5		Volcanic	6	o
Langsat (Lancium domesticum)	30-500	1500-2500	5.5-7.0		Loose	5	o
Rambutan (	200-1500	1500-2500	5.5-7.0		Well drained	8	o
Jackfruit (Artocarpus integra)	0-700(1000)	>1500	5.0-7.0	Deep	Well drained	5	o
Banana (Musa sp.)	0-1500	1400-2500					o
Guava (Psidium guajava)	0-800	700-3700	5.5-7.5	Deep	Well drained	5	o
Citrus sp.	0-1200	1500-2000	5.5-6.5	100	Sandy loam	3-4	o
Trees							
Cempaka(Elmerillia ovalis)	0-1000	2000-4000				20	o
Albizia(Paraserianthes falcataria)	0-1200	2000-4000	Acidic-nutral		Well drained	5 (for pulp), 20	o
Piper (Piper aduncum)							Autogenensis
Ficus sp							Autogenensis
Pangium (Pangium edule)							o
Tayapu (Trema orientaris)	300-2500	1000-2000	Nutral-basic		Loam	15	o
Mahogany(Swientenia sp.)	50-1400	1600-4000	Nutral-basic		Nutral-basic	15	o
Nyatou Batu(Paraquium sp.)	0-1000	2000-4000	Acidic-nutral			20	o
Kanonang (Cordia blancoi)	0-1000	Rain forest	Acidic-nutral				o
Dadap/Walantaken (Erythrina)	0-1000	Rain forest	Acidic-nutral				
Angsana pterocarpus	0-1000	Rain forest				30	o
Linggua (Pterocarpus indica)	0-1800	2000-4000				30-40	o
Pinus sp.	200-2000				Volcanic		x
Teak(Tectona grandis)	0-900	1250-2500	Acidic-nutral		Well drained	80	x
Meranti (Shorea Sp.)	0-1000				Well drained	50	x
Multipurpose trees							
Calliandra calothyrsus	150-1500	2000-4000	moderate acidic		Well drained		o
Gliricidia sepium	0-1600	1500-2300	Acidic-nutral		Well drained		o
Gmelina arborea	0-1200	950-4500	Acidic		Well drained	15	o
Leucaena Leucocephala	0-1000	600-3000	Nutral-basic		Well drained		x
Acacia auriculiformis	0-800	1500-2500	3-9			5-7 (for pulp)	x
A. mangium	0-720	1000-4500	Acidic-nutral			5-7(for pulp)	x
Jatropha Curcas(Balacai)	10-1000	2000-4000					

Source: Imperata Grassland Rehabilitation using Agroforestry and assisted Natural Regeneration, ICRAF 1999

Jenois-Jenis Pohon Serba Guna BRLKT 1999/2000, Nettai no Yuyo Jushu, TARC Japan 1977

Note: o; Suitable, x: not suitable

表 III-1.6.2 北スラウェシ州におけるチョウジの栽培面積、生産量、及び価格推移

Year	Price (Rp/kg)	Planted area (ha)	Production (ton)	Yield (kg/ha)	Exchange Rp/US\$ 1	Price (US\$/kg)	Value (US\$ mil)
1969	1,189	15,396	2,007	130			
1970	1,396	10,616	2,103	198	381	3.66	7.7
1971	1,334	18,425	2,022	110			
1972	1,478	18,149	904	50			
1973	1,328	19,484	8,000	411	618	2.15	17.2
1974	3,528	20,486	700	34	551	6.41	4.5
1975	4,135	24,485	2,800	114	522	7.92	22.2
1976	4,301	25,406	160	6	450	9.56	1.5
1977	4,146	26,856	12,000	447	474	8.74	104.9
1978	4,130	28,432	2,400	84	621	6.65	16.0
1979	8,161	30,008	4,800	160	627	13.01	62.5
1980	7,796	31,157	12,042	386	628	12.42	149.6
1981	8,144	33,158	6,700	202	644	12.64	84.7
1982	8,289	34,734	9,116	262	693	11.97	109.1
1983	7,960	36,301	10,000	275	994	8.01	80.1
1984	6,322	38,041	3,500	92	1,074	5.89	20.6
1985	8,535	39,305	4,000	102	1,125	7.58	30.3
1986	6,750	40,856	5,000	122	1,641	4.11	20.6
1987	6,100	40,856	5,000	122	1,650	3.70	18.5
1988	4,400	42,650	1,000	23	1,729	2.54	2.5
1989	6,350	43,650	3,500	80	1,795	3.54	12.4
1990	7,050	43,650	7,000	160	1,901	3.71	26.0
1991	7,900	43,700	14,215	325	1,992	3.97	56.4
1992	5,270	43,700	10,000	229	2,062	2.56	25.6
1993	3,200	43,700	6,000	137	2,110	1.52	9.1
1994	3,000	43,700	10,500	240	2,200	1.36	14.3
1995	2,500	43,485	10,990	253	2,308	1.08	11.9
1996	2,601	43,009	4,200	98	2,383	1.09	4.6
1997	2,997	43,009	7,400	172	4,650	0.64	4.8
1998	6,707	43,009	15,550	362	8,025	0.84	13.0
1999	20,107	43,009	1,800	42	7,100	2.83	5.1
2000	35,000	43,009			8,600	4.07	

Source: 1. Dinas Perkebunan North Sulawesi, 2. Dinas perkebunan Minahasa

3. Peranan Komoditi Cengkeh Terhadap Pertumbuhan Ekonomi

Daerah Sulawesi Utara, 4. Bank Negara Indonesia

表 III-1.6.3 不適切な農業土地利用地域

Site		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Location	Kecamatan Village	Kakas Passo	Kakas Passo	Kakas Passo	Kakas Passo	Kakas Passo	Kakas Passo	Remboken Sinuian	Remboken Leleko	Remboken Leleko	Tondano Urongo	Tondano Palelowan	Tondano Palelowan	Tondano Palelowan	Tondano Palelowan	Tondano Palelowan	Tondano Palelowan	Langowan Kawatak	Eris Tandegan
		N 01°16'39" E 124°51'19"	N 01°12'46" E 124°51'23"	N 01°12'46" E 124°51'27"	N 01°12'57" E 124°51'36"	N 01°12'42" E 124°51'20"	N 01°12'56" E 124°51'23"	N 01°13'20" E 124°51'23"	N 01°14'07" E 124°52'18"	N 01°14'15" E 124°52'24"	N 01°14'10" E 124°52'40"	N 01°14'15" E 124°52'49"	N 01°14'40" E 124°53'24"	N 01°14'44" E 124°53'25"	N 01°15'10" E 124°53'40"	N 01°15'27" E 124°53'44"	N 01°15'48" E 124°53'59"	N 01°7'46" E 124°50'20"	N 01°13'20" E 124°56'16"
Area	Length (m)	80	30	30	50	50	40	35	40	35	50	20	50	50	40	40	40	350	100
	Width (m)	100	40	180	55	100	50	30	50	50	50	50	150	100	50	50	100	400	150
	Area (sq. m)	8,000	1,200	5,400	2,750	5,000	2,000	1,050	2,000	1,750	2,500	1,000	7,500	5,000	2,000	2,000	4,000	140,000	15,000
Gradient (%)		50	50	50	50	58	36	27	36	36	36	36	36	36	36				
Elevation																			
Present land use		AGF- II Bamboo	Fallow	UF	UF	AGF-III Bamboo	AGF-III	UF	AGF-II	Fallow/AGF-II	Fallow/AGF-II	AGF-III Ficus Albizia	AGF-III	AGF-III Bamboo	AGF-II	AGF-II Bamboo	AGF-II	AGF-I/UF	AGF-III Cempaka
	Tree																		
	Fruit	Banana	Banana	Banana Langsat	Banana Langsat	Avogado Langsat	Mango Langsat		Mango Durian	Mango Banana Langsat	Mango Banana Langsat	Jackfruit Banana	Jackfruit Mango Langsat	Jackfruit Mango Langsat	Durian Langsat	Banana Papaya	Durian Jackfruit Guava Mango		
	Estate crops	Coconut Clove Sinamon				Papaya Clove Coffee	Clove		Coconut	Clove Coconut	Clove Coconut Sugar palm	Coconut Sugar palm	Coconut Sugar palm	Clove Coffee Coconut Sugar palm	Coconut	Coconut Clove	Coconut Clove	Clove Sugar palm	Clove
	Field crops	Maize		Maize	Maize Cassava Fallow	Maize	Maize	Maize	Maize	Maize Fallow	Maize Fallow	Maize Cassava	Maize Cassava	Maize Cassava	Maize	Maize	Maize	Maize	Maize Groundnut
	Headge crop	Gliricidea		Gliricidea Bnana	None	Banana	None	None	Gliricidea	Gliricidea	Gliricidea	Gliricidea Banana Cassava	None Banana Cassava	None Banana Cassava	None	None	Gliricidea	Gliricidea Banana	Gliricidea
	Ridge					0.15x0.3; 0.8					Terrace: 1.2x0.5								

表 III-1.8.1 既存チェックダムの現況 (1/2)

No.	Name of the Dam	Location							Year of Construction	Government Agency	Catchment Area (ha)	Dam Dimension				
		North Latitude	East Longitude	Town	Sub District	Sub-watershed No.	Zone	Area				Type	No. of the Dam (nos.)	Crest Length (m)	Dam Height (m)	Crest Width (m)
CD - 1	Tataaran II	01°16'45"	124°52'02"	Tataaran II	Tondano	2	Bm1	West	1983/1984	BRLKT	133	Earth Fill Dam	1	25.0	4.0	4.0
CD - 2	Tataaran II	01°16'39"	124°52'05"	Tataaran II	Tondano	2	Bm1	West	1984/1985	BRLKT	32	Earth Fill Dam	1	45.0	6.5	10.0
CD - 3	Tataaran I	01°16'06"	124°52'48"	Tataaran I	Tondano	-	Bm2	West	1983/1984	BRLKT	81	Earth Fill Dam	1	45.0	Unknown	4.0
CD - 4	Roong	01°15'57"	124°53'32"	Tounsaru	Tondano	5	Bm2	West	1982/1983	BRLKT	100	Earth Fill Dam	1	40.0	4.5	3.5
CD - 5	Leleko	01°15'01"	124°51'56"	Leleko	Remboken	6	Bm2	West	1984/1985	BRLKT	68	Earth Fill Dam	1	45.0	5.0	2.5
CD - 6	Kasuratan	01°15'07"	124°50'11"	Kasuratan	Remboken	-	Bm3	West	1991/1992	BRLKT	22	Earth Fill Dam	1	30.0	2.0	3.5
CD - 7	Pulutan	01°13'11"	124°50'09"	Pulutan	Remboken	-	Bm2	West	1995/1996	District Forest Survice	13	Earth Fill Dam	1	44.0	6.0	3.5
CD - 8	Touure	01°08'50"	124°47'15"	Touure	Tompaso	10	Bm2	South	1991/1992	BRLKT	59.2	Earth Fill Dam	1	-	-	-
CD - 9	Tumaratas	01°09'12"	124°48'14"	Tumaratas	Langowan	11	F	South	1993/1994	District Forest Survice	379	Earth Fill Dam	1	45.0	8.0	4.0
CD - 10	Tounelet	01°07'57"	124°50'21"	Tounelet	Langowan	-	Bm2	South	1997/1998	District Forest Survice	19	Earth Fill Dam	1	40.0	4.5	3.5
CD - 11	Tountimomor	01°11'04"	124°52'26"	Tountimomor	Kakas	-	-	-	1997/1998	District Forest Survice	6,770	Gabion Box Check Dam	2	7.0	Unknown	-
CD - 12	Telap	01°12'44"	124°54'48"	Telap	Eris	16	Bm1	East	1994/1995	District Forest Survice	42	Dam Penahan	4	4.0	0.0	-
CD - 13	Eris	01°13'30"	124°55'06"	Eris	Eris	17	Bm1	East	1984/1985	BRLKT	100	Earth Fill Dam	1	75.0	2.5	4.0
CD - 14	Tandengan	01°13'51"	124°55'47"	Tandengan	Eris	19	Bm1	East	1984/1985	BRLKT	30	Earth Fill Dam	1	40.0	4.0	4.0
CD - 15	Ranomerut	01°14'41"	124°56'01"	Ranomerut	Eris	-	Bm2	East	1983/1984	BRLKT	13	Earth Fill Dam	1	35.0	3.0	6.0
CD - 16	Touliang Oki	01°15'07"	124°56'36"	Touliang Oki	Eris	24	Bm2	East	1997/1998	Provincial Irrigation Office	104	Wet Masonry Gravity Dam	1	80.0	5.0	3.0
CD - 17	Touliang Oki	01°15'25"	124°56'13"	Touliang Oki	Eris	-	Bm2	East	1983/1984	BRLKT	21	Earth Fill Dam	1	50.0	3.5	4.0

表 III-1.8.1 既存チェックダムの現況 (2/2)

No.	Name of the Dam	Condition of Sediment Control			Condition of Water Supply				Condition of Dam Body
		Status of Sediment Control	Deposition Gradient (%)	Average Sediment Yield (ton/ha/year)	Intention for Water Supply	Purpose of Water Supply	Present Land Use of Downstream	Condition of Downstream Irrigation System	
CD - 1	Tataaran II	Functioning	N/A	N/A	Yes	Irrigation	Arable Upland	Not functioning	
CD - 2	Tataaran II	Functioning	N/A	N/A	Yes	Irrigation	Arable Upland	Not functioning	
CD - 3	Tataaran I	Abandoned	N/A	N/A	Yes	Irrigation	University Campus / Arable Upland	Abandoned	
CD - 4	Roong	Functioning	0.5	2,800	Yes	Irrigation	Grassland	Not Functioning	
CD - 5	Leleko	Functioning	1.8	3,000	Yes	Irrigation	Arable Upland	Not functioning	A part of dam body has damaged.
CD - 6	Kasuratan	Functioning	N/A	N/A	No	None	-	-	A part of spillway has damaged.
CD - 7	Pulutan	Functioning	3.0	1,000	No	None	-	-	
CD - 8	Touure	Not Functioning	N/A	N/A	No	None	-	-	Dam body has collapsed.
CD - 9	Tumaratas	Functioning	N/A	N/A	Yes	Irrigation	Paddy Field	Good	
CD - 10	Tounelet	Functioning	N/A	N/A	Yes	Irrigation	Paddy Field	Unknown	
CD - 11	Tountimomor	Functioning	N/A	N/A	No	None	-	-	
CD - 12	Telap	Functioning	N/A	N/A	No	None	-	-	
CD - 13	Eris	Functioning	N/A	N/A	Yes	Inland Fishery	Fish Pond	-	
CD - 14	Tandengan	Functioning	N/A	N/A	Yes	Irrigation	Paddy Field	Not functioning	
CD - 15	Ranomerut	Functioning	N/A	N/A	Yes	Irrigation	Paddy	Bad	
CD - 16	Touliang Oki	Functioning	N/A	N/A	No	None	-	-	
CD - 17	Touliang Oki	Functioning	N/A	N/A	Yes	Irrigation	Paddy	Good	

表 III-1. 10. 1 インテンシブエリアにおける有用植物および動物 (1/2)

No	Species	Kal	Tam	Kas	Man	Commercial Value
1	<i>Ainnaucleafagifolia</i>		+			Commercial wood
2	<i>Ailanthus integrifolia</i>		+	+	+	Commercial wood
3	<i>Alstonia scholaris</i>	+				Commercial wood and medicinal plants
4	<i>Areca vestiaria</i>		+	+	+	Ornamental plant
5	<i>Arengapinnata</i>			+	+	Multi-useful plant
6	<i>Begonia</i> sp		+			Ornamental plant
7	<i>Bhischoffia javanica</i>	+				Ornamental plant
8	<i>Calamus</i> sp 2		+	+	+	Industrial materials
9	<i>Calamus</i> sp 2		+		+	Industrial materials
10	<i>Calamus zollingeri</i>	+				Industrial materials
11	<i>Calathea</i> sp		+			Ornamental plant
12	<i>Calophyllum</i> sp 1	+	+	+		Ornamental plant
13	<i>Calophyllum soulattn</i>	+			+	Ornamental plant
14	<i>Calophyllum</i> sp 2		+			Ornamental plant
15	<i>Canarium hirtutum</i>		+	+		Commercial wood
16	<i>Canarium</i> sp 1		+	+		Commercial wood
17	<i>Canarium</i> sp 3			+	+	Commercial wood
18	<i>Canarium</i> sp 4				+	Commercial wood
19	<i>Canarium</i> sp 5		+			Commercial wood
20	<i>Canarium</i> sp 2	+				Commercial wood
21	<i>Canarium vulgare</i>	+		+		Commercial wood
22	<i>Caryota mitis</i>	+		+		Ornamental plant
23	<i>Caryota urens</i>				+	Ornamental plant
24	<i>Casuarina selegica</i>	+				Commercial wood/ Ornamental wood
25	<i>Cinamomum culilawan</i>				+	Medicinal plant
26	<i>Dracaena</i> sp			+		Ornamental plant
27	<i>Dracontomelon dao</i>			+		Commercial wood
28	<i>Elmenilia ovalis</i>	+	+	+		Commercial wood
29	<i>Erythrina</i> sp				+	Commercial wood
30	<i>Ficus benyamina</i>	+				Ornamental plant
31	<i>Ficus celebensis</i>	+	+	+		Ornamental plant
32	<i>Flagellaria indica</i>				+	Ornamental plant
33	<i>Garctinia macrophylla</i>			+		Commercial wood
34	<i>Homalium celebicum</i>	+				Commercial wood
35	<i>Homalium</i> sp		+	+		Commercial wood
36	<i>Knema</i> sp				+	Commercial wood
37	<i>Lantana camara</i>			+		Medicinal plant
38	<i>Lithocarpus celebicus</i>	+				Commercial wood
39	<i>Lithocarpus</i> sp		+	+	+	Commercial wood
40	<i>Macaranga gigantea</i>	+				Commercial wood
41	<i>Magnolia paulantha</i>		+			Commercial wood
42	<i>Mallotus</i> sp	+		+	+	Commercial wood
43	<i>Mangifera minor</i>	+				Commercial wood
44	<i>Myristica fatua</i>			+		Commercial wood
45	<i>Nephrolepis biserata</i>		+			Ornamental plant
46	<i>Oplismenus</i> sp		+	+	+	Ornamental plant
47	<i>Palaquium</i> sp 2	+				Commercial wood

Note: Kal = Kaluta forest, Tarn = Tarnpusu forest, Kas = Kasuratan forest,
Man = Manimporok forest

表 III-1. 10. 1 インテンシブエリアにおける有用植物および動物 (2/2)

No	Species	Kal	Tam	Kas	Man	Commercial Value
48	<i>Palaquium obovatum</i>	+		+		Commercial wood
49	<i>Palaquium obtusifolium</i>			+	+	Commercial wood
50	<i>Palaquium</i> sp 1			+		Commercial wood
51	<i>Palaquium</i> sp 3				+	Commercial wood
52	<i>Pharaserianthes minahasae</i>	+				Commercial wood
53	<i>Pigaffeta flaris</i>			+	+	Ornamental plant
54	<i>Pinanga caesia</i>	+	+	+	+	Ornamental plant
55	<i>Pinanga celebica</i>			+		Ornamental plant
56	<i>Pinanga</i> sp		+	+	+	Ornamental plant
57	<i>Polyalthia macrophylla</i>				+	Commercial wood
58	<i>Pathos</i> sp	+				Commercial wood
59	<i>Pterocarpus indicus</i>	+				Commercial wood
60	<i>Sarcocephallus cadamba</i>	+				Commercial wood
61	<i>Schefflera</i> sp	+			+	Ornamental plant
62	<i>Schimattogictis</i> sp			+		Ornamental plant
63	<i>Scindapsus</i> sp		+	+		Ornamental plant
64	<i>Selaginella intermedia</i>			+		Ornamental plant
65	<i>Shorea</i> sp				+	Commercial wood
66	<i>Spathoglottis</i> sp				+	Ornamental plant
67	<i>Syngonium</i> sp		+	+	+	Ornamental plant
68	<i>Talauma celebica</i>		+	+		Commercial wood
69	<i>Terminalia bellinca</i>		+	+	+	Commercial wood
70	<i>Trema orinentalis</i>				+	Commercial wood
71	Unknown 11	+				Commercial wood
72	Unknown 13			+	+	Ornamental plant
73	Unknown 14	+	+	+	+	Ornamental plant
74	Unknown 15			+		Ornamental plant
75	Unknown 16		+	+	+	Ornamental plant
76	<i>Ficus microcarpa</i>		+			Ornamental plant
77	<i>Ficus</i> sp 1			+		Ornamental plant

Note: Kal = Kaluta forest, Tarn = Tarnpusu forest, Kas = Kasuratan forest,
Man = Manimporok forest

表 III-1. 10. 2 インテンシブエリアにおける植物絶滅危惧種および危急種

No	Species	Kal	Tam	Kas	Man	Dangerous Spciesd	Threatened Status	
							Protected By I.G. ¹⁾	IUCN ²⁾ Categories
1	<i>Ailanthus integrifolia</i>		+	+	+			R
2	<i>Areca vestiaria</i>		+	+	+			R
3	<i>Calamus zollingeri</i>	+						R
4	<i>Canarium sp 2</i>	+						R
5	<i>Caryota mitis</i>	+		+			Pr	
6	<i>Garyota urens</i>				+		Pr	
7	<i>Casuarina selegica</i>	+						R
8	<i>Chisocheton warburgii</i>		+	+	+			R
9	<i>Dillenia celebica</i>	+		+				R
10	<i>Homalium celebicum</i>	+						R
11	<i>Hydnophytum formicarum</i>			+			Pr	
12	<i>Kibara coriacea</i>		+	+	+			LR/lc
13	<i>Lithocarpus celebicus</i>	+						R
14	<i>Magnolia paulantha</i>		+					R
15	<i>Manglietia glauca</i>	+	+	+	+			R
16	<i>Myristica fatua</i>			+				LR/lc
17	<i>Pharaserianthes minahasae</i>	+						R
18	<i>Pigaffeta flaris</i>			+	+		Pr	
19	<i>Pinanga caesia</i>	+	+	+	+			R
20	<i>Pinanga celebica</i>			+				R
21	<i>Piper aduncum</i>	+		+		Dangerous		
22	<i>Pterocarpus indicus</i>	+						VU A1d
23	<i>Saurauza minahasae</i>				+			R
24	<i>Talauma celebica</i>		+	+				R
25	<i>Terminalia bellinca</i>		+	+	+			R
26	Unknown 13			+	+		Pr	
27	Unknown 2	+		+		Dangerous		

Note: Kal = Kaluta forest, Tarn = Tarnpusu forest, Kas = Kasuratan forest, Man = Manimporok forest

1) Indonesian Government, 2) International Union for Conservation of Nature and Natural Resources

Pr: Protected by PP No. 7/1999 Concerning the protection of plants and animals.

R: Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

LR/nt: A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. **Near Threatened (nt)**. Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

Vu C1+2a: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future. C. Population estimated to number less than 10,000 mature individuals and either: 1. An estimated continuing decline of at least 10 % within 10 years or 3 generations, whichever is longer, or 2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and population structure in the form of a severely fragmented (i.e. no sub-population estimated to contain more than 1000 mature individuals)

表 III-1. 10. 3 インテンシブエリアにおける動物危急種

No	Scientific Name	Family	Location	Threatened Status	
				Protected By I.G. ¹⁾	IUCN ²⁾ Categories
1	<i>Accipiter</i> sp	Accipitridae	Kas	Pr	
2	<i>Aetopigia siparaja</i>	Nectariniidae	Kas	Pr	
3	<i>Centropus celebensis</i>	Centropoindae	Tam		R
4	<i>Dendrocopos temminckii</i>	Picidae	Tam		R
5	<i>Dicaeum auralimbatus</i>	Dicasidae	Tam, Kas		R
6	<i>Dicaeum celebicum</i>	Dicacidae	Kai, Tm, Kas		R
7	<i>Dicaeum nehrkorni</i>	Dicacidae	Tam, Man		R
8	<i>Ducula forsteni</i>	Columbidae	Kal, Tm		R
9	<i>Enodes erythrophris</i>	Stumidae	Kal		R
10	<i>Eudynamis melanorkynca</i>	Cuculidae	Kal		R
11	<i>Ficedula rufigula</i>	Muscicapidae	Kal, Ku		R/LR/nt
12	<i>Macropigia amboinensis</i>	Columbidae	Kal, Tm, Kas, Man	Pr	VU C1+2a
13	<i>Mulleripicus fulvus</i>	Picidae	Man		R
14	<i>Myzomela sanguinolenta</i>	Meliphagidae	Ku, Man	Pr	
15	<i>Nectarinia aspasia</i>	Nectariniidae	Kal	Pr	
16	<i>Nectarinia jugularis</i>	Nectariniidae	Tm	Pr	
17	<i>Pachycephala sulfuriventer</i>	Pachycephalidae	Tam, Ku, Man		R
18	<i>Penelopides exarhatus</i>	Bucerotidae	Kal	Pr	R
19	<i>Phaenicophaeus calyborhincus</i>	Cuculidae	Kal, Tm, Kas		R
20	<i>Pitta erythrogaster</i>	Pittidae	Tam, Kas	Pr	
21	<i>Prioniturus platturus</i>	Psittacidae	Kal		R
22	<i>Prosciurillus leucomus</i> (Tupai)		Kal		R
23	<i>Treron vernans</i>	Columbidae	Tam		R
24	<i>Trichastoma celebensis</i>	Timaliidae	Kal, Tam, Ku		R

Note: Kal = Kaluta forest, Tarn = Tarnpusu forest, Kas = Kasuratan forest, Man = Manimporok forest

1) Indonesian Government, 2) International Union for Conservation of Nature and Natural Resources
Pr: Protected by PP No. 7/1999 Concerning the protection of plants and animals.

R: Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km²) or in the number of locations (typically less than 5). Such a taxon would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming Critically Endangered or even Extinct in a very short period.

LR/nt: A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

Vu C1+2a: A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future. C. Population estimated to number less than 10,000 mature individuals and either: 1. An estimated continuing decline of at least 10 % within 10 years or 3 generations, whichever is longer, or 2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and population structure in the form of a severely fragmented (i.e. no sub-population estimated to contain more than 1000 mature individuals)

表 III-2.4.1 各ゾーンに適用する営農形態

Location	Kecamatan	Type	P Zone	Bm1 Zone	Bm2 Zone	Bm3 Zone	Bw Zone	F Zone	Total	Location	Kecamatan	Type	P Zone	Bm1 Zone	Bm2 Zone	Bm3 Zone	Bw Zone	F Zone	Total
East	Toulimambot	AGF - I	0	127	0	0	0	0	127	West	Remboken-E	AGF - I	0	0	6	0	6	0	12
		AGF - I/IM	0	167	0	0	0	0	167			AGF - I/IM	0	0	18	0	0	0	18
		AGF - II/IM	0	0	20	0	0	0	20			AGF - II/IM	0	0	0	60	0	0	60
		AGF - III/IM	0	79	70	0	0	0	149			AGF - III/IM	0	0	107	14	4	0	125
		UF/IM	0	0	31	0	0	7	38			UF/IM	0	0	0	0	5	48	53
		LF/IM	0	0	0	0	0	169	169			LF/IM	0	0	0	0	0	0	0
		Total	0	373	121	0	0	176	670			Total	0	0	131	74	15	48	268
	Eris	AGF - I	0	370	0	0	10	0	380		Kakas-W	AGF - I	0	0	39	0	0	0	39
		AGF - I/IM	0	494	0	0	0	0	494			AGF - I/IM	0	0	136	0	0	0	136
		AGF - II/IM	0	13	49	0	0	0	62			AGF - II/IM	0	0	30	15	0	35	80
		AGF - III/IM	0	88	0	0	0	0	88			AGF - III/IM	0	0	135	0	0	0	135
		UF/IM	0	0	23	0	3	3	29			UF/IM	0	0	0	0	0	50	50
		LF/IM	0	0	0	0	10	90	100			LF/IM	0	0	0	0	0	7	7
		Total	0	965	72	0	23	93	1,153			Total	0	0	340	15	0	92	447
South	Kakas-E	AGF - I	0	172	0	0	14	0	186	Tondano	AGF - I	0	30	0	0	30	0	60	
		AGF - I/IM	0	111	218	0	0	0	329		AGF - I/IM	0	80	281	0	0	0	361	
		AGF - II/IM	0	0	75	0	0	32	107		AGF - II/IM	0	0	450	0	0	0	450	
		AGF - III/IM	0	0	36	0	0	0	36		AGF - III/IM	0	0	570	0	0	0	570	
		UF/IM	0	0	0	0	2	30	32		UF/IM	0	0	20	440	0	81	541	
		LF/IM	0	0	0	0	10	109	119		LF/IM	0	0	0	0	0	88	88	
		Total	0	283	329	0	26	171	809		Total	0	110	1,321	440	30	169	2,070	
South	Langowan	AGF - I	0	15	0	0	0	0	15	Remboken	AGF - I	0	0	40	0	0	0	40	
		AGF - I/IM	0	86	100	0	0	0	186		AGF - I/IM	0	0	311	0	0	0	311	
		AGF - II/IM	0	0	0	209	0	232	441		AGF - II/IM	0	0	59	260	0	0	319	
		AGF - III/IM	0	0	260	79	0	0	339		AGF - III/IM	0	0	400	0	0	0	400	
		UF/IM	0	0	0	0	0	398	398		UF/IM	0	0	0	320	0	160	480	
		LF/IM	0	0	0	0	0	105	105		LF/IM	0	0	0	0	0	30	30	
		Total	0	101	360	288	0	735	1,484		Total	0	0	810	580	0	190	1,580	
	Tompaso	AGF - I	0	1	0	0	0	0	1	Total	AGF - I	0	715	85	0	60	0	860	
		AGF - I/IM	0	14	13	0	0	0	27		AGF - I/IM	0	952	1,077	0	0	0	2,029	
		AGF - II/IM	0	0	8	98	0	111	217		AGF - II/IM	0	13	691	642	0	410	1,756	
		AGF - III/IM	0	0	125	0	0	0	125		AGF - III/IM	0	167	1,703	93	4	0	1,967	
		UF/IM	0	0	0	6	0	134	140		UF/IM	0	0	74	766	10	911	1,761	
		LF/IM	0	0	0	0	0	20	20		LF/IM	0	0	0	0	20	618	638	
		Total	0	15	146	104	0	265	530		Total	0	1,847	3,630	1,501	94	1,939	9,011	

Note: AGF-I/IM; Improved agroforestry type I, AGF-II/IM; Improved agroforestry type II, and AGF-III; Improved agroforestry type III

UF/IM: Improved upland farming, LF: Lowland farming

表 III-2.5.1 各組織開発計画に必要な活動 (1/3)

(a) Community Institutional Development
- To prepare minimum requirements for village cadre selection, - To prepare and apply village cadre recruiting procedure, - To select first generation of village cadres and NGO members as to attend training programs as well, - To prepare and apply village cadre introductory program, - To develop village cadre human resource management capacity in relevant government office (forestry services) and a village level proposal process, - To prepare guidelines and technical manual for proposal development - To train local village communities based on technical manual & guidelines, - To repair guidelines for proposal selection, - To facilitate project proposal process in selected villages, - To deploy extension workers in the field, - To promote project process, - To implement village proposal process for nursery development, proper farming practices, physical measures construction, and agroforestry development, - To prepare ongoing proposal preparation selection, funding process, and implementation.
(b) Technical Institutional Development
- To develop physical measures construction training for extension workers, - To establish agroforestry research and development capacity (AFRDC), - To prepare facility, - To recruit consultants, - To prepare research programs, - To implement research programs, - To prepare annual reports and recommendations, - To establish and maintain demonstration plots, - To prepare modules for village cadre training center, - To appoint village cadre training center (VCTC) - To prepare facility, uniforms and kits, - To prepare basic programs such as agroforestry, environmental and watershed awareness, priority project identification, proper farming practices, physical measures construction, and project management, - To begin village cadre induction and orientation, - To strengthen village cadre training center (receive updated modules, recommendations from AFRDC) - To prepare advanced agroforestry extension worker training program - To apply basic extension cadre training program for new recruits - To apply advanced extension cadre training program (physical measures, proper farming, and agroforestry)

表 III-2.5.1 各組織開発計画に必要な活動 (2/3)

(c) Institutional Development of Forestry Services
<u>1) Information Systems Development I (District level)</u> - Establish office in district structure - Engage institutional development and information systems consultant - Install computers and related hardware in district office - Install software in district office - Select staff for training - Select training contractor - Computer operation training I (Basic Computer Operation 10 trainees x 10 days) - Computer operation training II (Business Software 10 trainees x 10 days) - Computer operation training III (Database & Data Processing 10 trainees x 10 days) - Computer operation Training (Advanced training, desktop publishing and GIS, 25 trainees X 4 sessions X 10 days) - Research and identify routine data gathering points - Install data gathering equipment and facilities - Develop simple watershed database - Develop standard data forms for branch offices - Training for branch staff - Develop standardized project monitoring and evaluation forms - Train staff in differential GPS operation - Deploy branch office staff - Gather data - Design input data screen form - Data coding - Data entry - Forward data to province office - Descriptive analysis and report writing training I - Descriptive analysis and report writing workshop I <u>2) Information Systems Development II (Province level)</u> - Engage database and computer communications specialist - Install computers and related hardware in province office - Install software in province office - Install LAN intranet - Design website with IT staff - Select staff for general training - Install watershed database - Computer operation training I (basic computer operation 15 trainees x 10 days) - Computer operation training II (Business Software 15 trainees x 10 days) - Computer operation training III (database & data processing 15 trainees x 10 days) - Computer operation training IV (desktop publishing and graphics design combined with district office) - Descriptive analysis and report writing training workshop I (15 trainees x 2 days) - Descriptive analysis and report writing seminar I (15 trainees x 2 days) - Develop simple but attractive environmental leaflet for village awareness - Develop posters (environmental awareness) - Computer GIS operation training I on the job - Train staff in differential GPS operation on the job - Develop environmental impact signaling system - Environmental impact signaling report 1 - Environmental impact signaling report 2 - General real time on the job training and coaching for information systems and product development in province and district Offices <u>3) General capacity strengthening</u> - Technical assistance with counterpart arrangements where existing office staff work together with technical assistance staff.

表 III-2.5.1 各組織開発計画に必要な活動 (3/3)

(d) Accurate Village Boundary Mapping
- To recruit survey and mapping consultant - To consultant preparations - To gather existing village boundary maps from Sub Districts and Department of Lands - To develop standard approach for mapping village boundaries - To have meetings with all Sub District Heads for explaining objectives of village boundary mapping - To use differential GPS to locate and establish village reference points - To relate maps to natural and man made boundaries (streams, roads etc.) - To establish boundaries through map and aerial photo interpretation on 1:10,000 maps - To create village boundary layer in GIS - To overlay village boundaries on zoning and problem maps - To provide recommendations to Sub District and village about zoning needs
(e) Institutional Integration and Strengthening of Legal and Regulatory Framework
- To revise laws and adapt regional regulations (Forestry/Social Forestry) - To research and establish joint decree - To establish Watershed Conservation Committee - To establish forum for integration of government activities
(f) Strengthening of Watershed Conservation Capacity at University of Manado
- To work with staff to strengthen the research capacity and supervise watershed program - To work with university staff to select research topics - To researcher undertake research - To present findings and recommendations to university - To revise based on inputs if necessary - To present final report to Watershed Conservation Committee - To work with public relations and community information section to develop simplified report - To translate simplified report - To layout and prepare simplified report - To disseminate simplified report to community

表 III-3.1.1 環境影響評估作業

Activities	Scale/Area
I. FORESTRY FIELD	
1 Development of Safari Garden	>= 250 ha
2 Development of Zoo	>= 100 ha
3 Forestry Exertion Authority	All size
4 Sago Forest Exertion Authority	All size
5 Industrial Plants Forest Exertion Authority	>= 10,000 ha
6 Bamboo Forest Exertion Authority	All size
7 Exertion of Natural Tourism in	
- National Park	>= 100 ha
- Natural Tourism Park	>= 100 ha
- Hunting Park	>= 100 ha
- Botanical Forest	>= 100 ha
All the activities appropriate to the Conclusion of Forestry Department no. 167/Kpts-II/1994	
II. TOURISM FIELD	
1 Hotels	>=200 rooms or area>5ha
2 Golf Area	All size
3 Park	>= 100 ha
4 Tourism Area	All size
III. AGRICULTURE FIELD	
1 Wet rice field on the Forest	>= 1,000 ha
2 Food plantation cultivation and horticulture with or without its exemption units	>= 3,000 ha
3 Estate season plant cultivation with or without its exemption unit	>= 5,000 ha
4 Estate Plant cultivation with or without its exemption unit	>= 10,000 ha
5 Fishpond cultivation	>= 50 ha
IV. PUBLIC WORK	
1 River normalization	
Medium city	>= 5 km
Village	>= 10 km
2 Water	>= 500 l/second
V. Relocation AND Forest cleared Settlement	
1 Settlement and relocation activities	>= 1,500 ha

表 III-3.3.1 初期環境影響評価 スコーピングチェックリスト-1 (1/3)

Issues	Judgement			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/Extension of agroforestry	Introduction/Extension of erosion control farming practices
1. Social Issues				
Scheduled relocation	D	D	D	D
Unwilling relocation	D	D	D	D
Alteration of the right on land tenure, & residence	D	D	D	D
Change of life style	D	B/C	C	C
Conflict between population	C	A	C	C
Effect on indigenous people, minority, & nomads	D	D	D	D
Reform of traditional institution, & custom	C	D	B	C
Obstruction on fishing right, water right, local regulations	C	D	D	D
Alteration of social structure by organization, etc.	C	C	C	C
Radical change of social structure, & population increase	D	D	D	D
Lost opportunity on production, such as loss of land	D	C	C	D
Transfer, conversion of foundation of economic activity, or unemployment	D	C	C	D
Enlarging income gap	D	C	C	C
Impact on existing transportation	D	D	D	D
Impact on schools & hospitals	D	D	D	D
Cutting off the local society by roads	D	D	D	D
People's perception	C	C	A	A
2. Health & Hygiene				
Occurrence of local diseases	D	D	D	D
Spread of malaria/ filaria epidemic	D	D	D	D
Increase of pesticide consumption	D	D	D	D
Accumulation of remained toxic matter	D	D	D	D
Increase of waste and excrement	D	D	D	D
Garbage & trash dump, falling standards of hygiene	D	D	D	D
Spread of vermin	D	D	D	D

表 III-3.3.1 初期環境影響評価 スコーピングチェックリスト-1 (2/3)

(Continued)

Issues	Judgement			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/Extension of agroforestry	Introduction/Extension of erosion control farming practices
2. Health & Hygiene (continued)				
Dump of construction waste, excavated soil, sludge, trash, etc.	D	D	D	D
3. Historical remains, Cultural legacy, superb panorama, etc.				
Destruction or damage of historical remains and cultural legacy	D	D	D	D
Loss of precious scenery	D	C	D	D
Effects on underground resources	D	C	D	D
Change of ground features by construction of the structures	D	D	D	D
Disturbance of harmonic scenery by construction of the structures	D	D	D	D
4. Area of precious fauna and flora, and eco-system				
Alteration of vegetation	A	D	B	D
Invasion and propagation of harmful fauna and flora	C	B	B	B
Extermination or decrease of precious or specific fauna and flora	A	B	B	D
Disappeared wetland or peat bog	D	D	D	C
Loss of bio-diversity	B	B	B	D
Loss of rain forest/ wild lands	A	C	B	D
5. Soils and Lands				
Land devastation (incl. Desertification)	D	D	D	D
Loss of soil fertility	D	D	D	D
Soil pollution by discharge or diffusion of toxic waste water	D	D	D	D
Soil loss	D	D	D	D
Loss of top-soil after forest cutting	D	D	D	D
Loss of top-soil after land consolidation	D	D	D	D
Modified important ground feature and loss of important geology by cut and bank	D	D	D	D

表 III-3.3.1 初期環境影響評価 スコーピングチェックリスト-1 (3/3)

(Continued)

Issues	Judgement			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/Extension of agroforestry	Introduction/Extension of erosion control farming practices
6. Hydrology & Water quality				
Change of flow/water surface	D	B	B	B
Occurrence of inundation and floods	D	D	D	D
Change of groundwater flow and groundwater table	D	B	B	C
Pollution or deterioration of water quality	D	D	D	D
Turbid water by soil erosion / reduced discharge	D	D	D	D
Exhausted groundwater by excess extraction or lowered recharge	D	D	D	D
Seeped toxic water of buried materials	D	D	D	D
Eutrophication	D	D	D	D
Water temperature change	D	D	D	D
7. Lake and River				
Sedimentation in lake	D	C	C	C
Sedimentation in rivers	D	C	C	C
Riverbed degradation	D	C	C	C
8. Others				
Increased opportunity of slope failure, accidents	D	D	D	D
Pollution by exhaust or toxic gas of vehicles and plants	D	D	D	D
Noise and vibration caused traffic, pumps, etc.	D	D	D	D
Change of temperature and wind by large scale development	D	D	D	D

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
 B : Anticipated impact
 C : Unknown (necessary to assess, detail could be clarified in a further assessment),
 D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.3.2 初期環境評価 スコーピングチェックリスト-2 (1/3)

Issues	Judgement			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
1. Social Issues				
Scheduled relocation	D	A	C	D
Unwilling relocation	D	A	C	D
Alteration of the right on land tenure, & residence	D	A	D	C
Change of life style	D	A	D	C
Conflict between population	D	A	A	C
Effect on indigenous people, minority, & nomads	D	C	D	D
Reform of traditional institution, & custom	D	B	C	D
Obstruction on fishing right, water right, local regulations	D	C	A	D
Alteration of social structure by organization, etc.	D	C	C	D
Radical change of social structure, & population increase	D	D	D	D
Lost opportunity on production, such as loss of land	C	A	C	C
Transfer, conversion of foundation of economic activity, or unemployment	D	C	D	C
Enlarging income gap	D	C	D	D
Impact on existing transportation	D	D	D	C
Impact on schools & hospitals	D	C	D	D
Cutting off the local society by roads	D	D	D	D
People's perception	C	C	C	C
2. Health & Hygiene				
Occurrence of local diseases	C	C	D	D
Spread of malaria/ filaria epidemic	C	D	D	D
Increase of pesticide consumption	C	D	D	D
Accumulation of remained toxic matter	D	D	D	D
Increase of waste and excrement	D	D	D	D
Garbage & trash dump, falling standards of hygiene	D	D	D	D
Spread of vermin	C	D	D	D

表 III-3.3.2 初期環境評価 スコーピングチェックリスト-2 (2/3)

(Continued)

Issues	Judgement			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
2. Health & Hygiene (continued)				
Dump of construction waste, excavated soil, sludge, trash, etc.	C	C	D	C
3. Historical remains, Cultural legacy, superb panorama, etc.				
Destruction or damage of historical remains and cultural legacy	C	C	D	C
Loss of precious scenery	C	C	D	C
Effects on underground resources	C	C	D	C
Change of ground features by construction of the structures	C	C	D	C
Disturbance of harmonic scenery by construction of the structures	C	C	D	C
4. Area of precious fauna and flora, and eco-system				
Alteration of vegetation	D	D	D	D
Invasion and propagation of harmful fauna and flora	C	C	D	D
Extermination or decrease of precious or specific fauna and flora	D	D	D	D
Disappeared wetland or peat bog	D	D	D	D
Loss of bio-diversity	D	D	D	D
Loss of rain forest/ wild lands	D	D	D	D
5. Soils and Lands				
Land devastation (incl. Desertification)	D	D	D	D
Loss of soil fertility	D	D	D	D
Soil pollution by discharge or diffusion of toxic waste water	D	D	D	D
Soil loss	D	D	D	D
Loss of top-soil after forest cutting	D	D	D	D
Loss of top-soil after land consolidation	D	D	D	D
Modified important ground feature and loss of important geology by cut and bank	D	D	D	C

表 III-3.3.2 初期環境評価 スコーピングチェックリスト-2 (3/3)

(Continued)

Issues	Judgement			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
6. Hydrology & Water quality				
Change of flow/water surface	C	A	D	B
Occurrence of inundation and floods	D	D	D	D
Change of groundwater flow and groundwater table	D	D	A	D
Pollution or deterioration of water quality	D	D	D	A
Turbid water by soil erosion / reduced discharge	D	D	D	A
Exhausted groundwater by excess extraction or lowered recharge	D	D	D	D
Seeped toxic water of buried materials	D	D	D	D
Eutrophication	D	D	B	D
Water temperature change	D	C	D	D
7. Lake and River				
Sedimentation in lake	A	A	D	A
Sedimentation in rivers	A	A	D	A
Riverbed degradation	D	D	D	C
8. Others				
Increased opportunity of slope failure, accidents	D	D	D	D
Pollution by exhaust or toxic gas of vehicles and plants	D	D	D	D
Noise and vibration caused traffic, pumps, etc.	D	D	D	D
Change of temperature and wind by large scale development	D	D	D	D

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
 B : Anticipated impact
 C : Unknown (necessary to assess, detail could be clarified in a further assessment),
 D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.1 計画による環境への影響：土壌と土地 (1/2)

Issues	Activities			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/ Extension of agroforestry	Introduction/Extension of erosion control farming practices
Land devastation (incl. Desertification)	D	D	D	D
Loss of soil fertility	D	D	D	D
Soil pollution by discharge or diffusion of toxic waste water	D	D	D	D
Soil loss	D	D	D	D
Loss of top-soil after forest cutting	D	D	D	D
Loss of top-soil after land consolidation	D	D	D	D
Modified important ground feature and loss of important geology by cut and bank	D	D	D	D

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
B : Anticipated impact
C : Unknown (necessary to assess, detail could be clarified in a further assessment),
D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.1 計画による環境への影響：土壌と土地 (2/2)

Issues	Activities			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
Land devastation (incl. Desertification)	D	D	D	D
Loss of soil fertility	D	D	D	D
Soil pollution by discharge or diffusion of toxic waste water	D	D	D	D
Soil loss	D	D	D	D
Loss of top-soil after forest cutting	D	D	D	D
Loss of top-soil after land consolidation	D	D	D	D
Modified important ground feature and loss of important geology by cut and bank	D	D	D	C

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
B : Anticipated impact
C : Unknown (necessary to assess, detail could be clarified in a further assessment),
D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.2 計画による環境への影響：水文 (1/2)

Issues	Activities			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
Change of flow/water surface	D	D	D	D
Occurrence of inundation and floods	D	D	D	D
Change of groundwater flow and groundwater table	D	D	D	D
Pollution or deterioration of water quality	D	D	D	D
Turbid water by soil erosion / reduced discharge	D	D	D	D
Exhausted groundwater by excess extraction or lowered recharge	D	D	D	D
Seeped toxic water of buried materials	D	D	D	D
Eutrophication	D	D	D	D
Water temperature change	D	D	D	D

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
B : Anticipated impact
C : Unknown (necessary to assess, detail could be clarified in a further assessment),
D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.2 計画による環境への影響：水文 (2/2)

Issues	Activities			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
Change of flow/water surface	D	D	D	D
Occurrence of inundation and floods	D	D	D	D
Change of groundwater flow and groundwater table	D	D	D	D
Pollution or deterioration of water quality	D	D	D	D
Turbid water by soil erosion / reduced discharge	D	D	D	D
Exhausted groundwater by excess extraction or lowered recharge	D	D	D	D
Seeped toxic water of buried materials	D	D	D	D
Eutrophication	D	D	D	D
Water temperature change	D	D	D	D

Judgement scores *A : Serious impact anticipated, need careful assessment in the site,*
B : Anticipated impact
C : Unknown (necessary to assess, detail could be clarified in a further assessment),
D : No impact anticipated, not necessary IEE and/or EIA
D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.3 計画による環境への影響：動植物 (1/2)

Issues	Activities			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/Extension of agroforestry	Introduction/Extension of erosion control farming practices
Occurrence of local diseases	D	C	C	D
Spread of malaria/ filaria epidemic	D	C	C	D
Increase of pesticide consumption	D	C	C	D
Accumulation of remained toxic matter	D	D	D	D
Increase of waste and excrement	D	D	D	D
Garbage and trash dump, falling standards of hygiene	D	D	D	D
Spread of vermin	D	D	D	D
Dump of construction waste, excavated soil, sludge, trash, etc.	D	D	C	D
Alteration of vegetation	D	D	D	D
Invasion and propagation of harmful fauna and flora	C	D	D	D
Extermination or decrease of precious or specific fauna and flora	D	D	D	D
Disappeared wetland or peat bog	D	D	D	C
Loss of bio-diversity	D	D	D	D
Loss of rain forest/ wild lands	D	D	D	D

表 III-3.4.3 計画による環境への影響：動植物 (2/2)

Issues	Activities			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
Occurrence of local diseases	D	D	D	D
Spread of malaria/ filaria epidemic	D	D	D	D
Increase of pesticide consumption	D	D	D	D
Accumulation of remained toxic matter	D	D	D	D
Increase of waste and excrement	D	D	D	D
Garbage and trash dump, falling standards of hygiene	D	D	D	D
Spread of vermin	D	D	D	D
Dump of construction waste, excavated soil, sludge, trash, etc.	D	D	D	D
Alteration of vegetation	D	D	D	D
Invasion and propagation of harmful fauna and flora	D	D	D	D
Extermination or decrease of precious or specific fauna and flora	D	D	D	D
Disappeared wetland or peat bog	D	D	D	D
Loss of bio-diversity	D	D	D	D
Loss of rain forest/ wild lands	D	D	D	D

Judgement scores

A : Serious impact anticipated, need careful assessment in the site,

B : Anticipated impact

C : Unknown (necessary to assess, detail could be clarified in a further assessment),

D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.4 計画による環境への影響：社会経済 (1/2)

Issues	Activities			
	Set-up of monitoring institution for watershed management	Establishing community forest	Introduction/Extension of agroforestry	Introduction/Extension of erosion control farming practices
Scheduled relocation	D	D	D	D
Unwilling relocation	D	D	D	D
Alteration of the right on land tenure, & residence	D	D	D	D
Change of life style	D	B/C	C	C
Conflict between population	D	D	C	C
Effect on indigenous people, minority, & nomads	D	D	D	D
Reform of traditional institution, & custom	D	D	D	D
Obstruction on fishing right, water right, local regulations	D	D	D	D
Alteration of social structure by organization, etc.	D	D	D	D
Radical change of social structure, & population increase	D	D	D	D
Lost opportunity on production, such as loss of land	D	D	D	D
Transfer, conversion of foundation of economic activity, or unemployment	D	D	D	D
Enlarging income gap	D	D	D	D
Impact on existing transportation	D	D	D	D
Impact on schools & hospitals	D	D	D	D
Cutting off the local society by roads	D	D	D	D
People's perception	D	D	D	D
Destruction or damage of historical remains and cultural legacy	D	D	D	D
Loss of precious scenery	D	D	D	D
Effects on underground resources	D	D	D	D
Change of ground features by construction of the structures	D	D	D	D
Disturbance of harmonic scenery by construction of the structures	D	D	D	D
Increased opportunity of slope failure, accidents	D	D	D	D
Pollution by exhaust or toxic gas of vehicles and plants	D	D	D	D
Noise and vibration caused traffic, pumps, etc.	D	D	D	D
Change of temperature and wind by large scale development	D	D	D	D

Judgement scores

A : Serious impact anticipated, need careful assessment in the site,

B : Anticipated impact

C : Unknown (necessary to assess, detail could be clarified in a further assessment),

D : No impact anticipated, not necessary IEE and/or EIA

表 III-3.4.4 計画による環境への影響：社会経済 (2/2)

Issues	Activities			
	Expansion of woodland, Prevention of deforestation	Green belt along the lake and rivers	Regulation of fishery in the lake	Construction of erosion control structures
Scheduled relocation	D	D	D	D
Unwilling relocation	D	D	D	D
Alteration of the right on land tenure, & residence	D	D	D	D
Change of life style	D	D	D	D
Conflict between population	D	D	D	D
Effect on indigenous people, minority, & nomads	D	D	D	D
Reform of traditional institution, & custom	D	D	D	D
Obstruction on fishing right, water right, local regulations	D	D	D	D
Alteration of social structure by organization, etc.	D	D	D	D
Radical change of social structure, & population increase	D	D	D	D
Lost opportunity on production, such as loss of land	D	D	D	D
Transfer, conversion of foundation of economic activity, or unemployment	D	D	D	D
Enlarging income gap	D	D	D	D
Impact on existing transportation	D	D	D	D
Impact on schools & hospitals	D	D	D	D
Cutting off the local society by roads	D	D	D	D
People's perception	D	D	D	D
Destruction or damage of historical remains and cultural legacy	D	D	D	D
Loss of precious scenery	D	D	D	D
Effects on underground resources	D	D	D	D
Change of ground features by construction of the structures	D	D	D	D
Disturbance of harmonic scenery by construction of the structures	D	D	D	D
Increased opportunity of slope failure, accidents	D	D	D	D
Pollution by exhaust or toxic gas of vehicles and plants	D	D	D	D
Noise and vibration caused traffic, pumps, etc.	D	D	D	D
Change of temperature and wind by large scale development	D	D	D	D

Judgement scores

A : Serious impact anticipated, need careful assessment in the site,

B : Anticipated impact

C : Unknown (necessary to assess, detail could be clarified in a further assessment),

D : No impact anticipated, not necessary IEE and/or EIA

表III-4. 1.1 インテンシブエリアにおけるゾーン別流域保全計画

Item	Zone					
	P Zone	Bm1 Zone	Bm2 Zone	Bm3 Zone	Bw Zone	F Zone
1 Physical Watershed Conservation Measures 1.1 Forestry Management and Rehabilitation	1) Boundary survey for protection forests 2) Community forestry (Soputan protection forest at south area) 3) Reforestation 4) Forest patrol 5) Research for non-wood products	The same plan will be applied for Bm1 and Bm2 zones 1)Nursery (9 locations), 2)Extension workers (30 persons), 3)Fuel wood plantation (150ha), 4)Delivery station(7 locations)		No plan	1) Establishment of green belt	No plan
1.2 Agriculture/Agroforestry Improvement	1) Fruit tree dominant agroforestry system in the middle part of community forest	1) AGF-I(Type I-2,4,5)/IM 2) Introduction of culture practice considering soil conservation	1) AGF-III(Type III-2)/IM 2) Application of AGF-I(Type I-2,4)/IM to place with low resistance to soil erosion 3) Application of AGF-II(Type II-2)/IM and UF/IM to place with high resistance to soil erosion	1) AGF-II(Type II-2/IM) and UF/IM 2) Application of AGF-III(Type III-2/IM) to a part of sloped area	1) Application of AGF-I(Type I-2) to sloped area along road. 2) Application of AGF-III (TypeIII-2) to gentle-sloped area 3) Application of AGF-I (TypeI-6) to undualted grass fallow 4) Provision of hedge raw at boundary of home garden	1) Application of AGF-II(Type II-2)/IM and UF/Im with hedge raw
1.3 Erosion Control Facility Development	1) Slope Protection works for hillsides at Mt.Maimberg in the South Area.	1) Construction of slope protection works for road at Eris-3 in the East Area 2) Construction of check dam at Tandengan in the East Area 3) Construction of check dam at Ranomerut in the East Area	1) Construction of slope protection works for road at Paleloan in the East Area 2) Construction of check dam at Tataaran in the West Area 3) Rehabilitation of existing check dam at Leleko in the West Area	1) Rehabilitation of existing check dam at Kasuratan in the West Area	No plan	1) River bed protection works at 6 sites on Panasen river in the South 2) River bank protection works at 900m site on Panasen river in the South Area 3) Construction of check dam at Tounipus in the East Area 4) Rehabilitation of exising check dam at Tountimomor in the South Area
2 Institutional Development	Applied for all zones. 1)Community institutional development, 2)Technical institutional development, 3)Institutional development of forestry services, 4) Accurate village boundary mapping, 5) Institutional integration and strengthening of legal and regulatory framwork, 6) Strengthening of watershed conservation capacity at university of Manado, 7) Strengthening of local NGOs.					
3 Community Empowerment	Applied for all zones. Provide relevant information and data to implementers and supporting agencies to be able to facilitate decision making for community empowerment.					
4 Monitoring and Evaluation System 4.1 Engineering Items 4.2 Socio-Economic Items	Applied for all zones. 1) Soil erosion and sedimentation, 2) Water quality, 3) Water balance, 4) River bed erosion and slope failures Applied for all zones. 1) Micro planning for sustanable land use, 2) Awareness raising and environmental education, 3) Organizing of local people and reorienting of officials, 4) Strengthening of social safety net, 5) Gender and conservation.					

Note 1

AGF-I (TypeI-2)/IM Improved Estate Crop Dominant Agroforestry System
AGF-I (TypeI-4,5,6)/IM Improved Tree(woody trees and tree crops) Dominant Agroforestry System
AGF-II (TypeII-2)/IM Improved Herbaceous Crop Dominant Agroforestry System
AGF-III (TypeIII-2)/IM Improved Inter-cropping System
UF/IM Improved Upland Cultural Practice

Note 2

S Zone is not included in Watershed Conservation Plan.