The proposed main intake facilities for the respective irrigation projects are listed in Table 5.8.

5.5 Cost Estimate

Construction costs of the proposed irrigation works were estimated on the basis of the following conditions; (i) The prices of all the materials, equipment, labor, so forth necessary for the project are those at the 1990 price level and (ii) Exchange rate used for the estimate is US\$ 1.00 = Rp. 1,850.

The construction cost was estimated based on the calculated work quantities of the proposed works. The breakdown of the construction costs of the proposed irrigation projects is shown in Table 5.9.

The operation, maintenance and replacement cost were assumed to be US\$ 40 per ha. The construction period of each project was assumed as follows.

Unit: years

Name of irrigation project	Construction period
Mezawa/How	5
Muwa	5
Ladara/Sowo/To'o/Afia	3
Susuwa/Afoa	3
Binaka	1
Boli	1
Siwalawa	2
Amuri	1
Lahusa	1
Ndra Humene	${f 2}$
Otuwa/Id.Zala/Todawa	3
T.Dalam/Bawodobara	2
Hilijihona	1
Torowa	$oldsymbol{2}$
Muzoi	3
Tuhenase/Afulu	2
Oyo/Dumula	5

6. PROJECT ASSESSMENT AND PRIORITY SEQUENCE

6.1 General

In the first place, an economic evaluation of the 17 irrigation projects formulated in the previous chapter was carried out. Then, priority sequence for the implementation was determined by applying the evaluation criteria taking various aspects into account. The assumption and procedure applied for the evaluation are described hereunder.

6.2 Economic Evaluation and Irrigation Benefit

The economic evaluation of each of the irrigation projects was performed in terms of economic internal rate of return (EIRR). The EIRR was estimated on the basis of the following conditions:

- (i) The project life is assumed to be 50 years.
- (ii) All the prices are expressed in constant 1990 price.
- (iii) Economic construction cost is estimated by applying the standard conversion factor (0.85) to financial construction cost.
- (iv) The economic prices of traded goods are estimated on the basis of the price forecast by IBRD.
- (v) The exchange rate of US\$ 1 = Rp.1,850 is applied.

It is expected that benefit accrued from the implementation of the projects will be irrigation benefit. It is defined as the difference of primary profit from crops between future with and without project condition. The irrigation benefit is expected to increase year by year and reach the full benefit in certain years. The build-up period to the full benefit was assumed to be 3 years for the existing irrigated lands, 4 years for the rainfed lands and 7 years for the newly developed lands. The build-up period for each irrigation project was determined by the ratio of the existing land use as shown in Table 6.1. The irrigation benefit at the full stage is shown in Table 6.2.

Based on the irrigation benefit and economic construction costs, EIRR for each irrigation project was calculated as shown in next section.

6.3 Priority Sequence of the Development

The priority sequence of the irrigation projects was determined based on the four evaluation criteria. The first criterion is the level of economic feasibility expressed by EIRR. The second is the magnitude of initial investment expressed as construction cost per ha. The third is the scale merit of the project expressed as difference between benefit and cost (in terms of total present value at 10% discount rate). The fourth is a distribution of benefits expressed by number of beneficiaries. Reflecting the importance of each indicator, weighted points are given to each category: (x 3) for the first: (x 2) for the second: (x 1) for the third and fourth. The evaluation criteria applied are shown below:

Criteria	Indicator	Grade F	oints	Magnitude
Economic feasibility	EIRR	A(high)	9	>13%
20011110 1040-12-119	(%)	B(medium)	6	13-10%
	(· - /	C(low)	3	10-7%
	•	D(very low)	0	<7%
Investment cost per ha	US\$/ha	A(low)	6	<4,000
mvestment cost per ma	0.017==0	B(medium)	4	4,000-6,000
		C(high)	2	6,000-8,000
		D(very high)	0	>8,000
Scale merit of the project	B-C	A(high)	2	10,000
oddio morn or mo project	(Rp.million)	B(medium)	1	10,000-5,000
		C(low)	0	<5.000
Distribution of benefit	Number of	A(high)	2	>5,000
	beneficiaries	B(medium)	1	1,000-5,000
		C(low)	0	<1,000

The values of indicators for each irrigation project are shown below;

Name of irrigation project	EIRR (%)	Cost/ha (US\$)	B-C (Rp,million)	Number of beneficiaries (Rp.million)
Mezawa/How	13.1	4,800	18,530	9,400
Ladara/sowo/To'o/Afia	12.4	6,300	5,394	3,500
Binaka	12.0	6,200	193	200
Siwalawa	8.5	8,500	-476	700
Lahusa	10.0	8,600	63	100
Otuwa/Id.Zala/Todawa/Sorake	10.3	7,700	1,363	3,800
Hilijihona	16.3	4,500	435	200
Muzoi	11.7	6,900	1,856	1,200
Oyo/Dumula	11.4	6,900	14,098	9,800
Muwa	12.3	3,800	7,675	7,600
Susuwa/Afoa	11.8	7,400	2,030	1,000
Boli	11.6	7,000	377	200
Amuri	11.4	6,900	462	300
Ndra Humene	12.4	5,400	1,469	1,200
T.Dalam/Bawodobara	9.8	8,200	82	500
Torowa	6.8	11,100	-1,965	700
Tuhenase/Afulu	10.1	9,200	342	600

Based on the figures summarized in the tables above, the points for each criterion were given. Priority ranking was made for each project following the order of points. When the points of some projects are same, priority is given to the project with higher EIRR. The total points and the priority ranking are estimated as follows;

Name of irrigation project	EIRR	Cost per ha	В-С	Number of beneficiaries	Total points	Rank of priority
Mezawa/How	9	4	2	2	17	1
Ladara/sowo/To'o/Afia	6	2	1	1	10	6
Binaka	6	2	0	• 0	8	10
Siwalawa	0	0	0	O	0	16
Lahusa	6	0	0	0	6	14
Otuwa/Id.Zala/Todawa/Sorake	6	2	0	1	9	9
Hilijihona	9	4	0	0	13	3
Muzoi	6	2	0	0	9	8
Oyo/Dumula	6	2	2	2	12	4
Muwa	6	6	1	2	15	2
Susuwa/Afoa	6	2	0	. 1	9	7
Boli	6	2	0	0	8	11
Amuri	6	2 .	0	0	8	12
Ndra Humene	6	4	- 0	1	11	5
T.Dalam/Bawodobara	3	0	0	0	3	15
Torowa	0	0	0	0	0	17
Tuhenase/Afulu	6	0	0	0	6	13

As a result, the Mezawa/How irrigation project would have the highest priority.

6.4 Implementation Schedule

The implementation schedule for these projects is to be determined so as to meet the increasing demand for paddy in the future in the Nias island. Supposing that the target year of this project is 2010, 20 years from now, the increasing demand for paddy in the Nias island was estimated at 93,500 tons as shown in Table 5.1. To meet the demand for paddy in 2010, two irrigation projects that rank first and second in priority sequence should be developed as shown in Table 6.3 and summarized below;

Name of Project	Year of start of construction			
Mezawa/How	1991			
Muwa	1996			

6.5 Project Impacts

In addition to irrigation benefits, various socio-economic and environmental impacts can be expected after implementation of the irrigation projects. The expectable positive impacts would be (i) creation of employment opportunities, (ii) increasing rice production, (iii) raising farm income and living standard of the farmers, (iv) improvement of marketing system, and (v) others. The irrigation projects were as formulated as to minimize the eventual negative impacts of their implementation. It is considered, therefore, that negative impacts which might be caused by the project will be small.

The Feasibility Study on The Nias Island Irrigation Agricultural Development Project

Vol. II AGRICULTURAL DEVELOPMENT PLAN IN THE NIAS ISLAND

TABLES

Table 2.1 GROSS REGIONAL DOMESTIC PRODUCT IN KABUPATEN NIAS

	19	983	19	984	19	85
KECAMATAN	GRDP Kecamatan	GRDP per Capita	GRDP Kecamatan	GRDP per Capita	GRDP Kecamatan	GRDP per Capita
	(Rp.000)	(Rp.)	(Rp.000)	(Rp.)	(Rp.000)	(Rp.)
1.P.P.Batu	8,080,322	371,937	10,398,229	472,948	10,079,521	442,414
2.Teluk Dalam	9,146,792	167,465	9,989,615	175,948	11,109,798	190,563
3.Lahusa	1,646,754	83,481	2,087,647	104,975	2,260,561	112,187
4.Gomo	1,960,857	57,984	2,176,373	64,205	2,450,151	69,510
5.Idanogawo	6,805,283	176,385	7,656,350	196,382	8,269,792	210,540
6.Lolowa'u	3,140,669	77,199	3,415,767	83,994	4,048,012	97,965
7.Sirombu	2,696,545	174,839	3,188,522	203,909	3,393,341	214,091
8.Mandrehe	2,922,073	78,231	3,496,441	91,655	4,238,274	105,027
9.Gido	8,688,770	143,346	9,102,085	140,116	9,816,603	146,748
10.Gn.Sitoli	20,442,473	253,799	24,396,766	295,575	26,975,093	324,095
11.Alasa	4,903,692	151,911	5,520,466	164,129	6,171,534	176,158
12.Lahewa	8,294,190	245,645	9,403,014	271,921	10,359,034	298,428
13.Tuhemberua	8,783,160	203,102	9,182,987	213,419	9,673,487	219,011
Total	87,511,581	2,185,324	100,014,263	2,479,175	108,845,200	2,606,737
-						

Source: Statistic Office of North Sumatra Province

	19	86	1987			
KECAMATAN	GRDP Kecamatan (Rp.000)	GRDP per Capita (Rp.)	GRDP Kecamatan (Rp.000)	GRDP per Capita (Rp.)		
			(Lipidos)	<u> </u>		
1.P.P.Batu	11,641,500	524,109	19,157,220	792,013		
2.Teluk Dalam	12,766,915	200,798	14,450,789	224,828		
3.Lahusa	2,501,877	116,032	2,976,784	133,404		
4.Gomo	2,632,733	74,637	3,056,929	85,866		
5.Idanogawo	9,280,465	220,282	10,297,976	232,224		
6.Lolowa'u	4,624,178	106,139	6,130,753	137,025		
7.Sirombu	3,844,870	244,824	4,581,015	282,100		
8.Mandrehe	4,341,789	108,021	5,812,257	143,166		
9.Gido	11,047,066	161,396	14,072,221	201,495		
10.Gn.Sitoli	30,819,134	369,893	35,626,889	414,165		
11.Alasa	6,996,426	198,036	7,666,629	210,975		
12.Lahewa	10,889,897	318,204	11,674,987	333,247		
13.Tuhemberua	10,284,706	222,512	12,565,367	260,352		
Total	121,671,556	2,864,882	148,069,816	3,450,861		

Source: Statistic Office of North Sumatra Province

Table 3.1 POPULATION STATISTICS

GROWTH 1961 - 1989

	1961	1971	1980	1985	1989
INDONESIA	97,085,000	119,208,000	147,490,000	164,047,000	179,136,000
NORTH SUMATRA KABUPATEN NIAS	4,964,734 314,829	6,621,831 370,825	8,360,894 468,021	9,445,601 531,629	x 582,578

GROWTH RATES (ANNUAL AVERAGE %)

	1961-1971	1971-1980	1980-1985	1985-1989
INDONESIA	2.2 %	2.3 %	2.2 %	2.2 %
NORTH SUMATERA	2.8 %	2.6 %	2.5 %	х
KABUPATEN NIAS	1.7 %	2.6 %	2.6 %	2.3 %

Table 3.2 POPULATION BY KECAMATAN (1989)

Kecamatan	Population	Land Area	Density	House- holds	Average Household	
		(ha)	per km2	·	Size	
1. GUNUNG SITOLI	88,826	34,260	259	14,686	6.0	
2. TUHEMBERUA	50,646	39,280	129	8,355	6.1	
3. ALASA	37,692	41,190	92	6,177	6.1	
4.GIDO	71,936	37,412	192	12,441	5.8	
5. LAHEWA	35,755	21,830	163	6,533	5.5	
6. IDANO GAWO	44,152	39,105	113,	6,691	6.6	
7. LOLOWA'U	45,445	37,500	121	7,631	6.0	
8. GOMO	36,918	21,720	170	6,630	5.6	
9. TELUK DALAM	65,053	44,560	146	11,917	5.5	
10. LAHUSA	23,351	41,936	56	4,236	5.5	
11. MANDREHE	42,810	30,800	139	7,176	6.0	
12. SIROMBU	16,141	12,795	126	2,839	5.7	
13. PULAU-PULAU BATU	23,853	123,450	19	5,130	4.6	
KABUPATEN NIAS	582,578	525,838	111	100,442	5.8 .	
WITHOUT PULAU- PULAU BATU	558,725	402,388	139	95,312	5.9	

Kecamatan					Adults		Indonesian	Foreign
	Male	Female	Total	Male	Female	Total	Nationals	Nationals
1. GUNUNG SITOLI	17,687	17,675	35,362	26,625	26,839	53,464	88,750	76
2. TUHEMBERUA	12,474	12,410	24,889	12,741	13,016	25,757	50,646	-
3. ALASA	8,302	8,332	16,634	10,606	10,452	21,058	37,692	-
4. G I D O	17,403	17,869	35,272	18,071	18,593	36,664	71,936	-
5. LAHEWA	6,441	6,552	12,993	11,309	11,453	22,762	35,755	-
6. IDANO GAWO	7,476	7,390	14,866	14,120	15,166	29,286	44,152	-
7. LOLOWA'U	11,012	11,426	22,438	11,367	11,640	23,007	45,445	-
8. G O M O	8,954	9,569	18,523	8,804	9,591	18,395	36,918	-
9. TELUK DALAM	17,507	17,278	34,785	14,195	16,073	30,268	65,049	4
10. LAHUSA	5,961	5,958	11,919	5,751	5,681	11,432	23,351	-
11. MANDREHE	9,191	9,716	18,906	11,802	12,102	23,904	42,810	-
12. SIROMBU	3,109	3,181	6,290	4,795	5,056	9,851	16,135	6
13. PULAU-PULAU BATU	5,125	4,767	9,892	7,158	6,803	13,961	23,853	-
KABUPATEN NIAS	130,642	132,123	262,769	157,344	162,465	319,809	582,492	86
WITHOUT PULAU- PULAU BATU	125,517	127,356	252,877	150,186	155,662	305,848	558,639	86

Table 3.3 POPULATION BY RELIGION (1989) AND INVENTORY OF THE FACILITIES

Kecamatan	Total Pop.	Islam	%	Protestant	%	Catholic	%	Hindu	%	Buddist	%
1. GUNUNG SITOLI	88,826	13,764	15.5	64,869	73.0	9,461	10.7	52	.1	680	.7
2. TUHEMBERUA	50,646	3,825	7.6	43,340	85.6	3,481	6.9	-	.· - ·	-,	
3. ALASA	37,692	281	. 7	29,479	78.2	7,932	21.0	-	-		
4. G I D O	71,936	2,006	2.8	63,469	88.2	6,461	9.0		-	. <u>-</u>	
5. LAHEWA	35,755	5,937	16.6	25,688	71.8	4,000	11.2	10	>.1	120	.3
6, IDANO GAWO	44,152	1,663	3.8	37,953	86.0	4,536	10.3	-	-	· -	
7. LOLOWA'U	45,445	40	0.1	26,822	59.0	18,583	40.9		-	- ,	
8, G O M O	36,918	6	>.1	33,212	90.0	3,700	10.0	•	-		
9. TELUK DALAM	65,053	2,716	4.2	37,926	58.3	24,332	37.4	5	> 1	74	.1
10. LAHUSA	23,351	81	.3	19,558	83.8	3,712	15.9	-	-	-	٠.
11. MANDREHE	42,810	12	>.1	37,119	86.7	5,679	13.3		-	-	
12. SIROMBU	16,141	1,581	9.8	13,074	81.0	1,465	9.1	-	-	21	.1
13. PULAU-PULAU BATU	23,853	3,679	15.4	15,375	64.5	4,725	19.8	-	• •	74	.3
KABUPATEN NIAS	582,578	35,591	6.1	447,884	76.9	98,067	16.8	67	>.1	969	>.1
WITHOUT PULAU- PULAU BATU	558,725	31,912	5.7	432,509	77.4	93,342	16.7	. 67	>.1	895	>.1

Kecamatan	Islamic	Chur	ch	Hnidu	Buddist
	Mosque	Protestant	Catholic	Temple	Vihara
1. GUNUNG SITOLI	33	153	39		1
2. TUHEMBERUA	21	90	30	· -	_
3. A L A S A	1	104	41	-	
4. G I D O	9	249	43	-	-
5, L A H E W A	25	113	26	-	-
6. IDANO GAWO	4	137	24	-	-
7. LOLOWA'U	-	116	75	-	•
8. G O M O	• .	110	16	-	-
9. TELUK DALAM	3	86	64	-	1
10. L A H U S A	1	33	18	-	. -
11. MANDREHE	-	103	35	-	
12. SIROMBU	11	58	9	-	1
13. PULAU-PULAU BATU	14	41	22		-
KABUPATEN NIAS WITHOUT PULAU-	122	1,393	442	~	3
PULAU BATU	108	1,352	420	-	3

Table 3.4 AGE DISTRIBUTION (1989)

Kecamatan	Children	Adults	Child-Adult	Median
	(under 15 yr.)		Ratio	Age (yr.)
1.GUNUNG SITOLI	35,362	53,464	1:1.51	19
2.TUHEMBERUA	24,889	25,757	1:1.03	15
3.ALASA	16,634	21,058	1:1.27	17
4.GIDO	35,272	36,664	1:1.04	15
5.LAHEWA	12,993	22,762	1:1.75	21
6.IDANO GAWO	14,866	29,286	1:1.97	21
7.LOLOWA'U	22,438	23,007	1:1.03	15
8.GOMO	18,523	18,395	1: .99	14
9.TELUK DALAM	34,785	30,268	1: .87	13
10.LAHUSA	11,919	11,432	1:.95	14
11.MANDREHE	18,906	23,904	1:1.26	19
12.SIROMBU	6,290	9,851	1:1.57	20
13.PULAU-PULAU BATU	9,892	13,961	1:1.57	18
KABUPATEN NIAS	262,769	319,809	1:1.22	17
WITHOUT P.P.BATU	252,877	305,848	1:1.21	17

Source: Calculations based upon data from Kabupaten NIAS Dalam Angka 1989

Table 3.5 POPULATION BY OCCUPATION (1988)

Kacamatan	Government Service		Far	ning	Lal	югег	Indi	istry		blic ities	Construction	
1. GUNUNG SITOLI	22,263	25.4%	38,868	44.4%	1,235	1.4%	2,119	2.4%	286	.3%	1,962	2.2%
2. TUHEMBERUA	2,377	4.7%	43,872		115	.2%	368	.7%	20	>.1%	116	.2%
3. A L A S A	1,831	5.0%	34,495			_	74	.2%			-	٠
4. G IDO	2,703	3.8%	63,692	89.1%	14	>.1%	622	.9%	107	.1%	429	.6%
5. LAHEWA	1,762	4.8%	26,981	75.7%	628	1.8%	777	2.2%			414	1.2%
6. IDANO GAWO	1,348	3.1%	39,864	90.9%	44	.1%	868	2.0%	13	>.1%	20	>.1%
7. LOLOWA'U	1,646	3.7%	41,150	92.0%	-		-	-	-	-		-
8. GOMO	1,244	3.4%	34,180	93.7%			13	>.1%	10	>.1%	25	.1%
9. TELUK DALAM	2,407	3.7%	49,835	77.4%	566	.9%	3,238	5.0%	26	>.1%	1,030	1.6%
10. LAHUSA	899	4.0%	21,209	93.7%	152	.7%	-	-	. 7	>.1%	27	.1%
11. MANDREHE	1,756	4.2%	40,187	95.4%	13	>.1%	101	0.2%	-	-		
12. SIROMBU	1.012	6,3%	13.732	85.2%	-	-	155	1.0%	32	.2%	64	.4%
13. PULAU-PULAU BATU	1,188	5.1%	19,330	82.7%	•	-	799	3.4%	24	.1%	44	.2%
KABUPATEN NIAS WITHOUT PULAU-	42,436	7.4%	467,395	81.2%	2,767	.5%	9,134	1.6%	525	.1%	4,131	.7%
PULAU BATU	41,248	7.5%	448,065	81.1%	2,767	.5%	8,335	1.5%	501	.1%	4,087	.7%

Kecamanta	Tr	ade	Tran Commu	Banking		Service Industry		Popula- tion (1988)	
1. GUNUNG SITOLI	11,972	13.7%	2,776	3.2%	736	1.4%	5,360	6.1%	87,580
2. TUHEMBERUA	3,001	6.0%	50	.1%	-	0.2%	433	.9%	50,352
3. A L A S A	442	1.2%			-	-	-	-	36,842
4. G 1D 0	3,146	4.,4%	265	0.4%	-	>.1%	522	.7%	71,500
5. LAHEWA	4,396	12.3%	107	0.3%	-	1.8%	592	1.7%	35,657
6. IDANO GAWO	1,326	3.0%	140	0.3%	-	.1%	210	0.5%	43,835
7. LOLOWA'U	1,811	4.0%	45	.1%	-		67	.1%	44,719
8. GOMO	989	2.7%	-	-	-	-	33	.1%	36,494
9. TELUK DALAM	4,879	7.6%	72	.1%	71	.9%	2,246	3.5%	64,370
10. LAHUSA	283	1.3%	23	.1%	-	.7%	23	.1%	22,623
11. MANDREHE	55	.1%	-	-		>.1%	4	>.1%	42,116
12. SIROMBU	996	6.2%	58	.4%	-	•	71	.4%	16,120
13. PULAU-PULAU BATU	1772	7.6%	23	.1%	-	•	196	.8%	23,376
KABUPATEN NIAS WITHOUT PULAU-	35,068	6.1%	3,559	.6%	807	.5%	9,757	1.7%	575,584
PULAU BATU	33,296	6.0%	3,536	.6%	807	.5%	9,561	1.75%	552,208

Table 3.6 SUMMARY OF METEOROLOGICAL STATIONS

No	Station	Latitude (N)	Longitude (E)	Altitude (M)	Starting Year	Jurisdiction
110	Other			(1,2)		V 411001041041
92	Teluk	0°34'	97°49'	3	1954	
) A .	Dalam	0.5.	<i>7.</i> . <i>,</i>	-	-1964	
92C	Tetehosi	1°10'	97°37'	50	1954	
,20	10101100		<i>y.</i> 0.		-1964	Departemen
93	G.Sitoli	1°13'30"	97°38'30"	6	1951	Perhubungan
						Ü
94C	Mandrehe			100	1954	
					-1957	
9	Lolofitu	0°58'21"	97°45'12"	250	1983	
11	Tefao	1°23'17"	97°16'43"	20	1984	
12	Lolowau	0°54'02"	97°34'58"	300	1984	Departemen
						Pekerjaan
28	Awa'ai	1°23'30"	97°29'17"	6	1984	Umum
29	Tetehosi	0°51'20"	97°49'13"	20	1984	

Source: Badan Meteorologi Dan Geofisika, Departemen Perhubungan, Badan Penelitian and Departemen Pekerjaan Umum

Table 3.7 AVAILABLE METEOROLOGICAL DATA

		4, 4, 1	Pen	od of Collected	Data	
No	Station	Rainfall	Temperature	Humidity	Wind Velocity	Sunshine
በሳ	matala	1054 1061	YN NY	15 NI	D. M	TO AT
92	Teluk	1954-1961	D.N.	D.N.	D.N.	D.N.
	Dalam	1964	D.N.	D.N.	D.N.	D.N.
92C	Tetehosi	1954	D.N.	D.N.	D.N.	D.N.
		1956-1964	D.N.	D.N.	D.N.	D.N.
93	G.Sitoli	1980-1989	1980-1989	1980-1989	1980-1989	1980-1989
94C	Mandrehe	1954-1955	D.N.	D.N.	D.N.	D.N.
		1957	D.N.	D.N.	D.N.	D.N.
9	Lolofitu	1983	1983-1985	1983-1984	1983-1986	1983-1987
		1986-1990	D.N.	D.N.	D.N.	D.N.
11	Tefao	1985	D.N.	1984-1985	1984-1985	1984-1985
12	Lolowau	1985	1985-1987	1984-1987	1984-1987	1984-1987
		1988-1989	D.N.	D.N.	D.N.	D.N.
28	Awa'ai	1985	N.O.	N.O.	N.O.	N.O.
		1988-1990	N.O.	N.O.	N.O.	N.O.
29	Tetehosi	1985-1990	N.O.	N.O.	N.O.	N.O.

Note: D.N. : Data not collected.

N.O.: Non-observation.

Table 3.8 SUMMARY OF CLIMATIC CONDITION

Teluk Dalam	(mm) 2,854	(°C)	(%)	(%)	(m/s)
Teluk Dalam	2,854				
		-	-	-	-
Tetehosi	1,727		-	-	-
G.Sitoli	2,941	25.6	89	49	2.97
Mandrehe	(2,836)	.	-	-	
Lolofitu	(3,487)	26.4	(97)	35	0.40
Tefao	*	*	(95)	(43)	0.23
Lolowau	*	27.2	88	39	0.43
Awa'ai	(2,247)	-	-	-	-
Tetehosi	(3,151)	-	-	-	-

Note: 1) (); data is only a year 2) Mark(*); the lack of data

Table 3.9 MONTHLY RAINFALL AT G. SITOLI STATION

Source: Badan Meteorologi Dan Geofisika, Departemen Perhubungan

Note: *: Corrected average

Table 3.10 (1/3) THE METEOROLOGICAL DATA AT G. SITOLI STATION

(1) TEMPERATURE

a) AVERAGE

•												(U	nit: °C)
Year	Jan,	Feb.	Маг.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	25.8	25.9	25.8	26.4	26.0	25.9	25.4	25.4	25.4	25.3	25.4	24.8	25.6
1981	25.0	25.6	26.6	25.8	26.1	25.7	25.0	25.3	25.0	25.0	25.2	25.7	25.5
1982	25.4	25.3	25.1	26.0	26.2	25.7	25.1	25,2	25.1	25.3	25.7	26.2	25.5
1983	26.5	26.9	26.8	27.0	26.3	26.2	25.6	25.7	25.4	25.4	25.1	25.3	26.0
1984	25.2	25.5	25.6	25.6	26.0	25.5	24.9	24.8	24.7	25.1	25.4	24.9	25.3
1985	25.7	25.9	25.8	25.9	25.7	25.3	24.4	25.1	25.0	25.2	24.9	25.3	25.4
1986	25.6	25.9	25.8	25.6	25.9	25.8	25.3	25.1	25.0	24.9	24.7	26.2	25.5
1987	26.0	26.0	26.4	26.3	26.1	26.3	25.5	25.9	25.7	25.9	25.4	25.9	26.0
1988	26.2	26.0	26.4	26.5	26.2	25.7	25.7	25.3	25.4	24.9	25.0	24.8	25.7
1989	26.1	25.4	25.3	25.2	25.0	25.5	25.0	24.8	25.2	25.0	25.5	26.0	25.3
AVE.	25.8	25.8	26.0	26.0	26.0	25.8	25.2	25.3	25.2	25.2	25.2	25.5	25.6

b) MAXIMUM

												(U	lnit: °C)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	30.8	30.9	30.6	30.8	30.8	30.5	30.0	29.9	29.7	29.4	29.4	28.9	30.1
1981	30.3	30.3	31.6	30.1	30.4	30.7	29.8	30.8	29.6	28.9	29.4	30.2	30.2
1982	30.5	30.2	30.0	30.5	30.7	30.6	30.0	30.1	30.0	29.9	30.0	30.6	30.3
1983	31.0	31.6	31.4	31.7	30.5	31.3	30.9	31.0	29.9	29.9	29.8	29.8	30.7
1984	30.0	30.6	30.3	30.0	30.7	30.4	29.6	29.3	29.3	29.5	29.6	29.8	29.9
1985	30.8	31.0	30.6	30.5	30.3	30.7	29.7	30.3	29.6	29.9	29.6	29.9	30.2
1986	30.3	31.2	30.3	30.4	30.8	30.7	30.0	30.4	29.8	29.4	29.5	30.8	30.3
1987	30.5	31.3	31.2	31.2	31.0	31.4	31.0	30.9	30.2	30.1	29.5	30.5	30.7
1988	30.8	30.8	31.2	31.3	30.9	30.9	30.8	30.1	29.9	29.2	29.1	29.7	30.4
1989	30.6	30.2	30.1	30.1	30.9	30.5	29.7	29.7	29.6	29.0	29.0	30.1	30.0
AVE.	30.6	30.8	30.7	30.7	30.7	30.8	30.1	30.3	29.8	29.5	29.5	30.0	30.3

c) MINIMUM

												J)	Jnit: °C)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1000		00.0	20.7			00.4	00.1	00.0	22.5	22.5	22.0	22.4	22.6
1980	22.4	22.3	22.7	23.4	22.8	22.4	22.1	22.3	22.5	22.5	22.8	22.4	22.6
1981	21.4	22.3	23.1	23.0	23.3	22.2	21.8	21.0	22.3	22.2	22.1	22.6	22.3
1982	21.6	22.2	22.1	22.8	23.1	22.2	21.4	21.9	21.7	22.5	22.8	22.9	22.3
1983	22.9	23.4	23.7	23.8	23.3	22.6	22.3	22.4	22.4	22.4	21.7	22.2	22.8
1984	22.1	22.2	22.4	22,5	22.6	22.2	21.5	21.6	21.3	21.8	22.4	21.6	22.0
1985	21.6	21.8	22.2	22.2	22.1	20.6	20.3	21.2	21.1	21.7	21.4	21.5	21.5
1986	21.4	20.9	21.8	21.4	21.2	20.8	20.4	20.0	20.5	20.9	20.1	21.7	20.9
1987	21.4	21.1	21.2	21.7	21.7	21.4	21.0	21.3	21.5	21.9	21.5	21.4	21.4
1988	21.7	21.1	21.9	21.8	21.4	20.6	20.5	20.8	21.1	20.3	20.3	19.9	21.0
1989	20.9	20.3	20.0	20.5	20.9	19.5	19.5	19.8	20.4	20.3	20.6	20.8	20.3
AVE.	217	21.8	22.1	22.3	22.2	21.5	21.1	21.2	215	21.7	21.6	21.7	21.7
AVE,	41.1	21.0	46.1	<i>₽₽.</i> , J	44,4	41.3	41,1	£1.£	٠,١,٠	21.1	21.0	21.1	41.1

Table 3.10 (2/3) THE METEOROLOGICAL DATA AT G. SITOLI STATION

(2) HUMIDITY

												((mit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	85	85	87	88	88	86	86	85	87	88	88	90	87
1981	85	86	84	89	87	86	87	84	87	.89	89	88	87
1982	87	87	90	89	89	88	. 88	89	89	90	89	88	.89
1983	86	86	88	88	89	87	89	88	89	- 90	88	89	88
1984	88	86	88	. 89	88	89	89	89	89	89	89	89	89
1985	85	86	88	90	91	86	89	88	89	89	91	90	89
1986	89	85	88	92	90	87	85	89	91	92	91	88	89
1987	89	88	88	90	90	90	90	90	90	.91	92	.90	. 90
1988	88	89	89	89	89	91	88	90	90	92	92	90	90
1989	90	89	89	91	90	88	90	91	91	92	92	88	90
AVE.	87	87	88	90	89	88	88	88	89	90	90	89	89

(3) RAINY DAYS

•											**	(Uni	t: days)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	21	12	20	23	20	14	20	18	18	20	26	25	20
1981	10	16	16	25	21	15	19	11	26	23	. 18	17	18
1982	13	16	21	21	20	16	18	19	-17	25	27	25	20
1983	18	15	22	21	24	15	20	19	25	24	22	24	21
1984	22	20	27	23	24	21	27	27	.20	24	26	23	24
1985	20	14	. 21	20	19	13	23	20	23	26	-28	27	21
1986	22	13	28	18	. 18	18	: 19	17	. 24	23	22	19	20
1987	20	18	23	28	26	23	. 21	26	-25	28	- 29	24	24
1988	25	22	31	27	15	17	17	23	-	24	-	17	-
1989		-	21	25	-	12		-	24	26	26	21	-
AVE.	19	16	23	23	21	16	20	20	22	24	25	22	21

(4) SUNSHINE

												π (τ	Init: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	50	65	47	49	55	63	55	51	34	42	41	32	49
1981	61	54	65	47	50	64	45	70	37	31	49	54	52
1982	65	53	36	55	51	67	58	45	45	41	48	60	52
1983	65	54	53	53	49	58	- 55	59	48	43	47	50	53
1984	54	48	44	- 50	55	55	48	41	48	41	- 54	49	49
1985	71	65	50	54	53	74	56	54	44	- 50	42	47	55
1986	49	72	48	46	57	68	56	47	33	39	40	55	51
1987	37	52	45	42	45	48	48	44	36	39	31	42	42
1988	46	50	42	-	49	53	- 65	40	31	20	20	40	-
1989	56	40	42	37	46	57	38	34	35	30	40	42	41
AVE.	55	55	47	48	51	61	52	49	39	38	41	47	49

Table 3.10 (3/3) THE METEOROLOGICAL DATA AT G. SITOLI STATION

(5) WIND SPEED

												(Uı	nit: m/s)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1980	2.64	2.65	2.52	2.30	2.61	2.92	3.24	3.07	2.93	3.19	3.21	2.94	2.85
1981	2.77	3.03	2.74	2.69	3,10	2.98	3.19	2.97	3.14	2.79	3.05	2.79	2.94
1982	2.61	3.09	3.02	3,12	2.79	4.51	3.04	3.19	2.97	2.95	2.83	2.84	3.08
1983	2.99	3.23	3.00	3,00	3.12	2.85	3.30	3.24	3.07	2.80	3.34	2.77	3.06
1984	3.00	2.98	2.89	3.00	2.54	2.86	2.80	2.80	3.38	3.12	3.04	2.87	2.94
1985	2.92	3.09	2.80	2.61	2.22	2.85	2.61	3.02	3.02	3.04	2.81	2.84	2.82
1986	2.84	2.87	3.30	2.54	2.61	2.83	3.04	3.20	3.31	2.52	3.28	2.74	2.92
1987	3.09	3.14	3.22	2.88	2.67	3.10	3.14	2.95	2.66	3.00	2.81	3.24	2.99
1988	2.64	2.91	3.17	2,80	3.32	3.05	3.24	2.84	3.19	2.94	3.46	2.85	3.03
1989	3.22	2.98	3.12	3.12	2.99	3.65	2.87	2.99	2.88	3.25	2.86	2.84	3.06
AVE.	2.87	3.00	2.98	2.81	2.80	3.16	3.05	3.03	3.05	2.96	3.07	2.87	2.97

Source: Badan Meteorologi and Geofisika, Departemen Perhubungan

Table 3.11 (1/3) MONTHLY RAINFALL AT 8 STATIONS

` '		1 .		•			: ·				(Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1954	125	172	285	318	202	83	250	117		348	423	231	
1955	176	187	263	252	258	66	127	435	243	473	324	378	3,182
1956	263	106	255	•	71	197	291	251	160	395	533	449	-
1957	151	189	219	338	267	74	311	232	440	278	335	442	3,276
1958	407	230	612	109	113	184	0	242	98	337	412	297	3,041
1959	220	360	284	210	226	472	58	340	379	385	391	285	3,610
1960	148	200	233	177	132	36	179	297	97	247	105	91	1,942
1961	27	414	210	107	94	90	268	280	27	187	207	159	2,070
1964		124	202	91	27	34	163	29			~		-
AVE.	190	220	285	200	154	137	183	247	206	331	341	292	2,854
(%)	6.8	7.9	10.2	7.2	<u>5.5</u>	4.9	6.6	8.9	7.4	11.9	12.2	10.5	100.0

(2) TETEHOSI

												Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1954	-	50	125	388	265	209	240	161	344	236	314	231	-
1955	_	-	-	-	-	-	-		-		-	-	-
1956	91	75	102	74	86	137	121	171	129	396	*	223	-
1957	20	67	167	164	97	97	. 229	164	214	200	193	111	1,723
1958	12	24	80	98	156	145	8	153	207	251	364	137	1,635
1959	60	28	229	222	88	112	127	142	158	397	239	162	1,964
1960	160	85	140	160	97	24	311	207	363	253	392	30	2,222
1961	64	93	82	129	244	118	127	89	145	173	222	243	1,729
1962	81	35	86	126	130	104	138	154	226	267	116	122	1,585
1963	125	12	75	47	94	55	93	42	128	214	245	100	1,230
1964	22	134	-	-	-	65	130	51	101	211	-	•	-
AVE.	71	60	121	156	140	107	152	133	202	260	261	151	1,727
(%)	3.9	3.3	6.7	8.6	7.7_	5.9	8.4	7.4	11.1_	14.3	14.4	8.3	100.0

(3) MANDREHE

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	m/month) Annual
1954	_	_	329	489	170	308	280	409	201	536	549	450	
1955	124	84	210	203	223	148	194	591	229	. 277	301	252	2,836
1957	10	110	114	169	120	125	155	212	-	-	-		-
AVE.	67	97	218	287	171	194	210	404	215	407	425	351	2,836
(%)	2.2	3.2	7.1	9.4	5.6	6.4	6.9	13.3	7.1	13.4	14.0	11.5	100.0

Table 3.11 (2/3) MONTHLY RAINFALL AT 8 STATIONS

(4) LOLOFITU

											(Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1983	_	_		_	_	* 72	* 16	* 0	* 0	*308	* 0	* 0	
1984	-	=	-	-	_	, 2	-	_	-	-	-	-	-
1985	-	_			-	•	_	-	-	-	-	-	-
1986		-		-	_		-	-	_	92	149	* 85	
1987	154	85	* 54	_	-	••	-	-	-	*	*	*	_
1988	.	_	-	•••	-	-	-	_	_	*435	687	312	-
1989	242	234	265	263	356	95	271	384	262	478	451	186	3,487
1990	396	105	54	52	138	-	-	-	-	-	-	-	-
AVE.		-	-	-		-	-		-	-		-	-
(%)	_						-	<u> </u>				-	

Starting year of observation: 1983 *: Data is not complete -: Data is not available

(5) LOLOWAU

•												Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984			-	_	-	-	-	-	-	-	-	-	-
1985	302	338	229	*191	* 3	* 2	* 2	* 3	* 0	* 0	* 0	* 0	-
1986	-	-	-	-	-	-	_	_	-	-	-	-	-
1987	* 0	* 0	* 0	-		-	-	-	-	-	-	-	-
1988	_	-	-	_	-	-	-	-	-	-	1,064	-	-
1989	-	_	-	-	-	_	-	35	58	73	87	•	-
1990		-	-	-	-	-	-	-	-	-	-	•	-
AVE.			_			_	-			-	-		
(%)	-	-	-	-	_	-		•	-			-	_

Starting year of observation: 1984

(6) AWA'AI

											(Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
1983	-	-	-		-	-	-	-	-	-	-	-	-
1984	-	-	-	_	-	-	-	-	-	-	_	-	-
1985	57	148	* 3	342	229	* 46	286	365	489	•	-	-	-
1986	-	-	-	_	-	-	-	· -	-	-	-	-	-
1987	-	-	_	_	-	-	-	-	-	-	-	-	-
1988	_	_	-	-	-	-	-	-	-	* 65	385	127	-
1989	61	149	152	220	187	179	229	277	189	230	202	172	2,247
1990	198	10	50	75	137	•	-	-	-	-	-	-	-
AVE.	-		-	-	-	-	-	-	-	-	-	-	-
(%)		-	-	-	_	_	_		-	-	<u> </u>	-	

Starting year of observation: 1984

Table 3.11 (3/3) MONTHLY RAINFALL AT 8 STATIONS

(7) TETEHOSHI

• •			•								(Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
		-											
1983	•	-	•	-	-		-	~	•			~	
1984	-	-	-	•	-	-	•••	. =	-			• .	
1985	_		_	-	* 40	* 39	* 98	* 59	270	498	899	726	
1986	676	450	964	536	* 0	* 0	* 0	* 0	* 0	* 0	*286	654	
1987	404	535	588	863	474	455	839	590	675	-	. .	-	-
1988			-			_	_	- '	-	*233	886	330	-
1989	296	90	174	211	163	239	276	547	349	366	291	149	3,151
1990	488	65	95	282	109	-	-		~	•	-	-	-
AVE.							-						-
(%)	-	-			_	-		_	_		_		_

Starting year of observation: 1984

(8) TEFAO

											(Unit: m	m/month)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sep.	Oct.	Nov.	Dec.	Annual
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	* 32	100	186	227	* 66	-	429	289	319	_	297	_	-
1986	-	-	-	-	-	-	_	-	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	_	-	-	-	_	-	
1990	-	-	-	-	-	-	-	-	-	-	-	-	-
AVE.	_	-	<u></u>	_	_	<u> </u>		······································			-		·····
_(%)	-	_	_	-	_		-	-	_	-	-		

Source: (1)-(3); Departemen Perhubungan, Badan Meteorologi Dan Geofisika

: (4)-(8); Departemen Pekerjaan Umum, Badan Penelitian
Dan Pengembangan Pekerjaan Umum
Note: Mark (-); Data is not available
Mark (*); Data is not complete

Table 3.12 (1/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(1) TEMPERATURE (AVERAGE)

a)	L	\mathbf{OI}	ÆΩF	ľ	ГU

												(Un	iit; °C)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	1975 - 🛖		-	• -	-	25.0	26.1	27.1	26.5	26.7	26.4	26.4	-
1984	26,2	26.6	26.4	26.8	27.1	26.7	26.2	26.1	25.9	26.0	26.5	26.2	26.4
1985	26.6	27.0	26.9	27.0	26.7	25.8	25.5	26.0	25.9	26.4	26.6	-	-
1986	-	•	-	-	-	-	-	-	-	-	-	-	-
1987		-	-	-	-	-	-	-	-	-	-	-	•
1988	_	-	-	-	· -	-	-	-	-	-	-	-	-
1989	-	-	_	-	-	-	-	-	-	-	_	-	-
1990	-	-	~	-	_	-	-	-	-	-	-	-	-
AVE.	26.4	26.8	26.7	26.9	26.9	25.8	25.9	26.4	26.1	26.4	26.5	26.3	26.4

b) LOLOWA'U

(Unit: °C)

						 -					NT-		
Year	Jan.	Feb.	<u>Mar.</u>	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984		-	_	-	-	-	-	-	-	-	-	26.6	-
1985	26.8	27.1	26.8	26.9	26.7	27.0	26.7	26.6	26.9	27.0	27.3	27.3	26.9
1986	*	27.3	27.5	27.3	27.8	27.4	27.1	27.3	29.4	26.3	22.8	22.5	-
1987	28.6	28.8	28.5	29.0	29.1	29.3	29.9	-	29.1	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	_	_	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-		-	-	-	-	-	-
						25.0			~~ =	72.5	25.1	240	
AVE.	27.7	27.7	27.6	27.7	27.9	27.9	27.9	27.0	28.5	26.7	25.1	24.9	27.2

c) TEFAO

(Unit: °C

rear	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	INOV.	Dec.	Ave.
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984		-	-	-		-	-		-	-	-	-	-
1985	-	-		-	-	-	-	-	-	-	-	-	-
1986	_	_	_	_	-	-	-	-	-	-	-	-	-
1987	-	-	-	-	-	_	-	-	-	-	-	-	_
1988	-	-	•	-	-	-	-	-	-	-	-	-	-
1989	_	-	_	-	~	-	-	-	_	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-		•
AVE.	-		_		-	-	-	-	-	-	-	-	

Table 3.12 (2/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(2) HUMIDITY (AVERAGE)

9)	1	OL	OF	TT	íI
αı	1	\sim L	v	. T T .	Ų.

	30111	•										(U	nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Aye.
1983		·	-	•		87	98	99	98	99	100	99	-
1984	99	89	98	95	99	95	.99	99	- 99	99	99	99	97.4
1985	-	_	· · ·				-		-	-		• -	-
1986	-	-	-	-	-	_	-	- '	-	-	-	-	
1987	_		_	-	-	•	-		-	-	-	-	-
1988	_	-	-	-	-	-	-	-	-	~	-	-	-
1989	·	-	_	-	-	-	-	-	_	-	-	-	
1990	-	-	-	-	-	_	-		-	-	-,	-	•
AVE.	99	89	98	95	99	91	99	99	. 99	99	100	99	97.0

b) LOLOWA'U

									•			(U)	nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Aye.
1983	-	-	-	-	-	-	-		-	-	-	-	
1984	-	-	-	-	-	~	-	-	-	-	-	90	-
1985	87	85	· 87	90	90	87	-86	88	86	91	87	89	87.8
1986	- ·	96	93	91	90	91	94	86	84	93	95	93	_
1987	92	87	82	75	68	-	_	-	- 80		_	· -	-
1988	-	_	-	-	-	_	-	-	-	• -	-	-	-
1989	_	-	-	-	-	-	-	-	-		-	~	· -
1990	-	-	-	-	-	-	-		-	-	-		. -
AVE.	90	89	87	85	83	89	90	87	83	92	91	91	88.1

													nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	-	-	_	-	-	-	-	-	~	· -	-	-	-
1984	-	-	٠ ـ	-	_	-	-	-	-	-	97	97	-
1985	99	96	97	93	92	97	92	93	95	96	94	97	95.1
1986	-	-	_	-	-	-	-	-	•	•	-	-	
1987	-	-	_	-	_	-	-	-	-	-	-	-	• •
1988	-	-		-	-	-	-	-	-	-	-		-
1989	-	-	-	-	-	-	-	-	7	-	-	-	, -
1990	-	_	-	-		•	٠.	-	-	•	-	-	
AVE.	99	96	97	93	92	97	92	93	95	96	96	97	95.2

Table 3.12 (3/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(3) EVAPORATION (AVERAGE)

a) LOLOFITU

			·									(Uni	t: mm)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983						3.3	3.7	4.1	3.9	4.7	5.4	7.9	
1984	4.6	4.6	5.2	4.5	4.7	3.3 4.6	4.5	4.7	3. 9 4.4	5.2	4.4	4.7	4.7
1985	4.3	6.5	4.7	4.5	4.5	4.8	4.7	4.5	4.3	4.2	4.7	5.5	4.8
1986	4.3	4.9	4.1	3.8	3.4	5.0	4.1	5,0	3.5	3.4	4.0	3.9	4.1
1987	-	-	-		-	-	•	-	-	-	-	-	-
1988	-	-	-	-	-	-	-	-	-	-	-	•	-
1989	-	-	-	-	-	-	-	•	-	-	-	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-	-
AVE.	4.4	5.3	4.7	4.3	4.2	4.4	4.3	4.6	4.0	4.4	4.6	5.5	4.6

b) LOLOWA'U

											(Uni	t: mm)
Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	4.6	-
3.7	4.3	3.4	4.7	3.6	4.4	4.8	5.4	4.5	4.4	5.8	5.5	4.5
-	7.0	7.4	5.9	7.5	6.8	6.0	7.7	6.5	7.0	3.2	5.8	-
5.8	7.5	6.6	6.8	5.3	7.2	7.4	_	4.0	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	· -	-	-	-	-	-	-	-	-	-	-
-	•	-	-	-	-	-	-	-	-	-	-	-
48	63	5 8	5.8	- 5 5	61	6.1	6.6	50	57	45	53	5.6
	3.7	3.7 4.3 - 7.0 5.8 7.5	3.7 4.3 3.4 - 7.0 7.4 5.8 7.5 6.6	3.7 4.3 3.4 4.7 - 7.0 7.4 5.9 5.8 7.5 6.6 6.8	3.7 4.3 3.4 4.7 3.6 - 7.0 7.4 5.9 7.5 5.8 7.5 6.6 6.8 5.3	3.7 4.3 3.4 4.7 3.6 4.4 - 7.0 7.4 5.9 7.5 6.8 5.8 7.5 6.6 6.8 5.3 7.2	3.7 4.3 3.4 4.7 3.6 4.4 4.8 - 7.0 7.4 5.9 7.5 6.8 6.0 5.8 7.5 6.6 6.8 5.3 7.2 7.4	3.7 4.3 3.4 4.7 3.6 4.4 4.8 5.4 - 7.0 7.4 5.9 7.5 6.8 6.0 7.7 5.8 7.5 6.6 6.8 5.3 7.2 7.4 -	3.7 4.3 3.4 4.7 3.6 4.4 4.8 5.4 4.5 - 7.0 7.4 5.9 7.5 6.8 6.0 7.7 6.5 5.8 7.5 6.6 6.8 5.3 7.2 7.4 - 4.0	3.7 4.3 3.4 4.7 3.6 4.4 4.8 5.4 4.5 4.4 - 7.0 7.4 5.9 7.5 6.8 6.0 7.7 6.5 7.0 5.8 7.5 6.6 6.8 5.3 7.2 7.4 - 4.0 -	3.7	Jan. Feb. Mar. Apr. May June July Aug. Sep. Oct. Nov. Dec. - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

												(Uni	t: mm)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	-	-	-	-	-	-	-	-	_	-	-	-	-
1984	, · · · -	-	-	-	-	-	-	-	-	-	6.4	4.4	-
1985	3.8	5.1	6.3	3.4	4.2	4.6	2.4	4.3	3.6	3.0	5.3	3.9	4.2
1986	-		-	_	-	-	-	-	-	_	-	-	
1987	-	-	-	-	-	-	_	-		_	-	-	-
1988	-	-	-	-	-	-		-	-	-	-	-	
1989	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	-	-	_	-	_	-	-	-	-
AVE.	3.8	5.1	6.3	3.4	4.2	4.6	2.4	4.3	3.6	3.0	5.9	4.2	4.2

Table 3.12 (4/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(4) SUNSHINE (AVERAGE)

a)	T.	OL	OF	ΤF	'U
aı	L.	\sim 1.	v.	. T T	··

•										-		<u>(U</u>	nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	_	_	_		-	26	36	32	27	29	39	34	· _
1984	28	24	27	28	37	34	27	33	25	27	28	35	29.4
1985	52	44	40	36	41	57	43	42	31	33	27	63	42.4
1986	32	44	31	25	33	47	45		-		36	41	-
1987	32	39	36	31	34	39	35	26	16	-	. •	-	
1988	-	_	-	-	-	_	-	-	-	_		-	-
1989	-	_	-	-	-	_	-	-	_	-	_	-	-
1990	-	-	-	-	-	-	-	-	-	-	-	-	
AVE.	36	38	34	30	36	41	37	33	25	30	33	43	34.6

b) LOLOWA'U

												(U	nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
W											•		
1983	-	-	-	-	-	-		-	-		-	-	
1984		-	-	-	-	•	-		-	-	-	43	
1985	48	53	38	39	33	- 59	48	45	33	39	17	43	41.3
1986	_	36	45	33	43	49	·		-	-	42	35	-
1987	28	40	38	- 16	10	45	48	•	-	_	-		-
1988	-	-	-	-		-	-	-	-	-	-	-	-
1989	_	-	-	-	-	-	-	-	-	-		-	-
1990	-	-	-	-	-	-	-	-		-	-	-	. j .
AVE.	38	43	40	29	29	51	48	45	33	39	30	40	38.8

			***										nit: %)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	-	-	-	-	-	-	-	-	-	-	-	-	· -
1984	, -	_	-	_	-	-	-	-		-	30	40	
1985	44	48	42	43	43	57	34	31	47	41	66	-	
1986	-	-	-	-	-	-	-	-		-	_	-	. • -
1987	-	-	-	-	-	-	-	-	-	-	-	-	
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	-	-	. •	-	-	-		-	-	-	
			- 10		, 10	F/2		21	453	41	70	40	42.0
AVE.	44	48	42	43	43	57_	34	31	47	41	48	40	43.2

Table 3.12 (5/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(5) WINDSPEED (AVERAGE)

a) LOLOFITU

					•							(Uni	t: m/s)
Year	Jan.	Feb.	Mar.	Арг.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
			• •										
1983	-	-	-			0.3	0.4	0.4	0.3	0.3	0.4	0.3	~
1984	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.6	0.4
1985	0.5	0.6	0.5	0.6	0.5	0.6	0.5	0.5	0.4	0.4	0.3	0.4	0.5
1986	0.5	0.6	0.5	0.3	0.4	0,4	0.4	0.4	0.4	0.3	0.3	0.3	0.4
1987	-	_	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-	-	-	_	-	-	~		-	-	-
1989	-	_	-	-	-	-		-	-	-	-	-	•
1990	-	-		-	-	-	-	-	-	-	-	-	-
						•	. :	·					
AVE.	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4

b) LOLOWA'U

100						+ 11 L						(Uni	t: m/s)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
	-												
1983	-	-	-	-	-	-	-	-	-	-	-	~	-
1984	-	-	-	-	-	-	-	-	-	-	_	0.7	-
1985	0.6	2.0	0.6	0.9	0.5	0.7	0.1	0.2	0.1	0.2	0.1	0.1	0.5
1986	-	0.6	0.2	0.1	0.2	0.2	0.8	2.0	1.1	0.2	0.2	0.2	_
1987	0.1	0.1	0.1	0.1	0.0	0.2	0.5	-	_	~	_	-	-
1988	-	-	-	-	-	-	-	-	-	_	-	-	-
1989	-	_	*	+	-	-		-	-	-	-	-	_
1990	-	-	-	_	-		-	-	-	-	-	-	-
AVE.	-	0.9	0.3	0.4	0.2	0.4	0.5	1.1	0.6	0.2	0.1	0.3	0.5

c) TEFAO

0) 1121												(Uni	t: m/s)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	_	_	_	-	· -	_	_	-	••	-	-		_
1984	-			_		-	-	_	-	_	0.3	0.2	-
1985	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.0	0.2
1986	-	-	-	-	_	-	-	_	-	-	-	-	-
1987	-	-	-	-	-	-	-	-	-	-	-	-	-
1988	-	-	-		-	-	-	-	_	-	-	-	-
1989	-	-	-	-	-	-	-	-	-	-	•	-	-
1990	-		-	-	-	-	-	-	-	-	_	-	~
A 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	~~~~										- 00		
AVE.	0.2	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.1	0.2

Source: (1)-(5); Departemen Pekerjaan Umum, Badan Penelitian Dan Pengembangan Pekerjaan Umum

Table 3.12 (6/6) THE METEOROLOGICAL DATA AT 3 STATIONS

(6) SUNSHINE (AVERAGE)

2)	1 1	OI I	OF.	TT	1
a	L		UZI.		J

,		-									(Unit	: cal/cr	n2/day)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
				1.0									
1983	-	-	-	-	-	337	310	340	324	298	331	241	-
1984	-		-			• -	-	-		-	-	-	-
1985	_	-	· -	350	312	396	331	370	333	335	299	320	4
1986	328	322	251	275	252	302	7 i =	-		: -	-	-	
1987	-	•	-	_	-	-			-	-	-	-	: '-
1988	-	-	-	-	-	-	-	-	-	-	-	-	-
1989	_	-	-	-		-	-	-		-	-		
1990	-	-	-	-	-	-	. -	-	-	-	-	-	-
AVE.	328	322	251	313	282	345	321	355	329	317	315	281	313.0

b) LOLOWA'U

•					•							: cal/cn	n2/day)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
1983	-	-	-	-	-	-	-	-		-	-	-	-
1984	-	_	-	-	-	-	_	-	-	-	-	-	-
1985	-	-	_	-	-	-	-	-	-	-	-	-	-
1986	-	-	-	-	-		-	-	-	-		•	-
1987		-	-	, -	-	-	-	-	-	-	_	+	-
1988	-	-		-	-	· -		-	٠ -		-	• -	
1989	-	-	-	-	-	-	-	-	-	-	-	-	-
1990	-	-	_	-	-	-	-	-	-	-	-	-	-
							·						
AVE.	-	-		-	-	-	_		_	-		_	

											(Unii	: cal/cr	n <i>z/</i> day)
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Ave.
						1.							
1983	-	-	-	-	-	-	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-	-	-	-	-	-	-
1985	-	-	-	-	-	-	-	-	-	-	-	-	
1986	-	-	-	-	· -	<u>-</u>	-	. =	-	-	-	-	-
1987	-	-	-	-	-	-	_	-	-	-	-	-	-
1988	-	-	_	•	-	-	-	-	-	-	-	-	-
1989	_	-	-	-	-	-	-	-	-	-	-	-	.* -
1990	-	-	_	-	-	-	-	-			-	-	-
AVE.	_	-		-	-	-	_	-		-	-	-	-

Table 3.13 CONSECUTIVE DROUGHT DAY G. SITOLI STATION

(Unit: days)

		**************************************			Ranking					. uays/
Year	No.1		No.2		No.3		No.4		No.5	
	Date	Days	Date	Days	Date	Days	Date	Days	Date	Days
1980	FEB. 5 - 21	17	JAN.23 -FEB.3	12	JAN.11 - 21	11	OCT.16 - 26	11	JUNE.14 - 22	9
1981	JULY.31 -AUG.18	19	JAN.20 -FEB.1	13	SEPT.30 -OCT.12	13	DEC.17 - 29	13	JAN7-16 MAR1-10	10 10
1982	JAN.20 - 31	12	AUG.22 - 31	10	FEB.10 - 18	9	JAN.12 - 18	7	NOV.17 - 23	7
1983	JUNE.21 -JULY.5	15	MAR,30 -APR.8	10	FEB. 7 - 15	9	MAY.27 -JUNE.4	9	AUG.21- SEP.29-	9 9
1984	FEB. 7 - 16	10	AUG.31 -SEPT.7	8	NOV.14 - 21	8	MAY.10 - 16	7	AUG.11- DEC.8-	7
1985	JUNE.22 -JULY.4	13	JAN,20 - 30	11	AUG. 4 - 14	11	FEB.21 -MAR.1	9	OCT.8- DEC.19	9 9
1986	MAY.10 - 24	15	AUG. 6 - 20	15	FEB 17 - 27	11	FEB. 4 - 12	9	MAY.26- JUNE13-	8
1987	FEB.19 -MAR.3	13	MAY. 6 - 17	12	JAN.21 - 30	10	APR.14 - 23	10	JUNE.5 - 13	9
1988	MAY.18 - 31	14	JAN. 7 - 18	12	APR.14 - 25	12	JULY.15 - 23	9	FEB. 8 - 15	8
1989	FEB. 1 - 17	17	JUNE.4 - 18	15	MAR. 7 - 19	13	JULY.19 - 31	13	DEC.10 - 19	10

Source: Badan Meteorologi Dan Geofisika, Departemen Perhubungan

Table 3.14 MAXIMUM DAILY RAINFALL.

(Unit: mm/day)

F-30400 pc. (80400444)					Ranking					
Year	No.1		No.2		No.3		No.4		No.5	
	Date	(mm)	Date	(mm)	Date	(mm)	Date	(mm)	Date	(mm)
1980	OCT,29	73.1	FEB.26	71.5	OCT. 9	64.9	DEC.21	64.3	ОСТ.14	61.8
1981	MAY. 3	105.3	JUNE.9	85.0	MAR.11	61.7	OCT.29	59.9	DEC. 1	53.7
1982	OCT.15	101.5	AUG.20	73.7	MAR. 5	72.2	JUNE.29	70.0	MAR 22	68.2
1983	OCT.18	79.8	OCT. 8	76.3	OCT.27	70.3	MAY.15	61.8	MAR. 7	61.7
1984	NOV. 1	77.9	JUNE.24	71.5	SEPT.20	68.3	SEPT.23	67.6	SEPT.27	61.7
1985	AUG.15	84.0	SEPT.17	65.9	DEC.15	65.5	MAR.15	64.8	JUNE.17	64.5
1986	JAN.7	133.4	NOV.29	90.2	DEC. 3	68.9	SEPT.7	60.0	JAN.31	52.4
1987	SEPT.21	111.3	JUNE.30	101.6	OCT.21	86.1	AUG. 4	84.6	MAY.29	70.0
1988	SEPT. 5	77.2	NOV.22	75.0	NOV.19	62.7	DEC.22	63.8	DEC.14	63.6
1989	JAN. 1	84.3	JAN.21	74.0	MAY.11	66.5	NOV. 4	66.5	DEC. 1	53.8

Source: Badan Penelitian and Pengembangan Pekerjaan Umum, Departemen Pekerjaan Umum

Table 3.15 MAXIMUM HOURLY RAINFALL

(Unit: mm/hour) Ranking No. 1 No. 2 No. 3 No. 4 No. 5 Date Rain Date Rain Date Rain Date Rain Date Rain Year Hour (mm) Hour (mm) Hour (mm) Hour (mm) Hour (mm) 01.NOV 20SEPT 17.APR 22.DEC 24.AUG 1984 02-03 46.3 11-12 45.3 15-16 34.0 12-13 32.8 12-13 32.2 03.NOV 15.DEC 17SEPT 17JULY 30.OCT 1985 03-04 49.6 14-15 40.4 14-15 45.7 45.5 15-16 17-18 32.9 07.JAN 26.AUG 29.NOV 12.OCT 25.MAY 1986 00-01 70.3 13-14 30.5 57.8 15-16 33.2 14-15 13-14 30.2 30JUNE **04.AUG** 29.MAY 21.OCT 04.DEC 1987 13-14 85.0 01-02 16-17 23-24 41.6 15-16 78.9 58.4 41.3 05SEPT 10.MAY 01MARC **22.DEC** 08.OCT 1988 14-15 61.7 08-09 54.8 06-07 49.5 39.3 00-01 14-15 39.3 01.DEC 01JUNE 05.AUG 28MARC 01.JAN 1989 22-23 60.4 05-06 46.5 14-15 36.8 34.8 00-01 32.2 15-16

Source: Badan Penelitian and Pengembangan Pekerjaan Umum, Departemen Pekerjaan Umum

Table 3.16 PROBABILITY OF ANNUAL RAINFALL (G.Sitoli Station)

Return Period	Value (mm/year)
1/100	2,144.2
1/50	2,223.0
1/30	2,288.5
1/20	2,346.4
1/ 10	2,461.8
1/ 5	2,609.3
1/ 3	2,755.0
1/ 2	2,916.4

Period: 31 years (From 1952 to 1989)

Table 3.17 PROBABILITY ANALYSIS OF CONSECUTIVE DROUGHT DAY

Return Period	Value (Days)	
1/2	14	
1/5	17	
1/ 10	18	
1/30	20	
1/50	20	

Table 3.18 LIST OF RIVERS IN NIAS ISLAND

River's Name	Catchment Area	Stream Length	A/L
	A(Km2)	L(Km)	
Muzoi	459	78.0	5.88
Sawo	44	15.0	2.93
Sowu	194	44.0	4.41
Olora	31	11.0	2.82
Nou	40	12.0	3.33
Idanoi	78	21.0	3.71
Gidosiido	51	19.5	2.62
Gidozebuwa	103	35.0	2.94
Gawo	121	39.0	3.10
Mola	134	44.0	3.05
Susuwa	203	44.0	4.61
Masio	81	15.0	5.40
Medsyaja	81	14.0	5.79
Sau'a	50	16.0	3.13
Eho	233	44.0	5.30
O'ou	48	15.0	3.20
Siwalawa	56	11.0	5.09
Lahomi	84	25.0	3.36
Move ordo	92	30.0	3.07
Oyo	497	82.0	6.06
Dumula	97	18.5	5.24
Ndra	7	5.0	1.40

Note: Figures are measured by use of top-map (1/50,000)

Table 3.19 SPECIFIC FEATURES OF THE MAIN RIVERS

Feature	Name of Main Rivers			
	Gawo	Mola	Muzoi	Оуо
Catchment area (Km2)	121	134	459	497
Altitude (m)				
Headwaters	625	500	365	370
Plain terrain	20	20	50	50
Stream length (km)	39	44	78	82
Stream gradient			•	•
Headwaters	L= 25 Km 1/40	L= 33 Km 1/70	L= 44 Km 1/140	L= 54 Km 1/170
Plain terrain	L= 14 Km 1/700	L= 11 Km 1/550	L= 34 Km 1/680	L= 28 Km 1/560
	•			

Note: Figures are measured by use of top-map (1/50,000)

Table 3.20 GAUGING STATIONS AND COLLECTED DATA

		Gauging station	
Items	Oyo River	Mezawa River	Eho River
The situation			
Latitude (N)	0°58'30"	1°1'-	0°41'-
Longitude (E)	97°35'30"	97°46'-	97°43'-
Starting year	1984	1983	1983
Altitude (m)*	200.0	62.5	50
The distance from river-mouth (Km)*	50.0	11	15.2
The longitudinal slope of river*	1/140	1/110	1/440
The period of collected data	4.Apr.1984 - 5.Jan.1987	5.Apr.1984 -24.Sept.1987 and 1.Aug.1989 -28.Feb.1990	5.Aug.1984 - 4.Sept.1984 and 22.Nov.1984 -20.Jan.1985

Note: Source; Departemen Pekerjaan Umum: Mark(*); Measured by use of topo-map (1/50,000)

Table 3.21 THE OBSERVATION OF RIVER DISCHARGE

Date	Name of River	Mezawa	Gawo	Gido	Mola	Muzoi
	Catchment area (Km2)	22.0	76.0	68.0	73.0	344.0
21 Aug., 1990 Discharge	Q(m3/s)	0.26	1.73	0.92	_	_
Specific run-of		1.182	2.276	1.353	_	
Spoome ran ex	* 1	2120%		•		
22 Aug., 1990						
Discharge	Q(m3/s)	•	-	-	1.48	-
Specific run-of	f q	-	-		2.027	-
25 Aug., 1990	·					
Discharge	Q(m3/s)	0.26	0.85	0.79	-	
Specific run-of		1.182	1.118	1.162	-	-
•						
30 Aug., 1990	0(-2/-)				1.59	
Discharge	Q(m3/s)	-	-	-	2.178	<u>-</u>
Specific run-of	f q	-	•	_	. 2.170	_
31 Aug., 1990	•					
Discharge	Q(m3/s)		• -	-		9.56
Specific run-of	f q	-	-	-		2.779
1 Cont 1000						
1 Sept., 1990 Discharge	Q(m3/s)	0.60	2.42	_	_	_
Specific run-of		2.727	3.184		÷.	-
Specific rain or	- 4					
6 Sept., 1990		4.0.				
Discharge	Q(m3/s)	1.36	6.84	-	-	-
Specific run-of	f q	6.182	9.000	-	-	-
11 Sept., 1990						
Discharge	Q(m3/s)	-	-		7.21	-
Specific run-of			-	-	9.877	-
12 0 1000						
13 Sept., 1990 Discharge	Q(m3/s)	0.60	3.62	_	-	_
Specific run-of		2.727	4.763	-	_	=
opcomo ran or	- 7	<i>~~</i> , <i>~~</i> , <i>~</i> , <i>~</i> , <i>~</i> , <i>~</i> , <i>~</i> , <i>~</i>	00			
27 Sept., 1990				•		
Discharge	Q(m3/s)	~	<u></u>			22.98
Specific run-of	f q	-	-	-		6.680
	<u> </u>					

Note: Q(m3/s) is a discharge converted by current meter Specific run-off; q (m3/s/100 Km2) Catchment area; the point of discharge's observation

Source: JICA Study Team, 1990

Table 3.22 CALCULATION OF EVAPOTRANSPIRATION

Month	ETpen	ET	ETpt	2@ETpt	ETa	ETa
	(mm)	(mm/month)	(mm/day)		(mm/day)	(mm/month)
Jan.	5.62	174	4.79	9.58	5,62	123
Feb.	5.82	163	4.91	9.82	5.82	112
Mar.	5,95	184	4.79	9.58	5.95	113
Apr.	5.80	174	4.41	8.82	5.80	91
May	5.38	167	4.41	8.82	5.38	107
Jun.	4.95	149	4.66	9.32	4.95	131
Jul.	5.07	157	4.16	8.32	5.07	101
Aug.	5,39	167	4.41	8.82	5.39	106
Sep.	5.83	175	4.16	8.32	5.83	67
Oct.	5.97	185	4.03	8.06	5.97	65
Nov.	5.83	175	4.16	8.32	5.83	75
Dec.	5.65	175	4.41	8.82	5.65	98
Total		2,045				1,189

Table 3.23 HIGH WATER DISCHARGE AT MAIN RIVER

Name of River	Idano	Mezawa	Gawo	Muzoi	Remark
Catchment Area A (Km2)*	73.0	22.0	76.0	344.0	Map 1/50,000
Longitudinal slope: I	1/100	1/110	1/100	1/500	Map 1/50,000
Coefficient of roughness (n)	0.060	0.080	0.060	0.060	
Velocity V (m/s)	1.936	2.365	1.938	1.744	Manning Formula
Discharge area A'(m2)	207.0	104.0	252.0	706.0	Cross Leveling
Discharge Q (m3/s)	401	246	489	1232	
q = Q / A (m3/s/Km2)	5.49	11.18	6.43	3.58	
Season	September	October		October	Hearing
and frequency	Nobember 3 times /year	3 times /year		Nobember 3 times /year	Survey

Note: * Catchment Area: Measured at the observation point of river discharge

Table 3.24 RESULTS OF WTAER QUALITY ANALYSIS

		· · · · · · · · · · · · · · · · · · ·			Wate	r Cond	ition		****
No.	Sampling Place		pH	Ec	Fe++	Zn	NH4	Collon B	Colour
	and the second s			μυ /cm	ppm	ppm	ppm	(%)	
1.	Pumping Station	(D,W)	**	540	0.0	0.0	0.0	15	Clean
	Soewe	(D.W)	-	590	0.2	0.1	1.0	80	Clean
3.	Umbu	(D.W)	_	330	0.2	0.1	1.0	40	Clean
4.	Gido	(R.W)	-	470	0.3	0.2	12.0	100	Turbid
5.	Labusa	(D.W)		450	0.0	0.5	0.0	100	Clean
6.	Silombu	(D.W)	-	740	0.2	0.0	5.0	50	Turbid
7.	Lolowau	(D.W)	-	50	0.1	0.0	10.0	40	Turbid
8.	Teluk Dalam	(D.W)		480	0.0	0.2	1.0	50	Clean
9.	Tetehosi	(D.W)	-	620	0.0	1.0	0.0	20	Clean
10.	Idano Gawo	(R.W)		460	0.2	0.0	0.2	30	Turbid
11.	Mezawa	(R.W)	_	500	0.3	0.0	0.2	90	Turbid
12.	Air Panas	(R.W)	-	750	0.0	0.0	1.5	5	Clean

Note: D.W = Drinking water R.W = River water

Table 3.25 (1/3) SOIL CHARACTERISTIC AND LAND SUITABILITY

No.	Great Soil	Topography (%)	Parent Material	Vegetation	Soil Depth	Drainage	Soil	Acidity (pH)	
1	Group Peat Soils	Phisiography 0 - 2 Coastal	(Origin) Peat Swamp Forest	Swamp Forest	(cm) 0 - 80	Very poor	colour Black, Olive Black	<4 Extreemly acid	
2	Marine Swamp Soils	Plain (cp) 0 - 2 (cp)	Marine Sediment	Swamp Forest	0 - 80	Very poor	Black	Slightly alkalin	
3	Regosol	0 - 3 (cp)	Sedimentary	Bush	30 - 90	Excessive	Light Olive Gray, Olive Gray		
4	Alluvial Soils	0 - 3 Alluvial Plain (ap)	Sedimentary	Paddy	60 - 90	Moderately Poor	Olive Gray	Very strong acid, slightly acid	
No.	Great Soil Group	Fertility <l< td=""><td>Texture <2</td><td>Wetland</td><td>Land Suit Upland</td><td>ability <3 Tree Crops</td><td>Forest</td><td>Soil Taxonomy (USDA, 1975)</td><td>Area (ha)</td></l<>	Texture <2	Wetland	Land Suit Upland	ability <3 Tree Crops	Forest	Soil Taxonomy (USDA, 1975)	Area (ha)
1	Peat Soils	K=0.6-1.0 P=Low N=High	Peat	N	N	M	М	Tropofibrists, Tropohemists	5,200
2	Marine Swamp Soils	K=0.1-0.2 P=Low N=Medium Na=High	Peat/swamp	N	N	N	М	Sulfaquents	3,200
3	Regosol	K=0.6-1.0 P=Low N=Low	Moderately coarse (SL)	N	M	S (Co)	М	Tropopsamments, Tropaquents	18,500
4	Alluvial Soils	K=0.1-0.2 P=Medium N=Medium	Moderately fine (CL, SiCL, SCL)	S	S	S	S	Fluvaquents, Tropofluvents	20,900
1	Vote: <1	: Fertility	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·			
	-	Rating	K=Ava (me/100		vailab P m) *2	N=To	otal N y weight)*3	Na=Exchang (me/100g	
	•	1. Very High		, (P)	-		.0	, morroo	3011)
	;	2. High	>0		- 20		- 1.0	>0.2	
		 Medium Low 			- 13 - 7	0.2	- 0.5 - 0.2	0.1 - (<0.1	
		5. Very low		-	-	<0		•	
	1	*1 : G.W. Thama *2 : Olsen's meth *3 : Kjeldahl met	od, Cooke, 196'	7					
	<2	: Soil Texture SL = Sandy Lo CL = Clay Loa SiCL = Silty C SCL = Sandy C SiC = Silty Cla L = Loam C = Clay SC = Sandy Cl LS = Loamy Si S = Sand	m lay Loam Clay Loam Y ay		: Land Suita S = Suita M = Mar N = Not \(\) (Co) = Co (Rb) = Ro (Cl) = Cl	ble ginally Suitab Suitable oconuts ibber	<4 :	Acidity (pH (H20 Extremely acid = Very strongly acid = Strongly acid = 4 Moderately acid = 6. Neutral = 7.0 Slightly alkalin =	<3.5 d = 3.6-4 .6-5.5 = 5.6-6.5 6-6.1

Table 3.25 (2/3) SOIL CHARACTERISTIC AND LAND SUITABILITY

No.	Great Soil	Topography (%)	Parent Material	Vegetation	Soil Depth	Drainage	Soil	Acidity (pH)	
	Group	Phisiography	(Origin)		(cm)		colour	<4	
5	Gray Hydro- morphic Soils	0 - 3 ap	Sedimentary	Paddy	30 - 60	Poor	Light Olive Gray	Very acid, slightly acid	
6	Latosol	8 - 25 terrace (tr)	Dacient	Bush	60 - 90	Well	Reddish Brown-Dark Red	Strongly acid, slightly acid	
7	Renzina	8 - 25 tr	Marl, Limestone	Bush, rubber	60 - 90	Well	Dark Red	Neutral, Slightly Alkalin	
8	Red Yellow Mediterranean Soil	8 - 25 tr	Marl, Limestone	Bush, rubber	30 - 60	Well	Bright Yellowish Brown	Neutral, Slightly Alkalin	
					Land Suit	ε ability <2		Soil	Area
No.	Great Soil Group	Fertility <1	Texture <2	Wetland	Upland	Tree Crops	Forest	Taxonomy (USDA, 1975)	(ha)
5	Gray Hydro- morphic Soils	K=0.1-0.2 P≤High N≃Mcdium	Moderately fine (CL, SiCL, SCL) -Medium (L, SL)	S	N	М	М	Hydraquents	45,900
6	Latosol	K=Medium P⇒Medium N=Medium	Fine (CL, SiCL, SCL)	N	S	S (Rb/Cl)	M	Haplorthox	10,500
7	Renzina	K≔Medium P=Medium N≖Medium	Fine (C, SC, SiC)	N	M	M (Rb/Cl)	М	Rendolls	11,700
8	Red Yellow Mediterranean Soil	K=Medium P=Medium N=Medium	Fine (C, SC, SiC)	N	S	S (Rb/Cl)	М	Tropudults, Tropudalfs	66,700
]	Note: <1:	Festility							
	·	Rating			Availab P pm) *2		otal N y weight)*3	Na=Exchan (me/100	
	. 3	2. High 3. Medium 4. Low 5. Very low	0.5 - <0		12 - 20 8 - 13 5 - 7	0.2 0.1	- 1.0 - 0.5 - 0.2).1	>0. 0.1 - <0.	0.2 I
		1: G.W. Thama 2: Olsen's meth 3: Kjeldahl me	od, Cooke, 196	7					
	<2	: Soil Texture SL = Sandy Lo CL = Clay Lo SiCL = Silty C SiC = Silty Cl L = Loam C = Clay SC = Sandy Cl LS = Loamy S	am Ilay Loam Clay Loam ay	· · · · · · · · · · · · · · · · · · ·	3: Land Suit S = Suit M = Ma N = Not (Co) = C (Rb) = R (C1) = C	able rginally Suitab Suitable oconuts ubber		Acidity (pH (H2 Extremely acid = Very strongly ac Strongly acid = 4 Moderately acid Slightly acid = 6 Neutral = 7.0 Slightly alkalin =	= <3.5 id = 3.6-4.5 4.6-5.5 = 5.6-6.5 .6-6.1

Table 3.25 (3/3) SOIL CHARACTERISTIC AND LAND SUITABILITY

No.	Great Soil Group	Topography (%) Phisiography	Parent Material (Origin)	Vegetation	Soil Depth (cm)	Drainage	Soil colour	Acidity (pH) <4	
9	Red Yellow Podzotic Soils	25 - 40 Undulating hill (h)	Acid Rocks, Rhyolite	Bush, coarse grass	60 - 90	Well	Bright Yellowish Brown	Very strong- strongly acid	
10	Red Podzolic Soils	25 - 40 (h)	Acid rocks	Bush, coarse grass	60 - 90	Well	Bright Reddish Brown	Very strong- strongly acid	
11	Brown Podzolic Soils	25 - 40 Mountain (m)	Acid rocks	Bush	60 - 90	Well	Brown	Strongly acid, moderately acid	
12	Podzolic Soils	25 - 40 (m)	Acid rocks	Bush	60 - 90	Well	Yellowish Brown	Strongly acid, moderately acid	
13	Lithosol	>40 (m)	Acid rocks, Base rocks	Bush	0 - 10	Excessive	Yellowish Brown	Very acid	
					1 1 0			Soil	A
No.	Great Soil	Fertility	Texture		Land Suit	adinty <3		Taxonomy	Area
	Group	<1	<2	Wetland	Upland	Tree Crops	Forest	(USDA, 1975)	(ha)
9	Red Yellow Podzolic Soils	Low-medium	Fine-Mode- rately (CL, SCL, SiCL)	N	N	S (Rb/Cl)	S	Tropudults, Tropudalfs	118,000
10	Red Podzolic Soils	K=Low P=Low N=Low	Moderately (CL, SCL, SiCL)	N	N	S (Rb/Cl)	s	Tropudults, Tropudalfs	3,600
11	Brown Podzolic Soils	K=Low P=Low N=High	Moderately (CL, SCL, SiCL)	N	N	S (Rb)	S		4,800
12	Yellowish Brown Podzolic Soils	K=Low P=Low N=High	Moderately (CL, SCL, SiCL)	N	N	S (Rb)	S	Eutropets, Humitropepts	15,300
13	Lithosol	K=Low P≖Very low N=Very low	Moderately coarse (SL)- coarse (LS, S)	N	N	N	s	Troporthents	78,100
ı	Note: <1:	Fertility				•			
			K=Avai		vailab P		otal N	Na=Exchang	
	1.	Rating Very High	(me/100 ₂	<u></u>	om) *2		y weight)*3	(me/100g	
		High Medium	>0 0.5 -		2 - 20 3 - 13		- 1.0 - 0.5	>0.2 0.1 - (
		Low	<0.		5 - 7	0.1	- 0.2	<0.1	
	-	Very low	1066 hand a	- LICA soils		.<().1	-	
	*2	: G.W. Thamas : Olsen's metho	od, Cooke, 1967	<i>.</i>		•			
		: Kjeldahl meti Soil Texture	nod, Metson, 19		: Land Suita	able Class	<4:	Acidity (pH (H20	ווכ
	~~ .	SL = Sandy Lo		7	S = Suita	ble		Extremely acid =	<3.5
		CL = Clay Loar SiCL = Silty Cl			M ≈ Mar N ≈ Not	ginally Suitab Suitable	le	Very strongly aci Strongly acid = 4	
		SCL = Sandy C	lay Loam		(Co) = Cc	conuts		Moderately acid:	= 5.6-6.5
		SiC = Silty Clay L = Loam	1		(Rb) = Ru (Cl) = Cl			Slightly acid $= 6$. Neutral $= 7.0$	6-6.1
		C = Clay SC = Sandy Cla	•		(42) (1)	- • • .		Slightly alkalin =	7.1-7.5
		LS = Loamy Sa S = Sand	11G						

Table 3.26 CRITERIA FOR LAND CAPABILITY

		Land Suitability	*******
Criteria	Rice	Upland crop	Tree crop
	Farming	Farming	Farming
1. Slope (%)			
<3	S	S	S
3 - 24	M	Š	S
25 - 40	N	N	S
>40	N	N	N
2. Effective Soil Depth (cm)			
> 90	S	S	S
60 - 90	Š	Š	Š
30 - 60	M	Š	Š
< 30	N	M	N
3. Drainage Condition			
Well	N	S	S
Moderate	S	. S	S
Poor	S	N	M
4. Soil Texture			
Fine	S	S	S
Medium	S	S	S
Coarse	N	M	S
5. Soil Reaction (pH (H2O))			
pH > 7.5	N	N	N
pH 6.6 - 7.5	M	S	S
pH 5.6 - 6.5	S	S	S
pH 4.6 - 5.5	S	S	S
pH 3.6 - 4.5	M	N	N
pH < 3.5	N	N	N
6. Groundwater Quality			
Fresh	S	S	S
Brackish/Sulphurous	N	N	S
Saline (tidal)	N	N	N

Note: S = Suitable

M = Marginally Suitable

N = Not Suitable

Source: Modified DGFCA, DA and USU Standard.

Table 3.27 HARVESTED AREA, PRODUCTION AND YIELD OF PADDY

KECAMATAN	1984	1985	1986	1987	1988	1989
HARVESTED AREA(HA)						
T.DALAM	2,610	3,081	3,769	3,625	3,134	3,967
LAHUSA	478	630	760	701	.728	819
GOMO	196	474	779	508	375	707
IDANO GAWO	5,034	4,780	5,235	5,806	6,183	5,767
LOLOWA'U	1,034	1,125	1,020	1,270	1,246	1,331
SIROMBU	636	655	600	897	795	560
MANDREHE	1,050	1,065	1,085	1,226	1,592	1,695
GIDO	6,322	6,331	6,843	6,754	6,772	6,408
G.SITOLI	1,379	1,488	1,870	1,646	1,641	1,383
ALASA	2,080	2,478	2,522	2,175	2,282	1,907
LAHEWA	420	420	432	438	468	525
TUHEMBERUA	3,258	3,563	3,670	3,782	3,467	3,448
TOTAL	24,497	26,090	28,585	28,828	28,683	28,517
PRODUCTION(TON)						
T.DALAM	9,219	11,071	12,807	13,485	9,060	13,139
LAHUSA	1,458	1,919	2,497	1,833	1,088	1,280
GOMO	597	1,361	2,449	1,295	642	1,211
IDANO GAWO	18,198	17,426	18,637	15,716	19,936	19,129
LOLOWA'U	3,076	3,292	3,470	3,619	3,610	4,351
SIROMBU	1,933	2,123	1,937	3,543	2,640	1,628
MANDREHE	3,412	3,396	3,470	4,637	5,190	5,385
GIDO	22,875	23,176	33,946	21,343	22,206	20,224
G.SITOLI	5,046	5,433	7,153	5,917	4,820	4,376
ALASA	6,157	7,472	8,038	5,524	3,506	5,115
LAHEWA	1,281	1,281	1,378	1,240	1,105	1,601
TUHEMBERUA	11,729	12,877	14,001	12,680	10,989	10,834
TOTAL	84,981	90,827	109,783	90,832	84,792	88,273
TRUE MINI D GOLDAN						
UNIT YIELD(TON/HA)	2.5		2.4		2.0	
T.DALAM	3.5	3.6	3.4	2.3	3.0	3.3
LAHUSA	.3.1	3.3	3.3	2.6	1.5	1.5
GOMO	3.0	3.5	3.1	2.5	1.7	1.7
IDANO GAWO	3.6	3.6	3.6	2.7	3.2	3.3
LOLOWA'U	3.0	3.0	3.4	2.9	2.9	3.3
SIROMBU	3.0	3.2	3.2	4.0	3.3	2.9
MANDREHE	3.3	3.2	3.2	3.8	3.3	3.2
GIDO	3.6	3.7	3.8	3.6	3.3	3.2
G.SITOLI	3.7	3.7	3.8	3.6	2.9	3.2
ALASA	3.0	3.0	3.2	2.5	1.5	2.7
LAHEWA	3.1	3.1	3.2	2.8	2.4	3.0
TUHEMBERUA	3.6	3.6	3.8	3.4	3.1	3.1
TOTAL	3.5	3.5	3.8	3.1	3.0	3.1

Data source: Agricultural service TK II Nias

Table 3.28 HARVESTED AREA, PRODUCTION AND YIELD OF MAJOR CROPS

production(ha)	Kind of Crops	1984	1985	1986	1987	1988	1989
production(ha)	upland rice						
unit yield(t/ha) 1.6 1.6 1.6 1.7 1.5 1.6 maize harvested area(ha) 3,380 4,150 4,408 4,053 4,062 2,826 production(ha) 2,700 3,337 3,392 3,205 3,680 2,562 unit yield(t/ha) 0.80 0.80 0.77 0.79 0.91 0.91 cassava harvested area(ha) 9,885 9,933 7,781 7,547 8,773 10,416 production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet polato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8	harvested area(ha)	16,542	16,683	16,788	21,108	18,650	5,340
Parize P	production(ha)	26,248	26,694	26,863	35,669	28,454	8,299
harvested area(ha)	unit yield(t/ha)	1.6	1.6	1.6	1.7	1.5	1.6
production(ha) 2,700 3,337 3,392 3,205 3,680 2,562 unit yield(t/ha) 0.80 0.80 0.77 0.79 0.91 0.91 0.91 Cassava harvested area(ha) 9,885 9,933 7,781 7,547 8,773 10,416 production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 Peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 Green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 Soy beans harvested area(ha) 33 production(ha) 334	maize						
unit yield(t/ha) 0.80 0.80 0.77 0.79 0.91 0.91 cassava harvested area(ha) 9,885 9,933 7,781 7,547 8,773 10,416 production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 <	harvested area(ha)	3,380	4,150	4,408	4,053	4,062	2,826
Cassaya harvested area(ha) 9,885 9,933 7,781 7,547 8,773 10,416 production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 33 production(ha) 33 production(ha) 33 production(ha) 33	production(ha)	2,700	3,337	3,392	3,205		
harvested area(ha) 9,885 9,933 7,781 7,547 8,773 10,416 production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34 34	unit yield(t/ha)	0.80	0.80	0.77	0.79	0.91	0.91
production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 3 34 production(ha) 3 34	cassava						
production(ha) 101,470 103,038 80,322 80,632 92,428 108,713 unit yield(t/ha) 10.3 10.4 10.3 10.7 10.5 10.4 sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 3 34 production(ha) 3 34	harvested area(ha)	9,885	9,933	7,781	7,547	8,773	10,416
sweet potato harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) - - - - - - - - - 33 production(ha) - - - - - - - - - - - - - - - - - - - -		101,470	103,038	80,322	80,632	92,428	
harvested area(ha) 8,874 8,010 6,966 7,260 7,828 8,787 production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 334	unit yield(t/ha)	10.3	10.4	10.3	10.7	10.5	10.4
production(ha) 61,319 56,455 53,183 63,199 61,619 68,794 unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	sweet potato						
unit yield(t/ha) 6.9 7.0 7.6 8.7 7.9 7.8 peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	harvested area(ha)	8,874	8,010	6,966	7,260	7,828	8,787
peanuts harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) - - - - - 33 production(ha) - - - - - 34	production(ha)	61,319	56,455	53,183	63,199	61,619	68,794
harvested area(ha) 56 59 51 78 103 66 production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	unit yield(t/ha)	6.9	7.0	7.6	8.7	7.9	7.8
production(ha) 46 59 45 67 86 54 unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	peanuts						
unit yield(t/ha) 0.82 1.00 0.88 0.86 0.83 0.82 green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	harvested area(ha)	56	59	51	78	103	66
green beans harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	production(ha)	46	59	45	67	86	54
harvested area(ha) 78 82 48 69 61 150 production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	unit yield(t/ha)	0.82	1.00	0.88	0.86	0.83	0.82
production(ha) 63 62 37 70 50 150 unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	green beans						
unit yield(t/ha) 0.81 0.76 0.77 1.01 0.82 1.00 soy beans harvested area(ha) 33 production(ha) 34	harvested area(ha)	78	82	48	69	61	150
soy beans harvested area(ha) - - - - 33 production(ha) - - - - 34	production(ha)	63	62	37	70	50	150
harvested area(ha) 33 production(ha) 34		0.81	0.76	0.77	1.01	0.82	1.00
production(ha) 34	soy beans						
	harvested area(ha)	-	.	-	-	. -	33
unit yield(t/ha) 1.0	production(ha)		-	· -	-	-	34
	unit yield(t/ha)	- · · · · · · · · · · · · · · · · · · ·	_	•		-	1.0

Table 3.29 (1/5) PLANTED AREA AND PRODUCTION OF TREE CROPS

RUBBER

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1989				
T.Dalam	1,824	1,809	971	0.54
Lahusa	155	143	74	0.52
Gomo	206	176	83	0.47
Idanogawo	382	322	205	0.64
Lolowa'u	1,608	1,229	676	0.55
Sirombu	661	520	270	0.52
Mandrehe	4,083	3,544	1,970	0.56
Gido	8,088	6,867	3,763	0.55
G.Sitoli	8,303	6,269	3,454	0.55
Alasa	6,289	5,698	3,219	0.56
Lahewa	1,235	1,092	590	0.54
Tuhemberua	7,636	6,281	3,480	0.55
Total	40,470	33,950	18,755	0.55

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1000				
1988	1,024	1,758	912	0.52
T.Dalam Lahusa	155	1,736	70	0.52
Gomo	206	136 176	81	0.31
Idanogawo	382	322	148	0.46
Lolowa'u	1,608	1,130	699	0.62
Sirombu	661	488	267	0.55
Mandrehe	4,083	3,466	1,895	0.55
Gido	8,088	6,852	3,830	0.56
G.Sitoli	8,303	5,813	3,290	0.57
Alasa	6,289	5,646	3,128	0.55
Lahewa	1,235	1,025	565	0.55
Tuhemberua	7,636	6,261	3,512	0.56
Total	39,670	33,073	18,397	0.56

Table 3.29 (2/5) PLANTED AREA AND PRODUCTION OF TREE CROPS

COPRA

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Yield (t/ha)
	rica (na)	Tirou (na)	(1011)	(4114)
1989				
T.Dalam	8,221	7,114	6,816	0.96
Lahusa	430	321	284	0.88
Gomo	120	89	75	0.84
Idanogawo	1,397	1,262	1,115	0.88
Lolowa'u	1,262	1,105	988	0.89
Sirombu	1,318	1,089	991	0.91
Mandrehe	568	485	442	0.91
Gido	1,317	1 ,0 91	984	0.90
G.Sitoli	5,120	4,601	4,309	0.94
Alasa	187	123	109	0.89
Lahewa	10,547	10,049	9,742	0.97
Tuhemberua	2,811	2,614	2,366	0.91
Total	33,298	29,943	28,221	0.94

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1000			-	
1988		w and	- 200	
T.Dalam	8,205	7,003	6,208	0.89
Lahusa	417	300	268	0.89
Gomo	120	85	75	0.88
Idanogawo	1,385	1,210	1,107	0.91
Lolowa'u	678	510	461	0.90
Sirombu	1,316	1,087	1,016	0.93
Mandrehe	566	480	464 844	0.97 0.80
Gido	1,302	1,055		
G.Sitoli	5,107	4,580	4,207	0.92
Alasa	187	122	118	0.97
Lahewa	10,547	9,982	9,685	0.97
Tuhemberua	2,805	2,558	2,361	0.92
Total	32,635	28,972	26,814	0.93

Table 3.29 (3/5) PLANTED AREA AND PRODUCTION OF TREE CROPS

COFFEE

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1989				
T.Dalam	79	55	34	0.62
Lahusa	63	42	25	0.60
Gomo	118	75	49 39 71	0.65 0.91 0.73
Idanogawo	67	43 97		
Lolowa'u	128			
Sirombu	71	48	34	0.71
Mandrehe	81	64	40	0,63
Gido	369	283	212	0.75
G.Sitoli	92	66	39	0.59
Alasa	34	26	12	0.46
Lahewa	116	85 :	46	0.54
Tuhemberna	86	62	46	0.74
Total	1,304	946	647	0.68

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1988				
T.Dalam	95	62	38	0.61
Lahusa	30	. 19	11	0.58
Gomo	49	29	18	0.62
Idanogawo	230	145	132	0.91
Lolowa'u	923	675	499	0.74
Sirombu	93	60	42	0.70
Mandrehe	355	278	182	0.65
Gido	1,413	1,018	737	0.72
G.Sitoli	56	34	20	0.59
Alasa	44	19	9	0.47
Lahewa	102	68	37	0.54
Tuhemberua	34	29	22	0.76
Total	3,424	2,436	1,747	0.72

Table 3.29 (4/5) PLANTED AREA AND PRODUCTION OF TREE CROPS

CLOVE

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1989				
T.Dalam	320	186	65	0.35
Lahusa	83	47	10	0.21
Gomo	14	12	2	0.17
Idanogawo	108	62	15	0.24
Lolowa'u	78	56	15	0.27
Sirombu	73	57	9	0.16
Mandrehe	169	99	21	0.21
Gido	136	91	31	0.34
G.Sitoli	343	213	67	0.31
Alasa	96	41	8	0.20
Lahewa	261	167	33	0.20
Tuhemberua	180	140	31	0.22
Total	1,861	1,171	307	0.26

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1988				
T.Dalam	288	167	74	0.44
Lahusa	83	44	10	0.23
Gomo	14	. 12	2	0.17
Idanogawo	108	60 52 52	12	0.20
Lolowa'u	61		15	0.29
Sirombu	70		8	0.15
Mandrehe	163	91	20	0.22
Gido	132	86	19	0.22
G.Sitoli	334	194	73	0.38
Alasa	86	34	3	0.09
Lahewa	253	151	33	0.22
Tuhemberua	165	120	28	0.23
Total	1,757	1,063	297	0.28

Table 3.29 (5/5) PLANTED AREA AND PRODUCTION OF TREE CROPS

NILAM

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1989				
T.Dalam	109	66	13	0.20
Lahusa	78	76	16	0.21
Gomo	107	29	9	0.31
Idanogawo	161	105	26	0.25 0.29
Lolowa'u	. 155	41	12	
Sirombu	60	65	10	0.15
Mandrehe	78	58	14	0.24
Gido	98	77	16	0.21
G.Sitoli	198	125	31	0.25
Alasa	175			
Lahewa				
Tuhemberua	52	36	9	0.25
Total	1,271	678	156	0.23

Kecamatan	Planted Area (ha)	Harvested Area (ha)	Production (ton)	Unit Yield (t/ha)
1988				
T.Dalam	104	48	10	0.21
Lahusa	72	54	9	0.17
Gomo	103	66	13	0.20
Idanogawo	56 159	22	7	0.32
Lolowa'u		89	22	0.25
Sirombu	55	33 57	9	0.27
Mandrehe	70		8	0.14
Gido	82	46	11	0.24
G.Sitoli	91	65	13	0.20
Alasa	168	107	29	0.27
Lahewa	•			
Tuhemberua	45	24	6	0.25
Total	1,005	611	137	0.22

Table 3.30 RESULTS OF FARM ECONOMIC SURVEY (1/2)

150 200 AFPA
151 75 Dry Season Paddy M.March E.April L.Inity R.45 157 130 Dry Season Paddy M.Sap E.Oct M.Inn S.56, Baure (110-123 days), Goberng 157 130 Dry Season Paddy L.Ang M.Oct E.April L.April R.46 (125-130 days) 158 159 Dry Season Paddy L.Ang M.Sap E.Jan R.65 SS 150 Dry Season Paddy E.April L.Apr. E.April L.Apr. R.46 (125-130 days) 150 Dry Season Paddy E.April L.Apr. E.April L.Apr. R.46 (125-130 days) 150 Dry Season Paddy E.April L.Apr. E.April L.Apr. R.46 (125-130 days) 150 Dry Season Paddy E.April L.Apr. E.April L.Apr. R.46 (125-130 days) 151 Dry Season Paddy E.April L.Apr. L.Apr. L.Apr. R.45 (125-130 days) 152 Dry Season Paddy E.April L.Apr. L.Apr. L.Apr. R.45 (125-130 days) 153 Arthorytic Arthorytic E.April L.Apr. L.Apr. R.45 (125-130 days) 154 Arthorytic Arthorytic E.April L.Apr. L.Apr. L.Apr. R.45 (125-130 days) 158 4.12 L.Apr. R.45 (125-130 days) 158 Arthorytic E.April L.Apr. L.Apr. L.Apr. L.Apr. R.45 (125-130 days) 158 Arthorytic E.Apr. L.Apr. L.Apr. L.Apr. L.Apr. L.Apr. L.Apr. R.45 (125-130 days) 158 Arthorytic L.Apr.
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167 150 Dry Scasson Paddy L.Aug. L.Aug
1899 153 Wet Season Paddy L.Aug. L.Aug. E.Sep. R.4.2 Average Unit Yield of Paddy Control Contr
DYS AMORENEE Dry Season Paddy E. April L. Apr. E. Sep R 42
Day Season Wet Season Paddy E.Or. L.Or. E.March R.46 (125-130 days) Day Season Wet Season Paddy E.Or. L.Or. E.March L.March L.March L.March L.March L.Aug. L.Oral Varieties 1.57 1.57 Wet Season Paddy E.March L.March L.March L.Aug. Local Varieties 1.58 1.83 Note:Decartly month, Memiddle of month, Lelate of month Location of Sample Farmer 1.59 2.28 Wet Season Paddy E.Stp. E.Or. M.Feb. Local Varieties 1.59 2.28 Wet Season March L.March L.March L.Aug. Local Varieties 1.59 2.28 Wet Season March L.March L.
Dry Scason Wet Scason CIDO ZEBUA Ver Scason CIDO ZEBUA Ver Scason CIDO ZEBUA Ver Scason Paddy E.F.c. L.F.c. L.Aug. L.Dec. R.42, R.46, Sinziki (150 days)
Conclus Conclus Conclus Conclus 2.44
2.44 Wet Season Paddy E.Aug. L.Aug. L.Dec. R 42, R 46, Sinariki (150 days)
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7 89 11 7. Insufficient Agricultural 3.0 4.0 3.7 1.0 3.5 2.7 Materials B. Unsuitable Variety 1.0 3.6 3.5 3.0 2.6 2.8 Clove Sweet Potato Durian 1. Diseast Shortage and Pest 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 <th< td=""></th<>
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Chops S. Unsuitable Variety 1.0 3.6 3.5 3.0 2.6 2.8 Sweet Potato Durian 9. Labor 1.0 1.0 1.0 1.0 1.0 1.0 Sweet Potato Durian 10. Diseases Shortage and Pest 1.0 1.4 1.6 2.9 5.0 5.0 1.3 1.3 1.3 1.2 1.2 1.2 1.0 1.0 3.8 3.0 2.0 2.0 1.5 1.0 0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 1.0 0 0 0 0 0 0 0 1.0 0 0 0 0 0 0 0 1.0 0 0 0 0 0 0 0 1.0 0 0 0 0 0 0 0 0 1.0 0 0 0 0 0 0 0 0 0
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Sweet Potato Durian 10 Diseasr Shortage and Pest 1.0 1.4 3.5 2.9 5.0 5.0 13 (%) (%) 11 Poor Credit 4,0 1.4 1.6 2.0 2.0 1.5 0 0 80 Note:5.0=Greatest, 4.0=Great, 3.0=Modium, 2.0=a little, 1.0=no constraints 2.0 1.7 10 50 20 20 1.7 1.7 10 0 20 1.7 1.7 10 1.0 20 1.0=no constraints 1.7 10 20 20 1.7 10 3.3 1.4 1.6 2.0 2.0 1.7 6 1.3 3.3 1.2 3.3 1.2 1.3 1.3
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13 38 12.Inactive Farmers Organization 1.0 3.8 3.0 2.0 2.0 1.7 0 80 Note:5.0=Greatest, 4.0=Great, 3.0=Medium, 2.0=a little, 1.0=no constraints 0 0 0 0 20 0 20 0 20 13 33
0 80 Note:5.0=Greatest, 4.0=Great, 3.0=Medium, 2.0=a little, 1.0=no constraints 0 0 0 5.0 20 0 20 n.a. n.a. 13 33
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na:Datz not available

Table 3.30 RESULTS OF FARM ECONOMIC SURVEY (2/2)

Items	Tech-Irrig	ation	Type of Ri Desa-Ini		Rainfed Dou	ble Cropping	Rainfed Single	Average
TEMS	Wet Season D		Wet Season D			Dry Season	Cropping(Wet)	
. Sample Numb€r	10	10	29	29	46	46	24	10
•	2,12	1.89	1.96	1.29	1.53	1.19	2.00	1.:
2. Unit Yield of Paddy	2,12	1107	. 1170			•		
3. Farm Input (Average, kg/ha)* Seed	39.2	39.2	43.0	40.0	30.0	32.0	34.0	35
	120.0	121.3	152.0	137.0	107.0	118.0	95.0	120
Urea		95.0	92.0	81.0	66.0	66.0	78.0	76
TSP	95.0			11.0	41.0	52.0	22.0	31
KCI	20.0	20.0	23.0				1.1	4
Insecticide	7.8	7.8	5.2	4.8	3.8	3.6		
Fungicide	1.0	1.0	6.0	6.0	1.5	1.2	0.0	2
Herbicide	0.0	0.0	. 0.0	0.0	1.1	1.6	0.0	C
Rodenticide	4.0	4.0	. 6.0	4.8	6.3	0.2	2.2	3
. Farm Input (Average, kg/ha)**				40.0				26
Seed	39.2	39.2	43.0	40.0	30.0	32.0	34.0	35
Urea	72.0	97.0	95.0	81.0	49.0	54.0	28.0	62
TSP	57.0	57.0	51.0	39.0	27.0	29.0	23.0	35
KCI	4.0	4.0	3.0	1.5	13.0	16.0	3.0	8
Insecticide	3.9	3.9	3.0	3.0	1.8	1.6	0.4	7
Fungicide	0.1	0.1	0.4	0.4	0.2	0.1	0.0	(
Herbicide	0.0	0.0	0.0	0.0	0.1	0.1	0.0	
Rodenticide	0.4	0.4	1.6	1.3	1.4		0.4	
							5 L	
Percentage of farmers who use		90	62	59	45	45	29	
Urca	60	80				43	29	
TSP	60	60	55	48	40		-	
KCI	20	20	14	14	32	30	13	
Insecticide	50	50	59	62	47	45	38	
Fungicide	10	10	7	7	11	11	4	
Herbicide	. 0	0	0	0	11	11	4	
Rodenticide	10	10	28	28	21	21	17	
Urea						100	•	
Applied method of land preparation	n				1000		•	4
Hoe	100	100	100	100	100	100	100	. 1
Animal	0	0	0	0	0	0	0	
Mechanical	ō	ō	0	0	0	0	0	
Applied method of planting	-							
Farmer's themselves	90	90	78	78	71	71	92	
Gotong Royong	ő	0	3	3	7	7	0	
Hired Labor	10	10	20	20	22	22	8	
Applied method of harvesting							:	
**	100	100	85	85	81	81	30	
Farmer's themselves	100						•	
Gotong Royong	0	0	0	0	6	6	24	
Hired Labor	. 0	0	12	. 12	,11	. 11	23	
Sharing	0	0	3	3	. 2	2	23	
Average annual cultivated area (ha)					•		
Paddy	0.45	-	0.56	-	0.63		0.67	. 0
Upland Paddy	0.00	_	0.00	_	0.01	-	0.00	0
Maiz	0.00		0.00	- 1 1 <u>-</u>	0.01		0.00	0
	0.00	•	0.00		0.01		0.01	. 0
Soybeans		-		•			· ·	o
Peanuts	0.00	-	0.00	-	0.00		0.09	
Cassava	0.11	-	0.10	-	0.12	· -	0.09	0
Vegetables	0.00	•	0.01	-	0.01	-	0.02	. 0
Rubber	0.23	-	0.56	-	0.43	•	0.15	. 0
Coconuts	0.32	-	0.16	-	0.43	.	0.51	O
Clove	0.32	-	0.02	-	0.08		0.00	0
Total	1.43	_	1.41		1.73	,	1.54	ì
).Yield Constraints to Main Crops		-			\		• :	
Water Shortage	80	80	97	97	96	- 96	92	
Damage by pest/desease	100	100	97	97	96	96	46	
					0		0	
Damage by Forest Bigs	0	0	0	0				
Unhybrid Variety	40	40	31	31	33	33	63	
Bad Seedlings	30	30	31	31	42	42	58	
Low Level of Fertilizer	80	80	55	55	58	58	67	
TOW TRACION LCHIING								
Unweeding	30	30	7	. 7	19	19	21	

Note: *= Average of farmer who apply, **= Average of total sample famer

Table 3.31 NUMBER OF LIVESTOCK IN THE NIAS ISLAND IN 1988

Kecamatan	cow	buffalow	horse	pig	goat	chicken	duck
T.Dalam	180	164	0	36,286	552	43,111	1,922
Lahusa	116	76	0	9,788	372	14,406	468
Gomo	12	73	3	13,638	441	18,823	410
Idanogawo	71	70	12	20,857	242	18,703	506
Lolowa'u	31	73	0	11,739	368	28,184	225
Sirombu	18	.0	2	18,651	386	22,747	264
Mandrehe	37	0	0	20,735	507	26,286	355
Gido	80	75	0	32,772	286	50,498	2,830
G.Sitoli	78	24	0	30,916	240	55,917	970
Alasa	34	0	2	16,677	468	26,716	372
Lahewa	134	132	2	18,802	1,708	33,935	1,120
Tuhemberus	112	48	0	28,663	365	44,268	889
							·
Total	903	735	21	259,524	5,935	383,594	10,331

Data source:Livestock service Dati II Nias

Table 3.32 EXISTING VILLAGE IRRIGATION SYSTEMS MANAGED BY DINAS PERTANIAN TANAMAN PANGAN KABUPATEN - NIAS

No.	Name of Project	Name of Scheme (Village)	Kecamatan	Subject	Potential Area	Irrigated Area	Year	Construction Cost (Rp.)	Remarks
1.	Fusola	Lahagu	Mandrehse		30	20			Not Operated
2.	Moafoa	Hiligaoni	Alasa		50	30		•	Operated
3.	Bagoa	Banua Sihohou-I	Alasa		50	30			Not Operated
4.	Gito	Simaeasi	Mandrehe		60	50			Not Operated
5,	Gizawili-I	Tuhegafoa	Lolowa u	Construction of one weir, one diversion box and secondary canal	75	40	1984	15,000,000	Not Operated
6.	Hilijihona	Hilijihona	Teluk Dalam		75	40	1984	15,000,000	Not Operated
7.	Edanau	Bawogosali	Teluk Dalam	Construction of one weir, one diversion box and secondary canal	63	30	1985	14,500,000	Not Operated
8.	Sinoto	Tetchosi Afia	Tuhamberua	Construction of one weir, one diversion box and secondary canal	86	50	1985	15,000,000	Not Operated
9.	Sizawili-II	Tuhegafoa	Lotowa'u	Construction of one weir, one diversion box and secondary canal	150	100	1986	19,500,000	Not Operated
10.	So'enuo	Hilimaenamolo	Teluk Dalam	Construction of one weir, one diversion box and canal	75	30	1986	19,500,000	Operated
11.	So'ohi	Solewo	Tuhemberua	Construction of one weir, one diversion box and secondary canal	50	40	1987	18,965,000	-
12.	Idano Ma'ae	Tatchosi, Hilimbowo	Tuhemberua	Construction of one weir, one diversion box and secondary canal	150	75	1987	18,960,000	Operated
13.	Geto	Hanofa	Sirombu	Construction of one weir, intake gate and diversin box	90	60	1988	19,070,000	Operated
14.	Awono	Sisobambowo	Teluk Dalam	Construction of one weir, intake gate, diversion box and one culvert	60	30	1988	19,054,000	Oeprated
15.	Sibobalane	Hilimbulawa	Teluk Dalam	Construction of one weir, two diversion box and canal	75	40	1989	19,149,000	Operated
16.	Latosebua	Lolowa'u	Loluwa'u	Construction of weir	. 60	40	1990	19,071,000	Oeprated
17.	Sigondri-Gondri	Tu'indrao	Teluk Dalam	Construction of intake gate and one diversion box	40	25	1989	19,074,000	Operated
18.	Madawa	Bawedesolo	Gido	Rehabilitation of weir, intake gate and canal	40	25	1990	19,577,000	Operated
19.	Bounene	Hilisimaetano	Teluk Dalam	Construction of one weir, main canal (stone masonry) and one diversion box	30	20	1990	19,534,000	Operated
	Total				1,309	775		270,954,000	

Table 3.33 EXISTING IRRIGATION SYSTEMS MANAGED BY DPU KABUPATEN - NIAS

No.	Name of Project	Name of Scheme (Village)	Kecamatan	Subject/ Facilities	Potential Area (ha)	Irrigated Area (ha)	Construction Cost (Rp)	Remark	Year
1.	Lasara	Lewuombanua	Tuhemberua	Weir, main canal	360	247	65,000,000	Operated	1988-1990
2.	Torowa	Torowa	Tuhemberua	Weir, main canal	262	245	165,000,000	Operated	1985-1990
3.	Afía	Afia	Tuhemberua	Main canal, weir and diversion box	713	291	185,000,000	Operated	1983, 1985-1989
4.	To'o Hilimbowo	Toʻo Hilimbowo	Gunung Sitoli	Construction of weir, main canal, dike and river diversion canal	150	135	55,000,000	Operated	1988-1990
5.	Ndra Humene	Ndra Humene	Gido	Weir, main canal,	314	297	134,000,000	Operated	1980, 1984-1989
6.	Gido Zebua	Gido Zebua	Gido	Diversion box, and drainage canal	1,428	0	2,410,000,000	Not operated	1975-1986
7.	Sialikhe	Hilisimaetano	Teluk Dalam	Weir, main canal and diversion box	125	105	40,000,000	Operated	1988-1990
8.	Idano Zalo	Idano Zalo	Teluk Dalam	Weir, main canal and diversion box	390	246	115,000,000	Operated	1986-1990
9.	Boti	Boli	Lahusa	Weir, main canal (stone masonry) and diversion box	150	42	35,000,000	Oeprated	1990
	Total				3,892	1,608	3,204,000,000		

EXISTING SOCIAL INFRASTRUCTURES Table 3.34 BY KECAMATAN

Kecamatan	Port	Elec. Supply	Drink Water	Tele- phone	Tele- gram	Post Office	Air Port
						~	
Tuhemberua	-	O	• -	-	•-	O	
Lahewa	О	О	O .	-	\mathbf{O}_{i}	O	- .
Gunung Sitoli	О	O	О	О	O	O	O
Alasa	94	-		• •	-	-	-
Mandrehe	-	О	-		-	-	-
Hiliweto	-	О	-	-	-	O	-
Idano Gawo	-	-	-	-		O	-
Labusa	-	-	-	-	-	-	-
Gomo	-	_		· · ·	-	· · · -	•
Sirombu	O	O	_	-	-	O	_
Lolowa'u	-	O -	-	_	-		-
Teluk Dalam	O	O	O	-	O	O	Planning

Note: O: Available
- : Not available

Table 3.35 LENGTH OF THE EXISTING ROADS

		(Unit: km)
Kind of Road	Y	ear
	1985	1980
Provincial Road		
 Asphalt road 	135,242	176,428
- Un-paved road	231,758	190,572
Total	367,000	367,000
2. Prefectural Road		
 Asphalt road 	132,860	189,779
- Stone road	275,635	189,627
- Earth road	1,480,945	1,510,034
Total	1,889,440	1,889,440

Table 3.36 DISTANCE BETWEEN KECAMATAN AND GUNUNG SITOLI

	Kecamatan	Distance
Kecamatan	Capital	(km)
1 Walak Dalam	Teluk Dalam	120
 Teluk Dalam Lahusa 	Helezalulu	80
2. Gomo	Gomo	96
4. Idano Gawo	Tetehosi	37
5. Lolowa'u	Lowowa'u	65
6. Sirombu	Tetesua	90
7. Mandrehe	Mandrehe	52
8. Gido	Hiliweto	24
9. Alasa	Ombolata	36
0. Lahewa	Lahewa	87
1. Tuhemberua	Tuhemberua	35
	•	

Table 3.37 HEALTH CONDITION OF NIAS(1989)

Unit: Number of patient Illness (Cases Reported) LÚNG Worms Diarcha Cough Totals Water Born Skin Tuber-Other Malaria Bronchitis Anemia Kecamatan culosis Illness Infections Livections 1. GUNUNG SITOLI 10,724 10,314 1,607 1,181 895 1,595 522 1,241 28,193 4,194 3,128 946 587 2. TUHEMBERUA 3,163 500 852 823 636 294 85 11,493 11,252 3. A L A S A 4,793 650 319 79 1,414 248 34 15,255 8,590 12,860 91 21 79 36 4. G I D O 4,753 5,910 693 482 291 1,983 208 844 3,220 4,664 2,621 1,249 5, L A H E W A 6. IDANO GAWO 7. LOLOWA U 3,636 5,304 3,107 229 950 75 203 159 172 518 290 1,023 475 399 323 175 933 679 408 8,626 377 2,092 8. G O M O 273 178 65 121 89 4,423 305 9. TELUK DALAM 5,763 6,892 529 730 1,208 394 716 580 25 16,837 10.LAHUSA 1,243 1,410 279 245 539 520 143 228 4,607 110 11. MANDREHE 2,619 1,900 354 447 200 776 159 411 6,976 12. S I R O M B U 13. PULAU-PULAU 1,451 179 176 103 918 10 128 33 2,998 137 2,831 113 121 165 11 5,556 BATU 1,862 34 282 KABUPATEN NIAS 51,479 48,282 5,781 5,579 6,089 9,384 3,631 6,784 657 137,666 48,436 WITHOUT PULAU-PULAU BATU 48,648 5,747 5,466 5,807 9,263 3,494 6,619 46,420 132,110

			Number of patient
		Infant Mortality	
		Infant	Infant
Kecamatan	Live	Death	Mortality
	Births	(0-1 Yr.)	per 1,000
1. GUNUNG SITOLI	1,202	41	34
2. TUHEMBERUA	314	•	-
3. ÁLASA	1,278	163	127
4.G 1 D O	1,169	23	20
5, LAHEWA	590	8	14
6. IDANO GAWO	610	48	79
7. LOLOWA'U	970	91	94
8. G O M O	461	16	35
9. TELUK-DALAM	581	23	40
10. L A H U S A	673	18	27
11. MANDREHE	1,045	92	88
12.SIROMBU	116	14	121
13. PULAU-PULAU			
BATU	659	12	18
KABUPATEN NIAS WITHOUT PULAU-	9,668	549	697
PULAU BATU	9,009	537	679

Source: Kabupaten Nias Dalam Angka 1989

Table 3.38 INVENTORY OF MEDICAL SERVICES OF NIAS (1989/1990)

							U	nit: Number of	
Kecamatan	Public Hospital	Public Health Center	Public Health Sub-center	Family Planning Clinic	Mother+ Child Clinic	Villages Clinic	Private Clinic	Apothacary	Drug Store
1. GUNUNG SITOLI	1	3	8	12	2	169	7	2	. 9
	1	6	5	12	-	115	-	-	-
2. TUHEMBERUA		1	9	1	2	49		-	
3. ALASA	-	1	7	· 1		151	-		_
4, GIDO	-	2	, ,	1	•	51	_		_
5. LAHEWA	-	1	b a	1	1	67	1	_	_
6. IDANO GAWO	-	1	,	3	1	67	1		_
7, LOLOWA'U	-	1	,	4	. Z	33	1	•	-
8. GOMO	-	1	6	1	. 1	- 53	1	2	•
9, TELUK DALAM	l	2	7	2	3		1	L	•
10. LAHUSA	-	1	5	1	1	30	-	-	•
11. MANDREHE	-	1	5	1	2	87	-		
12. SIROMBU	-	1	3	2	-	59	-	•	-
13. PULAU-PULAU									
BATU	-	1	6	1	2	*		· .	-
KABUPATEN NIAS	2	22	81	45	21	931	10	4	9
WITHOUT PULAU-					4.				
PULAU BATU	2	21	75	44	19	931	10	4	9 .

				Unit :	Number of staff
	General	Specialist			Trained
Kecamatan		-	Nurses	Midwives	Lay
	Doctor	Doctor			Midwives
1. GUNUNG SITOLI	7	3	30	14	140
2. TUHEMBERUA	1	-	11	3	30
3. ALASA	1	_	9	ï	71
4.GIDO	2	_	24	8	27
5. LAHEWA	1	-	14	3	39
6. IDANO GAWO	1	=	8	1	42
7. LOLOWA'U	1	•	3	1	8
8. GOMO	-		11	2	33
9. TELUK DALAM	3	-	36	6	15
10. LAHUSA	-	-	7	1	40
11. MANDREHE	1	-	5	-	14
12. SIROMBU	1	-	11	4	24
13. PULAU-PULAU					
BATU	-	•	*	3	• .
KABUPATEN NIAS	19	3	169	47	483
WITHOUT PULAU- PULAU BATU	19	3	169	44	483

Note: Partial data for this Kecamatan.

Source: Data collection individual Kecamatan by JICA Team.

Table 3.39 INVENTORY OF EDUCATION SERVICES OF NIAS (1989)

Unit:Number of facilities Kecamatan **Elementary Schools** Middle High Teachers State Schools Private Total Schools College 1. GUNUNG SITOLI 2. TUHEMBERUA 3. ALASA 4. GIDO 5. LAHEWA 6. IDANO GAWO 7. LOLOWA'U 8. GOMO 9. TELUK DALAM 10. LAHUSA 11. MANDREHE 12. SIROMBU 13. PULAU-PULAU **BATU** KABUPATEN NIAS WITHOUT PULAU-**PULAU BATU**

Source: Kabupaten Nias Dalam Angka 1989

Table 3.40 MOVEMENT OF MAJOR COMMODITIES INTO OR FROM NIAS ISLAND

	Total	c	> 6	>	0	c		27.00	04777	1,00,1	0 0	> <	> 2	\$ \	2,42	125	553			Total	25,411	338	1,590	3,900	180	Ŋ	0	140	-	1,787	0	0	0	9
	Sirombu		> 0	>	0	C	c	CLY	7.5	\$ =	· c	•		*	100	, cr	0			Sirombu	1,647	0	461	702	0	0	0	0	0	625	0	0	0	9
	T.Daiam	c	> 0	>	0	O	c	201.0	(4 <u>1</u> ,4	3	c		5	\$ ¥	90	188	143		1990	T.Dalam	943	0	626	2,044	ø	0	0	80	0	554	0	0	0	0
	(2) (3)		> <	>	0	C	o	166	§ %	२	0	o c	y	o 	130	177	•			Jahewa(2)						Q.								
	G.Sitoli L	c	> <	>	0	O	c	10.012	19,013	200	0 0	o e	ç	266	0.56.7	080	404			G.Sitoli [22,720	338	223	285	171	s	0	41	-	40	0	Ö	0	0
	Total	•	> <	5	0	C	· C	32 022	150,62	5	o c	o c	2 9 9	883	1	70	515			Total	25,050	62	1,841	4,688	138	0	0	127	v	863	0	0	0	0
	Sirombu	c	> 0	5	0	C	, c.	950	14		> 0	> C) (007	96	į			Strompa	1,276	-	359	771	0	ó	0	m	0	323	0	0	0	Ö
	1989 T.Dalam		> •	0	0	c	· c	2	4,00,4 53:	j	> ¢	> C	> 7	y 6	1 957	710	, v		1989	T.Dalam	496	0	395	1.408	0	0	0	9	0	510	0	0	0	0
Nias Island	Lahewa	٥	> (0	0	· C	, c	200	1,703	2	00	> <	s é	ž, A		\ \ †) 4	Nias Island		Lahewa	1,629	0	950	2,145	0	ø	0	28	0	0	0	0	0	9
Movement into Nias Island	G.Sitoli	c	> (0	٥	C	· C	3	4,0,7	7.	0	00	> 6	, 12, 12, 13, 13, 13, 13, 13, 13, 13, 13, 13, 13	0 140	9,130	, v.	Movement from Mias Island		G.Sitoli	21,649	61	137	36	138	0	0	8	S)	0	0	0	0	0
2	Total	c	> 1		0	C	· c	30,00	071,62	600,	> <	0	> t	200	11 630	1 224	346	Ž		Total	27,344	264	1,152	2,721	228	630	161	36	7	0	٥	7	0	
	Strombu	•	> <	0	0	0	c	1 164	130	ì	o c	o c	7	ታ መ ሰ ሰ	202	11				Sirombu	483	0	619	1,505	o	0	0	0	0	0	0	0	0	9
000	T.Dalam	c		>	0	Q	· c	2 201	171		· c	0	> Q	\$ <u>c</u>	2300	130	74		1988	T.Dalam	269	0	204	855	0	o	0	0	0	0	0	0	0	0
	Lahewa(1)	c	٠ د	1	0	c	· c	000	050	5	0	0	•	ຼີຕ	۱ د	-	· C			ahewa(1)	0	7	0	0	٥	630	161	0	0	0	0	7	0	,t
	G.Sitoli L.		> 0	3	0	c	· c	19.025	10,033	701,1	o c	>	212	010 644	070	1,083	272			G.Sitoli Lahewa(1	26,292	263	329	361	228	0	0	36	-	0	0		0	9
	ııcıns	ioq.	DOG S	Ise	Y73	Cooking oil	Nilam oil		N.C.		Nithmass	Cake of pressed permits	Care of pressure pressures	Wheat	Comment	Gantan	Fish(salt)		,		Rubber	Coffee	Copra	Cooking oil	Nilam oil	Rice	Sugar	ve	Nuturneg	Cake of pressed peanuts	Wheat	Tobacco	Cement	Fertilizer

(1) Data indicate only 4 months from Sep. to Dec. (2) Data indicate only 6 months from Jan. to Jun. Data source: Port Authority

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Table 3.41 RICE MOVEMENT HANDLED BY SUB-DOLOG WILAYA IV

		(unit:ton)
	1989	1988
1. Rice stock	328	226
2. Rice movement into Nias		
(i) from Bulog	0	0
(ii) from regional Dolog	1,710	2,921
3. Total (1+2)	2,037	3,147
4. Distribution of rice	1,771	2,819
(i) Government employment	1,280	1,857
(ii) A.B.R.I	219	345
(iii) Market operation	223	559
(iv) Pertamina	9	8
(v) Prison	34	40
(vi) Natural disaster	6	7
(vii) Social	1	3
5.Stock over next year	267	328

Source: Office file of Sub-Dolog Wilaya IV, Gunung Sitoli

Table 3.42 MARKET PRICE OF MAJOR CROPS IN GUNUNG SITOLI IN 1989

Item	Unit	Jan.	Feb.	Mar.	Apr.	May	Jun.	<u>, , , , , , , , , , , , , , , , , , , </u>
RICE :								
a.Sawah halus	Rp/Kg	625.00	625.00	625.00	625.00	625.00	624.00	
b.Sawah kasar/silumat	Rp/Kg	563.00	563.00	563.00	563.00	563.00	563.00	
c.Sipisang	Rp/Kg	547.00	547.00	547.00	547.00	547.00	547.00	
d.Ex Dolog	Rp/Kg	531.00	531.00	531.00	531.00	531.00	531.00	
FOODS:						220 207		
a.Wheat	Rp/Kg	700.00	700.00	750.00	750.00	750.00	750.00	
b.Coconut	Rp/Pc	137.50	143.75	143,75	187.50	187.50	187.50	
VEGETABLES:			m	****	800.00	700.00	700.00	
a.Potato	Rp/Kg	700.00	700.00	700.00	700.00	700.00	700.00	
b.Cabbage	Rp/Kg	400.00	400.00	400.00	400.00	400.00	400.00	
c.Carrot	Rp/Kg	900.00	900.00	900.00	900.00	900.00	900.00	
d.Red-pepper	Rp/Kg	2,250.00	2,750.00	2,500.00	3,000.00	3,000.00	3,000.00	
e.Red-onion	Rp/Kg	1,050.00	1,200.00	1,200.00	2,000.00	1,850.00	2,000.00	
f.Tomato	Rp/Kg	1,000.00	1,050.00	1,200.00	1,200.00	1,200.00	1,200.00	
EXPORT CROPS:	_ ~~			£ 000 00	£ 000 00	£ 000 00	£ 000 00	
a.Nutmeg flowers	Rp/Kg	6,500.00	5,375.00	5,000.00	5,000.00	5,000.00	5,000.00	
b.Nutmeg	Rp/Kg	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00	
c.Robusta coffee	Rp/Kg	2,050.00	1,900.00	1,800.00	1,400.00	1,400.00	1,400.00	
d.Copra	Rp/Kg	275.00	275.00	275.00	275.00	275.00	275.00	
Item	Unit	Jul.	Aug.	Sep.	Oct,	Nov.	Dec.	Average
	Unit	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Average
RICE:	·				·	Nov. 650.00	Dec.	Average
RICE : a.Sawah halus	Rp/Kg	625.00	625.00	650.00	Oct. 650.00 585.00			
RICE : a.Sawah halus b.Sawah kasar/silumat	Rp/Kg Rp/Kg	625.00 563.00	625.00 563.00		650.00	650.00	650.00	633.25 569.50
RICE : a.Sawah halus b.Sawah kasar/silumat c.Sipisang	Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00	625.00 563.00 547.00	650.00 575.00	650.00 585.00	650.00 585.00	650.00 585.00	633.25 569.50 554.29
RICE : a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog	Rp/Kg Rp/Kg	625.00 563.00	625.00 563.00	650.00 575.00 559.50	650.00 585.00 572.00	650.00 585.00 572.00	650.00 585.00 572.00	633.25 569.50 554.29
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS:	Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00	625.00 563.00 547.00	650.00 575.00 559.50	650.00 585.00 572.00	650.00 585.00 572.00	650.00 585.00 572.00	633.25
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00	625.00 563.00 547.00 531.00	650.00 575.00 559.50 543.50	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	633.25 569.50 554.29 538.29
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut	Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00	625.00 563.00 547.00 531.00	650.00 575.00 559.50 543.50 787.50	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	633.25 569.50 554.29 538.29
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES:	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00	625.00 563.00 547.00 531.00	650.00 575.00 559.50 543.50 787.50	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	650.00 585.00 572.00 556.00	633.25 569.50 554.29 538.29 757.29
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES: a.Potalo	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc	625.00 563.00 547.00 531.00 750.00 150.00	625.00 563.00 547.00 531.00 750.00 150.00	650.00 575.00 559.50 543.50 787.50 150.00	650.00 585.00 572.00 556.00 800.00 150.00	650.00 585.00 572.00 556.00 800.00 150.00	650.00 585.00 572.00 556.00 800.00 150.00	633.25 569.50 554.29 538.29 757.29 157.29
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Cocomut VEGETABLES:	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00	625.00 563.00 547.00 531.00 750.00 150.00	650.00 575.00 559.50 543.50 787.50 150.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES: a.Potato b.Cabbage	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES: a.Potato b.Cabbage c.Carrot	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00 3,000.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00 3,000.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00 3,000.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00 3,000.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42 2,191.67
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES: a.Potato b.Cabbage c.Carrot d.Red-pepper	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 2,625.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 1,875.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42 2,191.67
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Cocomut VEGETABLES: a.Potato b.Cabbage c.Carrot d.Red-pepper e.Red-onion f.Tomato	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 2,625.00 2,125.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 1,875.00 2,875.00 1,200.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00 3,000.00 1,200.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00 3,000.00 1,025.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00 3,000.00 850.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00 3,000.00 850.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42 2,191.67 1,097.92
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Cocomut VEGETABLES: a.Potato b.Cabbage c.Carrot d.Red-pepper e.Red-onion f.Tomato	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 2,625.00 2,125.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 1,875.00 2,875.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00 3,000.00 1,200.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00 3,000.00 1,025.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00 3,000.00 850.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00 3,000.00 850.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42 2,191.67 1,097.92
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Cocomut VEGETABLES: a.Potato b.Cabbage c.Carrot d.Red-pepper e.Red-onion f.Tomato EXPORT CROPS:	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 2,625.00 2,125.00 1,200.00 5,000.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 1,875.00 2,875.00 1,200.00 5,000.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00 3,000.00 1,200.00 1,500.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00 3,000.00 1,025.00 5,000.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00 3,000.00 850.00 5,000.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00 3,000.00 850.00 5,000.00 1,500.00	633.25 569.50 554.29 538.29 757.29 157.29 702.08 400.00 960.42 2,510.42 2,191.67 1,097.92 5,156.25 1,500.00
RICE: a.Sawah halus b.Sawah kasar/silumat c.Sipisang d.Ex Dolog FOODS: a.Wheat b.Coconut VEGETABLES: a.Potato b.Cabbage c.Carrot d.Red-pepper e.Red-onion f.Tomato EXPORT CROPS: a.Nutmeg flowers	Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Pc Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg Rp/Kg	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 2,625.00 2,125.00 1,200.00	625.00 563.00 547.00 531.00 750.00 150.00 700.00 400.00 900.00 1,875.00 2,875.00 1,200.00	650.00 575.00 559.50 543.50 787.50 150.00 700.00 400.00 900.00 2,500.00 3,000.00 1,200.00	650.00 585.00 572.00 556.00 800.00 150.00 925.00 400.00 1,050.00 2,500.00 3,000.00 1,025.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,175.00 2,125.00 3,000.00 850.00	650.00 585.00 572.00 556.00 800.00 150.00 600.00 400.00 1,200.00 2,000.00 3,000.00 850.00	633.25 569.50 554.29 538.29

Table 3.43 NUMBER OF RICE MILLS

(unit: number) Under Not Yet Total Kecamatan Licenced Licenced Licenced Number **TELUK DALAM GOMO IDANO GAWO** LOLOWA'U **SIROMBU MANDEHE GIDO G.SITOLI ALASA** LAHEWA **TUHEMBERUA TOTAL**

Source: Office File of Dinas Pertanian Tanaman Pangan, Kab. Nias

Table 3.44 CONDITION OF EXTENSION WORKERS

Name of BPP	Kecamatan Covered by BPP	Number of Extension Workers	Nos. of Village	No. of Villages Covered by One PPL
1. WA'AI	GUNUNG SITOLI	8	96	12.0
i, waai	TUHEMBERUA	8	46	5.8
2. HILIWETO	GIDO	9	82	9.1
	IDANO GAWO	6	42	7.0
3. HILIMAENAMOLO	TELUK DALAM	7	52	7.4
•	LOLOWAU	4	50	12.5
	MANDREHE	6	64	10.7
	SIROMBU	4	36	9.0
	LAHEWA	4	33	8.3
	LAHUSA	1	17	17.0
	GOMO	1	33	33.0
	ALASA	1	40	40.0
TOTAL	· · · · · · · · · · · · · · · · · · ·	59	591	10.0

Source: Office File in Dinas Pertamian Tanaman Pangan, Kab. Nias

Table 3.45 INVENTORIES OF FARM EQUIPMENT IN BPP

(Unit: number)

Kind of		Location of BPP	
Equipment	AWA'AI	Hilimaenamolo	Hiliweto
1. Sickle	50	100	10
2. Hand thresher	0	0	0
3. Pedal thresher	1	0	6
4. Power thresher	0	0	1
5. Cleaner	0	1	4
Total	51	101	21

Data source: Office File of Dinas Pertanian Tanaman Pangan, Kabupaten Nias

Table 3.46 CREDIT CONDITIONS OF COOPERATIVES IN THE NIAS ISLAND

Kind and Name	Criteria	Cr	edit	Total	Loca	ion
of	of		Total Amount			
Cooperative	Credit	Period	Rp.	(Number)	Village	Kecamatan
WILL THE PARTY						
(A) Koperasi Unit Desa (KUD)	77 1170	1000 1000	24 100 000	1,648	TUMERI	GUNUNG SITOL
1.LAZA SEBOLO	K,U.T	1988-1989	34,199,000	712	SILIMA BANUA	TUHEMBERUA
2.SEHATI	K.U.T	1987-1988	7,625,460		AFIA	
3.SINAR PAGI	K.U.T	1986-1987	4,241,127	396		TUHEMBERUA
4.TEMANI	K,U,T	1988-1989	20,649,677	910	HILIMBAWA DESOLO	
5.HARAPAN	K.U.T	1986-1987	4,674,542	206	LOLOZASAI	GIDO
6.MEKAR	K.U.T	1986-1987	4,334,163	191	SOGAEADU	GIDO
7.MASA KARYA	K.U.T	1987-1988	7,861,787	264	TETEHOSI	IDANO GAWO
8.SERASI	K.U.T	1987-1988	57,604,285	360		MANDREHE
9.SWADAYA	K.U.T	1987-1988	13,042,779	215		LOLOWA'U
10.FAOMASI	K.U.T	1987-1988	12,796,160	335	ONOLIMBU	SIROMBU
11.BINTANG BARU	K.U.T	1987-1988	23,705,702	630	4	SIROMBU
12.SANUNEHE	K.U.T	1986-1987	23,724,687	313		LAHEWA
13.KARYA ABADE	K.U.T	1987-1988	2,146,000	261	AFULU	LAHEWA
Sub-total			216,605,369	6,441		
(B) Fisheries Cooperatives				4.		
1.BERKAT YAKIN	K.1.K	1986-1987	2,196,066	78	HILIMBOWO	TUHEMBERUA
2.SITEFATO	K.I.K	1986-1987	1,559,866	164	TELUK BELUKAR	TUHEMBERUA
3.SWADAYA	K.I.K	1987-1988	2,176,507	117	ILCON BELOKAK	LOLOWA'U
Sub-total	K.i.K	1907-1900	5,932,439	359		LOLOWAU
(C) Tree Crop Cooperatives			3,932,439	339		
(C) Tree Clop Cooperatives						
1.HULOMBANIO	K.I.K	1988-1989	1,116,000	88	ILIR	GUNUNG SITOL
2.L O T U	K.I.K	1986-1988	1,228,816	87	FADORO	TUHEMBERUA
3.KARYA DAGANG	K.I.K	1986-1988	509,197	.51	LADORA	TUHEMBERUA
4.MAJU BERSAMA	K.I.K	1986-1987	2,177,761	77	HILILAWA'E	IDANO GAWO
5.FAMILI	K.I.K	1987-1988	780,000	92	TOGIZITA	LOLOWA'U
6.SINAR JAYA	K.I.K	1986-1987	902,400	92		ALASA
7.KELUARGA	K.I.K	1987-1988	3,996,091	81	HILIAMAETA	TELUK DALAM
8.WALOMBOU	K.I.K	1987-1988	2,215,773	98	•	TELUK DALAM
9.DAMAI	K.I.K	1986-1987	2,045,111	95		LAHUSA
Sub-total			14,971,149	761		
Total	4	<u> </u>	224,582,919	7,319		

Table 3.47 CONDITION OF KUD IN NIAS ISLAND

		Name		Date	Total	Farm C		Drying		Number of
No.	Kecamatan	of	Location	of	Participant	(Rp.)		Yard	of	
		KUD		Establisment	(number)	1986/1988 1989/199		(m2)	Storage	Kios
1	Teluk Dalam	Beringin Raya	Teluk Dalam	14-06-1979	231	_	-	_	-	2
		Sanurehe	Hilisamactano	20-01-1981	313	23,724,687	-	-	-	1
	•	Bfata	Hilisataro	16-06-1987	74		-	•		-
2	Lahusa	Orani	Lahusa	25-05-1979	270	-	_	-	-	-
3	Gomo	Karya Gomo	Gomo	15-09-1980	290	-	_		-	-
4	Idano Gawo	Masa Karya	Tetehosi	6-05-1981	264	7,861,787	-	56m≤	1	2
		Sadar	Sindrondro	7-03-1980	235	-	_	-	-	-
		Tolong Menolong	Siefabanua	26-05-1986	1,073		_	-	-	-
		Schati Maju	Bawolatu	16-05-1987	460		-			-
5	Lolowa'u	Swadaya	Lolowa'u	24-06-1979	215	13,042,779	-	•		
6	Sirombu	Faomasi	Sirombu	10-03-1980	335	12,796,160	_	-	1	_
		Bintang Baru	Onolimbu	12-04-1980	630	23,705,702	-	-	-	-
7	Mandrehe	Serasih	Mandrehe	21-03-1980	360	57,604,285	_	-		
8	Gido	Temani	Hilimbawa Desolo	21-03-1980	910	20,649,677	-	56m≤	1	1
		Harapan	Lolozasai	18-10-1973	206	4,674,542	-			1
		Mekar	Sogacadu	18-10-1973	191	4,334,163			1	2
9	Gunung Sitoli	Lazasebalo	Gunung Sitoli	7-03-1980	1,642	34,199,000	-		1	2
	g	Desa Pantai	Olora	31-07-1980	584		-	_	-	1
		Lestari	Sisarohili	27-12-1980	142			-		1
		Oiyerita	Lolowa'u	20-03-1981	285		_	-	-	_
10	Alasa	Harapan Tani	Ombolata	7-09-1980		-	_	-	-	_
		Mutiara	Faekhuna'a	16-11-1981	254	-	_		_	-
11	Lahewa	Karya Abadi	Afulu	15-09-1980	261	2,146,000	-			
		Maju	Lahewa	23-07-1980	221			-	1	1
12	Tuhemberua	Sinar Pagi	Afia	19-02-1980	396	4,241,127	_		1	2
		Schati	Tuhemberua	7-09-1980	712	7,625,460	-	_	1	2
		Makmur	Hiligeo M	28-06-1989	107			-	-	-
			Total		10,891	216,605,369		112	8	18

Data: Kantor Keperasi Kab. Nias

Table 3.48 LIST OF WATER USERS' ASSOCIATION (P3A)

No.	Name of P3A	Location	Kecamatan	Village	Area (ha)	Activity
1	Sali Indah	Soafu	Giđo	So'ewe	30	-
2	Bira	Umbudahana .	Gido	Dahana	50	-
3	Sederhana	Umbusirete	Gido	Sirete	75	-
4	Bawambua	Ndra Munene	Gido	Tulumbaho	125	ca.
5	Betia	Tulumbaho	Gido	Tulumbuasi	60	_
6	Badar Hati	Sizini	Gido	Tuhembuasi	75	-
7	Mo'awu	Mo'aqu	Idanogawo	Awonilauso	- 75	-
8	Talabu	Tarifo	Idanogawo	Awonilauso	75	-
9	Ahedano	Ahedano	Idanogawo		50	-
10	Forego	Bo'uso	Tehemberua	Gawu2	100	-
11	Suka Maju	Torowa	Tehemberua	Lasarasawo	75	-
12	Afia	Afia	Tehemberua	Ll.Tetehosi	475	+
13	Sinoto	Sinoto	Tehemberua	T.hosiafia	125	-
14	Suka Maju	So'ohi	Tehemberua	Tuhemberua	50	-
15	Idano Ma'ae	Inanoma'ae	Tehemberua	Tetehosi	40	_
16	Karya Maju	Tumoril	G.Sitoli	Tumori	40	- .
17	Madala	Ndra humene	G.Sitoli	Hilimbowo	. 75	. + ,
18	To'o	To'o	G.Sitoli	H.olora	75	-
19	Saradodo	Inano Jala	T.Dalam	Hilisimaetano	50	-
20	Mo'uliho	No'uliho	T.Dalam	Hilisimaetano	75	
21	Sinaar Pagi	Idanijala	T.Dalam	Hilisimaetano	50	-
22	Meso	Meso	T.Dalam	Bawomataluo	150	•
23	Hilizihono	Umori	T.Dalam	Hilizihono	75	-
24	Edanau	Edanau	T.Dalam	Bawogosali	75	-
25	So'emo	So'emo	T Dalam	Hilimaenamolo	75	•
26	Awono	Awono	T.Dalam	Sisobambowo	40	-
27	Sibola'ene	Sibola'ene	T.Dalam	Hilimbulawa	90	-
28	Sizawili I	Sizawili	Lolowa'u	Tehegafoa	75	-
29	Bazigu II	Bazigu	Lolowa'u	Tuhegafoa	75	+
30	Gito	Gito	Sirombu	Hanofa	75	+

Table 3.49 FARMER'S EXPECTATION FOR AGRICULTURAL DEVELOPMENT

(Unit: %)

	Type of Farmer															
Item	Technical Irrigation			Desa Irrigation			Rainfed-1*			-	Rainfed-2**					
·	A	В	C	D	A	В	C	D	A	В	C	D	A	В	C	D
Extent land area	70	10	10	10	52	17	31	0	8	42	17	33	50	29	17	4
Rehabilitation of irrigation facil.	60	20	0	20	59	38	3	Õ	63	25	4	8	75	23	0	2
Rehabilitation of drainage facil.	70	20	0	10	38	38	24	0	63	13	13	13	63	29	4	4
Development of village road	70	20	0	10	52	24	24	0	63	21	4	13	71	23	4	2
Agricultural mechanization	70	20	0	10	24	48	28	0	46	33	8	13	58	35	4	2
Kind of new varieties	30	60	0	10	41	34	24	0	46	38	4	13	50	40	6	4
Kind of new livestock	30	40	0	30	14	48	34	3	33	46	13	8	29	48	19	4
Fertilizer	30	60	0	10	55	45	0	0	25	54	0	21	44	48	2	6
Pesticide	30	60	0	10	41	52	. 7	0	13	54	4	29	42	40	4	15
Sprayer	30	20	10	40	17	59	14	10	13	46	13	29	29	52	8	10
Thresher machine	30	20	10	40	10	62	17	10	17	67	0	17	21	63	10	6
Rice mill	60	30	0	10	17	59	17	7	13	50	8	29	10	63	10	17
Financial/Credit	30	60	0	10	55	41	0	3	13	63	4	21	48	42	2	8
Marketing system	30	60	0	10	38	45	14	3	42	29	13	17	44	42	6	8
Technical extension	30	60	0	10	52	45	. 3	0	63	25	4	8	56	38	2	4
Others	0	0	20	80	3	3	21	72	4	13	13	71	4	4	23	69

nit:	90)

	Type of Farmer										
Item		Rub	ber	Coconut							
	A	В	C	D	Α	В	C	D			
Extent land area	14	64	21	0	67	33	0	0			
Rehabilitation of irrigation facil.	7	29	29	36	0	50	33	17			
Rehabilitation of drainage facil.	14	29	21	36	17	50	17	17			
Development of village road	50	50	0	0	83	17	0	0			
Agricultural mechanization	36	57	7	0	83	17	0	0			
Kind of new varieties	43	50	0	7	100	0	0	0			
Kind of new livestock	36	50	14	0	17	50	33	0			
Fertilizer	29	50	7	14	50	50	0	0			
Pesticide	29	50	0	21	17	17	33	33			
Sprayer	29	14	29	29	17	17	17	50			
Thresher machine	7	7	0	86	0	17	33	50			
Rice mill	7	7	7	79	0	17	33	50			
Financial/Credit	43	43	7	7	83	17	0	0			
Marketing system	43	57	0	0	83	17	0	0			
Technical extension	43	57	0	0	83	17	0	0			
Others	0	0	0	100	0	17	33	50			

Remarks:

- * Paddy farmer cultivates single cropping of rice in rainfed paddy field ** Paddy farmer cultivates double cropping of rice in rainfed paddy field

Grade of need:

A: greatest B: great
C: a little
D: no need

Table 3.50 THE NUMBER OF TOURISTS FROM 1980 TO 1989

Nationality					Year	validat dele-bloke)	******			
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Japan	_	-	_	•	-	-		57	35	65
South Korea	-	-	-	_			-	.17	7	78
Taiwan	_	-	4		-	-		17	0	49
Thailand	· · · · · · _	_	_	_	-	-	-	12	2	18
Singapore	-		*		-	_	_	36	4	61
Philippines	-		•	-	-	-		3	4	2
Malaysia	_	_	_	-	-	-		20	3	16
India	_	-	_	-	-	-	-	8	1	. 28
Pakistan/Bangladesh	_	_	_	_	_	_	-	6	0	. 14
Australia		_	-	_	-	. <u>-</u>		316	126	123
New Zealand	•	-	4	-	-	_	-	45	56	74
USA	_		4	-		-	-	144	87	130
Canada	_	-	_	-	-	-	-	46	41	49
England	_		-	-	_	•	-	65	134	193
Nederland/Belgium	_	_	_	_	-	_	_	88	133	175
Austria	-	-	-	_	-	-	-	58	20	24
France	-	•	-	-		-		76	112	159
Germany	_		-	_	-			426	263	195
Switzerland	_	_	-	-	_	_	-	70	99	78
Denmark	_	-	_	-	_	_	-	27	18	10
Italy	-	-	-		-		•	70	49	86
West Europe	-	_	_		· _		_	0	50	760
etc.		-	-		_			103	104	1,379
Total	2,416	1,049	1,121	2,402	2,694	2,370	1,888	1,710	1,348	3,766

Data source; Tourism Service in Kabupaten Nias

Table 4.1 LIST OF WATER RESOURCES

No.	Water Resource	Effective Catchment	Total Catchment		1	Normal 1	Discharg	ge at We	ir Site	(m3/s)					*
	(Name of River)		(Km2)	J	F	М	<u>A</u>	M	J	J	Λ	S	0	N	D
1	Muzoi	310	459	7.9	7.0	9.0	9.2	8.2	7.7	10.2	8.7	13.0	15.6	14.8	11.6
2	Sawo	34	44	0.9	0.8	1.0	1.0	0.9	0.8	1.1	1.0	1.4	1.7	1.6	1.3
3		86	194	2.2	1.9	2.5	2.5	2.3	2.1	2.8	2.4	3.6	4.3	4.1	3.2
4	Afia	7	24	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2
5	To'o	6	20	0.1	0.1	0.2	0.2	0.1	0,1	0.2	0.2	0.2	0.3	0.3	0.2
. 6	Ndra	6	7	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2
7	Idanoi	64	78	1.6	1.5	1.9	1.9	1.7	1.6	2.1	1.8	2.7	3.2	3.1	2.4
8	G. Zebua	71	103	1.8	1.6	2.1	2.1	1.9	1.8	2.3	2.0	3.0	3.6	3.4	2.7
9	Gidosido	46	50	1.2	1.0	1.3	1.4	1.2	1.2	1.5	1.3	1.9	2.3	2.2	1.7
10	Muwa	42	83	1.1	1.0	1.2	1.2	1.1	1.1	1.4	1.2	1.8	2.1	2.0	1.6
11	Mezawa	17	68	0.4	0.4	0,5	0.5	0.4	0.4	0.6	0.5	0.7	0.9	0.8	0.6
12	Mola	75	134	1.9	1.7	2,2	2.2	2.0	1.9	2.5	2.1	3.2	3.8	3.6	2.8
13	Gawo	76	121	1.9	1.7	2.2	2.3	2.0	1.9	2.5	2.1	3.2	3.8	3.6	2.9
14	How	30	92	0.8	0.7	0.9	0.9	0.8	0.8	1.0	0.8	1.3	1.5	1.4	1.1
15	Susuwa	168	203	4.3	3.8	4.9	5.0	4.4	4.2	5.5	4.7	7.1	8.5	8.0	6.3
16	Masio	42	81	1.1	1.0	1.2	1.2	1.1	1.1	1.4	1.2	1.8	2.1	2.0	1.6
17	Sau'a	44	50	1.1	1.0	1.3	1.3	1.2	1.1	1.4	1.2	1.9	2.2	2.1	1.7
18	Gomo	20	233	. 0.5	0.5	0.6	0.6	0.5	0.5	0.7	0.6	0.8	1.0	1.0	0.8
19	Armo	50	55	1.3	1.1	1.5	1.5	1.3	1.3	1.6	1.4	2.1	2.5	2.4	1.9
20	Eho	38	233	1.0	0.9	1.1	1.1	1.0	1.0	1.2	1.1	1.6	1.9	1.8	1.4
21	O'ou	46	48	1.2	1.0	1.3	1.4	1.2	1.1	1.5	1.3	1.9	2.3	2.2	1.7
22	Siwalawa	34	56	0.9	0.8	1.0	1.0	0.9	0.9	1.1	1.0	1.4	1.7	1.6	1.3
23	Dumula	18	97	0.5	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.8	0.9	0.9	0.7
24	Oyo	380	497	9.7	8.6	11.1	11.3	10.0	9.5	12.5	10.7	16.0	19.2	18.1	14.3
25		44	92	1.1	1.0	1.3	1.3	1.2	1.1	1.4	1.2	1.9	2.2	2.1	1.7
26	Lahomi	36	84	0.9	0.8	1.1	1.1	1.0	0.9	1.2	1.0	1.5	1.8	1.7	1.4
27	Lahusa	9	10	0.2	0.2	0.2	0.3	0.2	0.2	0.3	0.2	0.4	0.4	0.4	0.3
	Total	1,796	3,216	45.7	40.7	52.4	53.2	47.4	44.9	59.0	50.7	75.7	90.6	85.6	67.4

Table 4.2 LIST OF POTENTIAL DIVERSION DAMS

		Catchment	Water Surface Area at	Di	mensions of Da	m
No.	River Name	Area (km2)	Full Water Level (km2)	Height (m)	Crest Length (m)	Capacity (mill, m3)
1	Muzoi	203	12	40	700	300
2	Muzoi	42	5	30	300	80
3	Sawo	25	1.4	35	400	30
4	Sowo	16	1.3	30	400	20
5	Sowo	31	2.5	30	700	40
6	Olora	8	0.5	40	700	10
7	Siwalawa	25	2.1	25	400	25
8	Lahomi	15	1.0	45	400	20
9	Mordo	18	1.5	50	500	25
10	Oyo	150	12	75 -	400	350
	Total	•				900

Table 4.3 LIST OF DEVELOPMENT POTENTIAL AREAS

francisch versch	Sarrain arter area and the Steven are much after Wheel as a resident in the property of the All Indian Contention				Effective
No	Name of Schemes	Kecamatan	Potential	Water	Catchment
· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	Area (Ha)	Resources	(Km2)
1,	Muzoi	Tuhemberua	5,330	Muzoi	310
2.	Torowa	Tuhemberua	1,040	Sawo	34
3.	Ladara	Tuhemberua	380	Sowu	86
4.	Sowo	Tuhemberua	1,610	Afia	7
5	Afia / To'o	Tuhemberua	1,440	To'o	6
				Olora	20
6.	Ndra Humene	Gido	1,360	Ndra	6
				Idanoi	64
7.	Binaka	Gido	300	Small Rivers	
8.	Gido Zebua	Gido	1,340	Gido Zebua	71
9.	Muwa	Idano Gawo	7,170	Muwa	42
				Gidosiido	46
				Gawo	76
10.	Mezawa	Idano Gawo	6,620	Mezawa	17
				Mola	75
11.	How	Idano Gawo	6,450	How	30
12.	Susuwa	Lahusa	1,580	Susuwa	168
13.	Afoa	Lahusa	590		
14.	Boli	Lahusa	190	Masio	42
15.	Bawodobara	Teluk Dalam	170	Sau'a	41
16.	Teluk Dalam	Teluk Dalam	320	Small River	20
17.	Hilijihona	Teluk Dalam	100	Small River	5
18.	Sorake	Teluk Dalam	270	Gomo	20
19.	Todawa	Teluk Dalam	350	Eho	38
20.	Otuwa and Idano Zala	Teluk Dalam	1,720	Armo	50
21.	Amuri	Lolowau	540	O'ou	46
22.	Siwalawa	Lolowau	530	Siwalawa	34
23.	Oyo, Dumula	Alasa	12,480	Dumula	18
				Oyo	380
				Mordo	44
				Lahomi	36
24.	Lahusa	Sirombu	140	Lahusa	9
	Sub-total (*)		52,020		
25.	Afulu	Lahewa	1,280	-	
26.	Tuhenase	Lahewa	150	-	-
	Sub-total (**)		1,430		
· · · · · · · · · · · · · · · · · · ·	Total		53,450	N	

(*): potential irrigation area dependent on surface run-off (**): potential irrigation area dependent on spring water Note:

Table 4.4 GROSS FIELD WATER REQUIREMENTS

			-														
Month	Temperature Hum	e Humidii	ty Sunshine	ndity Surshine Wind Velocity Elo	017	์ วี โ	3	ප	2	3	ဗ ု	٠.	1	¥ Ľ¥	3	G 5	ž
	္	(%)	(%)	(m/s)		1:1	1.1	1.05	1.05	1.05	0.95	Y	(S=200)				
11	25.8	87	55	0.4	5.6	6.2	6.2	5.9	5.9	5.9	5.3	-	10.9	3.3			0.0
32	25.8	87	55	4.0													0.0
丘	25.8	87	55	5.0	5.8	6.4	6.4	6.1	6.1	6.1	5.5	-	11.1	3.3			0.0
£	25.8	83	55	6.5													0.0
M	26.0	88	47	0.4	6.0	9.9	9.9	6.3	6.3	6.3	5.1		11.1	33	11.1		5.6
MZ	26.0	88	47	4.0				٠.					٠		11.1	11.1	11.1
AI	26.0	8	8 4	0.4	5.8	6.4	6.4	6.1	6.1	6.1	5.5	,I	11.0	33	7.4	11.0	9.2
A2.	26.0	ጽ	48	0.4		64	-	:							10.7	7.4	6
M	26.0	8	51	0.4	5.4	5.9	5.9 2	5.7	5.7	5.7	5.1	, - (10.7	33	6.7	10.2	∞
WZ	26.0	8	51	4.0				74							10.0	6.7	8.4
Ę	25.8	88	61	0.4	5.0	5.5	5.5	5.3	5.3 2	5.3 1	4. 8.	*~4	10.5	9. 53	6.3	9.6	8.0
12	25.8	88	61	0.4						7	-				5.8	6.3	6.1
IJ	25.2	88	52	0.5	5.1	5.6	5.6	5.4	5.4	5.4	4.8 2	r~4	10.5	93 63	0.0	5.8	2.9
72	25.2	88	52	6.0												0.0	0.0
A1	25.3	88	\$	0.4	5.4	5.9	5.9	5.3	5.7	5.7	5.1		10.7	9 9	10.7		5.4
A2	25,3	88	49	0.4											10.7	10.7	10.7
Si	25.2	88	39	0.4	5.8	6.4 1	6.4	6.1	6.1	6.1	5.5		11.0	3,3	7.4	11.0	9.2
.S2	25.2	6 8	36	0.4		7				٠					10.7	7.4	9.1
10	25.2	8	38	0.3	6.0	9.9	6.6 2	6.3 1	6.3	6.3	5.7	-	11.1	3.3	7.3	10.4	9.1
0	25.2	ጽ	38	0.3	٠			64							10.6	7.3	9.0
Z	25.2	ጽ	41	0.4	5.8	6.4	6.4	6.1	6.12	6.1 1	5.5	—1	11.0	33	7.1	10.4	∞
Z	25.2	8	41	0.4						14	-				6.5	7.1	6.8
Ē	25.5	68	47	0.4	5.6	6.2	6.2	5.9	5.9	5.9	5.3 2	r~i	10.9	3.3	0.0	6.3	3.2
D2	25.5	89	47	4.0											0.0	0.0	0.0
Notes:	1. ETo	H	evapotran	evapotranspiration, FAO approach, albedo =0.25	approa	ch, albed	0=0.25										
-	2. C1 to C5	n	FAO crop	FAO crop coefficients for HYV paddy	THYV.	paddy											
:	3. P	В	percolation	percolation and seepage													
	4. LP1	IJ	land prepa	land preparation requirements for (C1+P),	nents fo	1 (C1+P)											
	with S	ii	200 mm		٠.												
	5. WLR	Л	water laye	water layer replacement, i.e. 50 mm in 1/2 month twice during crop	i.e. 501	nm in 1/.	2 month	twice d	uring crc	Ć.							
	6. G1 and G2	, II	golongan 1 and 2	1 and 2				-							•		
	7. GFR	JJ	gross field	gross field water requirements, excluding effective rainfall and irrigation efficiency	ments, e	xcluding	effectiv	e rainfa	ll and irr	igation (fficiency						
	8. Last 1/2 month sh		s zero for pre	ows zero for pre-harvest drying out	ont												
	9. Indices 1 and 2 sh		where values	ow where values are applicable to golongans I and 2 respectively;	to gold	ngans 1	and 2 res	spective	ly;								
	these values are u	a :	in arriving al	sed in arriving at totals G1 and G2 respectively	GZ resp	ectively											
	10. Locanon; 01	4	1 KC /KV														

Table 4.5 DIVERSION REQUIREMENTS

Month	GFR	R80	F	RE	NFR	DR	DR
	mm/d	mm/d		mm/d	mm/d	mm/d	1/s/ha
	4						
J1	0.0	5.5		0.0	0.0	0.0	0.0
J2	0.0	5.5		0.0	0.0	0.0	0.0
F1	0.0	4.9		0.0	0.0	0.0	0.0
F2	0.0	4.9		0.0	0.0	0.0	0.0
M1	5.6	6.3	0.18	1.1	4.5	7.5	0.87
M2	11.1	6.3	0.53	3.3	7.8	13.0	1.50
A1	9.2	6.4	0.55	3.5	5.7	9.5	1.10
A2	9.1	6.4	0.40	2.6	6,5	10.8	1.25
M 1	8.5	5.7	0.40	2.3	6.2	10.3	1.19
M2	8.4	5.7	0.40	2.3	6.1	10.2	1.18
J1	8.0	5.4	0.40	2.2	5.8	9.7	1.12
J2	6.1	5.4	0.40	2.2	3.9	6.5	0.75
J1	2.9	7.1	0.20	1.4	1.5	1.5	0.17
J2	0.0	7.1			0.0	0.0	0.00
A1	5.4	6.1	0.18	1.1	4.3	7.2	0.83
A2	10.7	6.1	0.53	3.2	7.5	12.5	1.45
S1	9.2	9.1	0.55	5.0	4.2	7.0	0.81
S2	9.1	9.1	0.40	3.6	5.5	9.2	1.06
O1	9.1	10.9	0.40	4.4	4.7	7.8	0.90
O2	9.0	10.9	0.40	4.4	4.6	7.7	0.89
N1	8.8	10.3	0.40	4.1	4.7	7.8	0.90
N2	6.8	10.3	0.40	4.1	2.7	4.5	0.52
D1	3.2	8.1	0.20	1.6	1.6	2.7	0.31
D2	0.0	8.1	•	0.0	0.0	0.0	0.00

Notes: 1. GFR

= gross field requirements excluding effective rainfall and irrigation

efficiency

2. R80 = 1 in 5-year low rainfall

3. F = rainfall factor, incorporating area

and rainfall effectiveness

4. RE = effective rainfall

5. NFR = net field water requirements

6. DR = diversion requirements, including overall irrigation efficiency of 60%

= NFR/(8.64 x 0.6)

Table 4.6 IRRIGABLE AREA

Catchment Area for Weir 100 km2 Catchment Area for Dam 40 km2 Month Unit water Rainfall River Irrigable Requirment Intensity Capacity of Dam(x 1,000m³) Runoff Area (m3/s)(ha) A1(ha)=2,218 A2(ha)=2,500A3(ha)=3,000(1/s/ha) (mm/day) 2.55 J10.00 5.5 2.55 J2 0.00 5.5 Fl 0.00 4.9 2.27 4.9 F2 0.00 2,27 0.87 6.3 2.92 3,352 M1 2,92 1,944 550 1,116 2,120 1.50 6.3 M2 -276 2,96 2,694 437 A1 1.10 6.4 2,370 210 **A**2 1.25 6,4 2.96 1,020 2.64 2,218 450 1,247 M1 1.19 5.7 417 1,207 2.64 2,236 M2 1.18 5.7 2.50 2,232 389 1,115 **J1** 1.12 5.4 J2 0.75 5.4 2.50 3,333 3.29 19,336 J1 0.17 7.1 3.29 J2 0.00 7.1 2.82 3,402 A1 0.83 6.1 1,948 **A2** 1.45 6.1 2.82 S1 0.81 9.1 4.21 5,201 9.1 3,974 **S2** 1.06 4.21 0.90 10.9 5.05 5,607 01 **O2** 0.89 10.9 5.05 5,607 N1 0.90 10.3 4.77 5,298 N2 0.52 10.3 4,77 9,170 12,097 D1 0.31 8.1 3.75 D20.00 8.1 3.75 Total 550 2,306 7,146

Table 4.7 LIST OF PROPOSED IRRIGATION AREA AND FACILITIES

		Suitable Area	Potential	Water							
Name of	Kecamatan	for Paddy	Imigable	Resources	Imi	Irrigable Area			Requir	Required Facilities	ities
Scheme		Cultivation (ha)	Area (ha) (***)		Alt1		Alt2		Weir Dam	1	Capacity of dam (m.qu.m)
(1)Muzoi	Tuhemberna, Lahewa	099'9	5,330	Muzoi River	5,330	(100%)	'		Yes	Š	
(2)Torowa	Tuhemberua	1,300	1,040	Sawo River	655	(63%)	1,040	(100%)	Yes	Yes	2.7
(3)Ladara	Tuhemberua	470	380	Sown River	-2,569	(78%)	3,430	(100%)	Yes	Yes	4.3
(4)Sowo	Tuhemberua	2,010	1,610	Afia River	٠	•			Yes	Š	
(5)Afia/To'o	Tuhemberna, G.Sitoli	1,800	1,440	To'o River	٠	٠	٠	٠	Yes	Š.	
(6)Ndra Humene	Gido	1,700	1,360	Ndra River	1,360	(100%)	•	•	Yes	S.	
(7)Binaka	G.Sitoli	380	300	Idanoi River	300	(100%)	1	ı	Yes	No	
(8)Gidozebua	Gido	1,670	1,340	Gido Zebua River	1,340	(100%)	•	•	Yes	No.	
(9)Muwa	Idano Gawo, Gido	8,960	7,170	Muwa River	-3,228	(45%)	•	•	Yes	S _S	
				Gidosiido River -	ŀ	•	1	•	Yes	Š	
				Gawo River	•	•	•	•.	Yes	Š	
(10)Mezawa	Idano Gawo	8,270	6,620	Mezawa River	-5,711	(38%)	٠	•	Yes	Š	
				Mola River	1	٠	1	•	Yes	Š	
(11)How	Idano Gawo	90'8	6,450	How River	1	•	٠	•	Yes	ģ	
(12)Susuwa	Lahusa	1,980	1,580	Susuwa River -		٠	•	•	Yes	Š.	
(13)Afoa	Lahusa	740	280								
(14)Boli	Lahusa	240	190	Masio River	8	(100%)	•	•	Yes	Ņ.	
(15)Bawodobara	Teluk Dalam	210	170	Sau'a River	 8	(100%)	٠	•	Yes	å	
(16)T.Dalam	Teluk Dalam	400	320	Sau'a River		•	٠	٠			
(17)Hilijihona	Teluk Dalam	130	100	Small river	8	(100%)	ı	٠	Yes	ž	
(18)Sorake	Teluk Dalam	340	270	Gomo River	- 2,340	(100%)	•	•	Yes	Š	
(19)Todawa	Teiuk Dalam	440	350	Eho River	•	•	•	٠	Yes	Š.	
(20)Otuwa/Idano Zala	Teluk Dalam	2,150	1,720	Armo River	•	•	٠	•	Yes	ž	
(21)Amuri	Lolowan	019	540	O'ou River	540	(100%)	ŧ	t	Yes	Š	
(22)Siwalawa	Lolowau, Sirombu	099	530	Siwalawa River	530	(100%)	1	,	Yes	Š	
(23)Oyo/Dumula	Alasa, Sirombu, Mandrehe	15,600	12,480	Dumula River	8,944	(72%)	12,480	(100%)	Yes	Š	
				Oyo River		•	•	•	Yes	Yes	20.1
				Mordo River -	•	•	1		Yes	Š	
				Lahomi River	•		•	•	Yes	å	
(24)Lahusa	Sirombu	180	140	Lahusa River	145	(100%)	•	٠	Yes	No	
Sub-total(*)		020'59	52,020		33,767	(65%)	38,549	(74%)			
(25)Afulu	Lahewa	1,600	1,280	Spring	•	•	•	•	٠	t	
(26)Tuhenase	Lahewa	190	150	Spring	'	١	•	•	1		
Total(**)		0,810	53,450								

Note;(*)potential imigation area dependent on surface run-off
(**)total potential imigation areas dependent on spring and surface run-off
(***).It is assumed that 80% of suitable area for paddy cultivation is taken as net irrigable (productive) area, reducing area of roads, canals etc.

DEMAND PROJECTION OF PADDY IN THE NIAS ISLAND Table 5.1

Year	Popu- lation*	Per-Capita Consumption of Rice	Total Paddy Consumption	Other Requirement**	Total Paddy Requirement	Supply of Paddy***	Demand of Paddy
******		(Kg/person/yr)	(ton/year)	(ton/year)	(ton/year)	(ton/year)	(ton/year)
1989	558,700	135	116,000	15,800	131,800	94,500	37,300
1990	570,100	135	118,400	16,100	134,500	94,500	40,000
1995	624,700	135	129.700	17,700	147,400	94,500	52,900
2000	679,600	135	141.100	19,200	160,300	94,500	65,800
2005	735,700	135	152,800	20,800	173,600	94,500	79,100
2010	796,500	135	165,400	22,600	188,000	94,500	93,500
2015	858,100	135	178,200	24,300	202,500	94,500	108,000
2020	924,400	135	192,000	26,200	218,200	94,500	123,700

^{*:} population growth rate 1989-1990; 2.04 %

*: population growth rate 1990-1995; 1.85 %

*: population growth rate 1995-2000; 1.7%

*: population growth rate 2000-2005; 1.6 %

*: population growth rate 2010-2015; 1.5 %

*: population growth rate 2015-2020; 1.5 %

*: population growth rate 2015-2020; 1.5 %

**: including seed requirement, waste and feed requirement (about 12% of total demand of paddy)

***: total production of paddy of the Nias island (80 % of average total production of lowland paddy and upland between 1985 and 1989)

Table 5.2 PRESENT AND FUTURE LAND USE IN IRRIGATIOIN PROJECT AREAS

Name of	Name of	Suitable Area	1	Paddy Field		Upland	Bush	Tree	Crops	Forest	Others
Irrigation Projects	Kecamatan	for Paddy		(In Net)		Crop Field	and			and	
		Cultivation	Irrigated	Rainfed	Sub-Total		Shrub	Coconuts	Rubber	Settlements	
		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
(1)Muzoi	Tuhemberua, Lahawa	6,660	250	380	630	110	350	30	760		
(2)Torowa	Tuhemberua	1,300	250	140	390	90	140	50	530	0	100
(3)Afia/To'o, Ladara, Sowo	Tuhembeaus, G. Sitoli	4,280	600	1,350	1,950	80	610	60	680	420	480
(4)Ndra Humene	Gido	1,700	300	140	440	60	230	270	400	190	110
(5)Binaka	G. Sitoli	380	. 0	90	. 90	0	0	20	150	100	20
(6)Muwa	Gido, Idano Gawo	8,960	9	5,530	5,530	80	1,630	0	0	340	1,380
(7)Mezawa, How	Idano Gawo	16,330	0	4,540	4,540	170	4,680	180	0	5,620	1,140
(8)Afoa, Susuwa	Lahusa	2,720	0	270	270	130	1,210	50	980	10	70
(9)Boli	Lahusa	240	40	150	190	0	0	0	0	0	50
(10)Bawodobara, T.Dalam	Teluk Dalam	610	40	150	190	0	80	210	0	80	50
(11)Hilijihona	Tcluk Dalam	130	0	100	100	0	0	0	0	0	30
(12)Todawa, Otuwa/Ie. Zala	Teluk Dalam	2,930	520	720	1,240	0	700	680	. 0	0	310
Sorake											
(13)Amuri	Lolowau	670	0	180	180	0	90	350	0	0	50
(14)Siwalawa	Lolowau, Sirombu	660	180	240	420	0	130	0	0	0	110
(15)Oyo/Dumula	Alasa, Sirombu, Mandrehe	15,600	190	2,180	2,370	60	8,050	1,890	0	2,640	590
(16)Lahusa	Sirombu	180	0	50	50	0	100	20	0	0	10
(17) Afulu, Tuhenase	Lahewa	1,790	0	220	220	0	380	1,130	0	0	60
Total		65,140	2,370	16,430	18,800	780	18,380	4,940	3,500	14,020	4,720

WITH PROJECT CONDITION	N										
Name of	Name of	Suitable Area		Paddy Field		Upland	Bush	Trec	Crops	Forest	Others
Imigation Projects	Kecamatan	for Paddy	,	(in Net)		Crop Field	and			and	
		Cultivation	Irrigated	Rainfed	Sub-Total		Shrub	Coconuts	Rubber	Settlements	
		(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
(1)Muzoi	Tuhemberua, Lahewa	6,660	1,000	0	1,000	0	0	30	760	4,620	250
(2)Torowa	Tuhemberua	1,300	570	0	570	0	0	50	530	0	150
(3)Afia/To'o, Ladara, Sowo	Tuhemberua, G. Sitoli	4,280	2,500	0	2,500	0	0	60	680	420	620
(4)Ndra Humene	Gido	1,700	680	0	680	0	Ð	270	400	190	160
(5)Binaka	G. Sitoli	380	90	0	90	0	0	20	150	100	20
(6)Muwa	Gido, Idano Gawo	8,960	5,530	0	5,530	80	1,630	0	0	340	1,380
(7) Mezawa, How	Idano Gawo	16,330	8,420	0	8,420	0	0	180	0	5,620	2,110
(8)Afoa, Susuwa	Lahusa	2,720	940.	0	940	0	500	50	980	10	240
(9)Boli	Lahusa	240	190	0	190	0	0	0	0	0	50
(10)Bawodobara, T.Dalam	Teluk Dalam	610	250	0	250	0	0	210	0	80	70
(11)Hilijihona	Teluk Dalam	130	100	0	100	0	0	0	0	0	30
(12)Todawa, Otuwa/Ic. Zala	Teluk Dalam	2,930	1,800	0	1,800	0	0	680	0	0	450
Sorake											
(13)Amuri	Lolowau	670	250	0	250	0	0	350	0	0	70
(14)Siwalawa	Lolowau, Sirombu	660	520	0	520	0	0	0	. 0	0	140
(15)Oyo/Dumula	Alasa, Sirombu, Mandrehe	15,600	8,860	0	8,860	0	0	1,890	0	2,640	2,210
(16)Lahusa	Sirombu	180	130	0	130	0	0	20	0	0	30
(17)Afulu, Tuhenase	Lahewa	1,790	520	0	520	0	0	1,130	0	0	140
Total		65,140	32,350	0	32,350	80	2,130	4,940	3,500	14,020	8,120

Table 5.3 PROPOSED FARMING PRACTICES OF RICE

Items	Practices
1) Varieties	IR Series (IR 46, 48, 54), High Yielding Varieties
2) Growth Period	130 days
3) Planting	
-Area of Nursery Bed	300 m2/ha (1.5 m x 200 m)
-Amount of Seed	30 kg per ha for planting area, 100 g/m2 nursery bed
-Nursery Period	25 days
-Planting Density	25 hills/m2, 3 seedlings/hill
4) Land Preparation	2 time of plowing, 1 time of harrowing and puddling
5) Fertilization	
-Application amount	
Nursery bed	Urea=6.4 g/m2, TSP=3.3 g/m2
Planting area	Fertilizer Urea(kg/ha) TSP(kg/ha) KCl(kg/ha)
	a.basal 75 75 50
	b.Top-1 75
	c.Top-2 75 75 50
•	total 225 150 100
-Time of Application	
Basal Application	Before 2 nd plowing
1 st top dressing	20 days after transplanting
2 nd top dressing	25 days before heading stage
6) Weeding	Manual weeding
7) Control of pest, etc.	
-Insecticide	FURADAN 2G 30kg/ha, before 2 nd plowing, mix with soil
-Pesticide	BLA-S or HINOSANN, 15 days after seeding
-Others	WARFARIN, 30 days before heading stage
8) Harvesting	Manual harvesting by sickle, 30 days after heading stage

Table 5.4 ESTIMATED YIELD OF PADDY IN RELATED KECAMATANS AND IRRIGATION PROJECT AREAS

1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	Statistic	Yield	
Name of	yield*	assessed**	
Kecamatan	(ton/ha)	(ton/ha)	
Tuhemberua	3.4	2.7	
Lahewa	2.9	2.3	* Average yield of
Gido	3.7	3.0	paddy between 1985
Idano Gawo	3.3	2.6	and 1989
Lahusa	2.9	2.3	
T.Dalam	3.4	2.7	** 80% of the statistic
Lolowau	3.1	2.8	paddy yield
Alasa	2.6	2.1	
Sirombu	3.4	2.7	
Mandrehe	3.3	2.8	

Name of	Name of	Estimated Yield
Irr. Project area	Kecamatan	(ton/ha)
Muzoi	Tuhemberua, Lahewa	2.5
Torowa	Tuhemberua	2.7
Ladara	Tuhemberua	2.7
Sowo	Tuhemberua	2.7
Afia/To'o	Tuhemberua, G.Sitoli	2.8
Ndra Humene	Gido	3.0
Binaka	G.Sitoli	2.8
Gidozebua	Gido	3.0
Muwa	Idano Gawo,Gido	2.8
Mezawa	Idano Gawo	2.6
How	Idano Gawo	2.6
Susuwa	Luhusa	2.3
Afoa	Luhusa	2.3
Boli	Luhusa	2.3
Bawodobara	T.Dalam	2.7
T.Dalam	T.Dalam	2.7
Hilijihona	T.Dalam	2.7
Sorake	T.Dalam	2.7
Todawa	T.Dalam	2.7
Otuwa/Idano Zala	T.Dalam	2.7
Amuri	Lolowau	2.8
Siwalawa	Lolowau, Sirombu	2.8
Oyo/Dumula	Alasa,Sirombu, Mandrehe	2.5
Lahusa	Sirombu	2.7
Afulu	Lahewa	2.3
Lahusa	Lahewa	2.3

Table 5.5 ECONOMIC PRICE OF RICE

Items	Paddy
Projected 1995 world market price of rice(US\$/ton)(1)	243
Quality adjustment(2)	24
International shipping and handling(US\$/ton)	29
CIF price at Gunung Sitoli(US\$/ton)	248
CIF price at Gunung Sitoli(Rp./Kg)(3)	459
Port charge, handling, operation(Rp./Kg)	37
Transort to wholesaler(Rp./Kg)	13
Trader margin(Rp./Kg)	11
Ex-mill or wholesale price(Rp./Kg)	498
Conversion ratio to paddy(4)	324
Milling cost(Rp./Kg)	. 13
Transport farm to mill(Rp./Kg)	13
Economic farm gate price(Rp./Kg)	298

Based on the IBRD price prospects for major primary commodities, 1988-2000, update The IBRD figures estimated are given in 1985 constant prices, which have been adjusted by a factor of 1.4439 (MUV) to allow for price escalation between 1985 and 1990. pricing basis: rice Thailand ,milled,5% broken,FOB Bangkok
 a 10 % discount for rice
 one US\$=Rp.1850
 65%

Table 5.6 ECONOMIC PRICE OF FERTILIZER

A) Urea		
•	Price of FOB Europe (\$/ton)	248
	Price differential of Indonesian Urea (\$/ton)	16
	FOB price of Bagged Urea ex-factory Lhokseumawe (\$/ton)	264
	Ex-factory Lhokseumawe (Rp/kg)	488
	Transport to Project Area (Rp/kg)	18
	Handling costs (Rp/kg)	17
	Transport wholesaler to farm (Rp/kg)	11
	Economic Farm Gate Price (Rp/kg)	534
B) TSP		
-,	Price of US Gulf (\$/ton)	240
	Freight and Insurance (\$/ton)	63
	CIF Indonesia (\$/ton)	303
	CIF Indonesia (Rp/kg)	561
	Transport to Project Area (Rp/kg)	18
	Handling costs (Rp/kg)	17
•	Transport wholesaler to farm (Rp/kg)	11
•	Economic Farm Gate Price (Rp/kg)	607
C) KCL		
-	Price of FOB Vancourver (\$/ton)	132
	Freight and Insurance (\$/ton)	53
	CIF Indonesia (\$/ton)	185
	CIF Price Belawan (Rp/kg)	342
	Transport to Project Area (Rp/kg)	18
	Handling Costs (Rp/kg)	17
•	Transport wholesaler to farm (Rp/kg)	11
	Economic Farm Gate Price (Rp/kg)	388

Remaks:Exchange Rate of One US\$=Rp.1,850 (*):Urea=Export Parity
TSP and KCL=Import Parity

TABLE 5.7 CROP BUDGET OF PADDY PER HA IN TERMS OF ECONOMIC VALUE WITH AND WITHOUT PROJECT CONDITIONS

		With Proj	With Project(wet/dry season	season)	Without	Without Project (Type]	/pe])	Without Project (Type II)	Project (1	ype II)	Without	Without Project (Type I	Se III)
Items	Unit	άO	Crit	Amount	Q'ty Q'ty	Unit	Amount	Á,Ŏ	Unit	Amount	Q,Q	Unit	Amount
			Price			Price			Price			F.	
Unit Yield	ton/ha	5.0			2.3		,	2.5			2.6	 	1
Unit Price	Rp./ton	,	298,000	•	•	298,000	,	1	298,000	•	•	298,000	•
Gross Income	Rp./ha	ı	•	1,490,000	•	٠	685,400	•		745,000	•	•	774,800
Production Cost													
Seed	Rp./kg	30	350	10,500	35	350	12,250	35	350	12,250	35	350	12,250
Urea	Rp./kg	225	534	120,150	83	534	33,642	83	534	33,642	83	534	33,642
TSP	Rp./kg	150	607	91,050	36	603	21,852	36	607	21,852	36	60	21,852
KCI	Rp./kg	100	388	38,800	8	388	3,104	∞	388	3,104	00	388	3,104
Agr.chemicals	Rp./lit	n	5,660	16,980	3.6	2,660	20,376	3.6	5,660	20,376	3.6	5,660	20,376
Labor	man-day	180	2,300	414,000	142	2,300	326,600	142	2,300	326,600	142	2,300	326,600
sub-total				691,480			417,824		•	417,824			417,824
Primary Profit	Rp./ha			798,520		.]	267,576		'	327,176		-	356,976

		Without	Without Project (Type IV	/pe IV)	Without	Without Project (Type V	ype V)	Without	Project (1	ype VD
Items	Unit	Q'ty	Unit Price	Amount	Q'ty	Unit Price	Amount	Q.D	Q'ty Unit Amou Price	Amount
Unit Yield	ton/ha	2.7			2.8			3.0		1
Unit Price	Rp./ton	•	298,000	ı	1	298,000			298,000	
Gross Income	Rp./ha			804,600		•	834,400	•	1	894,000
Production Cost										
Seed	Rp./kg	35	350	12,250	35	350	12,250	35	350	
Urea	Rp./kg	83	534	33,642	ß	534	33,642	63	534	
TSP	Rp./kg	36	69	21,852	38	689	21,852	36	607	
KCI	Rp./kg	90	388	3,104	∞	388	3,104	00	388	
Agr.chemicals	Rp./lit	3.6	5,660	20,376	3.6	5,660	20,376	3.6	5,660	
rode.	man-day	142	2,300	326,600	142	2,300	326,600	142	2,300	
sub-total	•			417,824			417,824			417,824
Primary Profit	Ro. Ma		•	386 776		•	416 576		•	476 176

Type I : Tuhenase/Afulu, Susuwa/Afoa, Boli Project (Rainfed-Wet season)

Type II : Muzoi, Oyo/Dumula Project (Rainfed-Wet season)

Type III: Mezawa/How Project (Rainfed-Wet season)

Type IV: Ladara/Sowo/Afia/Too, Otuwa/Id.Zala/Todawa, T.Dalam/Bawodobara, Hilijihona, Torowa, Lahusa Project (Rainfed-Wet season)

Type V : Muwa, Binaka, Siwalawa, Amuri Project (Rainfed-Wet season)

Type VI: Ndra Humene Project (Rainfed-Wet season)

Table 5.8 MAIN INTAKE FACILITIES

No.	Name of Irrigation Projects	Name of Rivers	Intake Discharge(m^3/s)
1.	Mczawa/How	Mezawa	0.50
	:	Mola	2.19
	4	How	0.88
		Susuwa	4.08
2.	Muwa	Gidosiido	1.34
		Muwa	0.53
		Gawo	2,22
3.	Ladara/Sowo/Afia/To'o	Sawo	2.48
		Olora	0.58
		Afia	0.19
		To'o	0.18
4.	Susuwa/Afoa	Masio	1.41
5.	Binaka	tributary	0.14
6.	Boli	tributaries	0.29
7.	Siwalawa	Siwalawa	0.64
8.	Amuri	O'ou	0.19
9.	Lahusa	tributaries	0.20
10.	Ndra Humene	Idanoi	1.02
11.	Otuwa/Zala/Todawa/Sorake	Eho	0.90
		Armo	1.20
		Gomo	0.48
12.	T.Dalam/Bawodobara	tributary	0.38
13.	Hilijihona	tributary	0.15
14.	Torowa	Sowo	0.58
15.	Muzoi	Nalua	0.44
16.	Afulu/Tuhenase	Spring	-
17.	Oyo/Dumula	Oyo	10.79
		Mordo	0.99
		Lahomi	1.05

Table 5.9 CONSTRUCTION COST ESTIMATE

Name	V	Veir		igation Canal		rainage Canal	R	toad	Rec	lamation	Total	Unit Cost
No. of Irrigation Projects	O'tv	Cost	Oty	Cost	Oty	Cost	Qty	Cost	Q'ty	Cost		
11010013				(Rp.million)		(Rp.million)	(km)	(Rp.million)	(ha)	(Rp.million)	(Rp.million)	(US\$/ha)
1 Mezawa/How	8	8,052	159.0		43.0	· -	122.0	11,921	3,880	4,960	60,104	4,800
2 Muwa	6	3,744	100.5	•	18.0		52.0	8,790	0	. 0	31,250	3,800
3 Ladara/Sowo/Afia/To'o	7	2,787	88.8	10.932	9.5	595	64.5	8,156	550		23,173	6,300
4 Susuwa/Afoa	1	2,391	27.3	3,201	3.3	200	23.5	3,666	670	857	10,315	7,400
5 Binaka	1	38	8.0	490	2.0	67	2.0	230	0	0	825	6,200
6 Boli	2	154	9.0	245	0.0	0	12.5	1,569	0	0	1,968	7,000
7 Siwatawa	5	479	26.5	1,639	1.0	. 80	24.0	4,224	100	128	6,550	8,500
8 Amuri	3	435	16.0	789	0.0	0	10.0	1,232	70	90	2,546	6,900
9 Lahusa	4	32	8.0	249	0.0	0	0.8	1,280	80	102	1,663	8,600
10 Ndra Humene	1	2,000	21.3	2,739	3.5	28	2.5	394	240	307	5,468	5,400
11 Otuwa/Zala	4	2,667	68.9	9 009	7.0	235	46.0	7,970	560	716	20,597	7,700
12 T.Dalam/Bawodobara	1	283	16.0	1,565	11.0	787	2.5	328	60	. 77	3,040	8,200
13 Hilijihona	1	18	6.5	647	0.0	0	0.0	D	0	O	665	4,500
14 Torowa	4	664	31.5	1,668	33.5	3,454	33.5	3,387	180		9,403	11,100
15 Muzoi	9	962	44.8	2.744	0.0	. 0	66.0	6,031	370		10,210	6,900
16 Afulu/Tuhenase	1	8	12.5	702	24.0	806	55.0	5,146	300		7,046	9,200
17 Oyo/Dumula	12	15,340	134.0	29,687	33.0	1,581	110.0	36,006	6,490		90,911	6,900
Total	70	40,054		112,705		15,321		100,330		17,324	285,734	

Table 6.1 DETERMINATION OF BUILD-UP PERIOD FOR IRRIGATION BENEFIT

Reclaimed land:7 year Rainfed land: 4 year Irrigated land: 3 Year

Name	L	and Criteria (%	(b)	Building-up
irrigation	Irrigated	Rainfed	Reclaimed	period*
project	Paddy Field	Paddy Field	land	(year)
Mezawa/How	0	54	46	5.4
Muwa	0	100	0	4.0
Ladra/Sowo/Afia/To'o	24	54	22	4.4
Susuwa/Afoa	0	28	72	6.2
Binaka	0	100	0	4.0
Boli	21	79	0	3.8
Siwalawa	0	81	19	4.6
Amuri	0	72	28	4.8
Lahusa	0	38	62	5.9
Ndra Humene	44	21	35	4.6
Otuwa/Id.Zala/Todawa/Sorake	29	40	31	4.6
T.Kalam/Bawodobara	16	60	24	4.6
Hilijihana	0	100	0	4.0
Torowa	44	24	32	4.5
Muzoi	25	38	37	4.9
Tuhenase/Afulu	0	42	58	5.7
Oyo	2	25	73	6.2

^{*:}Irrigated Paddy Field(%)x3 +Rainfed Paddy Field(%)x4+ Reclaimed Land(%)x7

Table 6.2 IRRIGATION BENEFIT

			With Pro	Project Condition	ition			Withor	Without Project Condition	dition		
Name of Irrigation	Project	Annual	Unit	Gross	Production	Primary	Armual	Unit	Gross	Production	Primary	Irrigation
Project	Area C	Cultivated Area	Yield	Income(1)	Cost(2)	Profit(3)	Cultivated Area	Yield	Income(4)	Cost(5)	Profit(6)	Benefit(7)
	(ha)	(ha)	(ton/ha) (Rp	(Rp.million)	(Rp.million)	(Rp.million)	(ha)	(ton/ha)	(Rp.million)	(Rp.million)	(Rp.million) (Rp.million	Rp.million)
1. Mezawa/How	8,420	14,620	5.0	21,784	10,102	11,681	4,540	2.6	3.518	1.898	1.620	10.062
2. Muwa	5,530	8,730	5.0	13,008	6,037	6,971	5,530	2.8	4,614	2,312	2,303	4,668
3. Ladara/Sowo/Afia/To'o	2,500	5,000	5.0	7,450	3,457	3,993	2,550	2.7	2,052	1,066	986	3,007
4. Susuwa/Afoa	940	1,880	5.0	2,801	1,300	1,501	270	2.3	185	113	72	1,429
5. Binaka	8	180	2.0	268	124	1	8	2.8	75	38	37	106
6. Boli	190	380	5.0	566	263	304	230	2.3	158	96	62	242
7. Siwalawa	220	1,040	5.0	1,550	719	831	009	5.8	501	251	250	581
8. Amuri	250	500	5.0	745	346	399	180	2.8	150	75	75	324
9. Lahusa	130	260	5.0	387	180	208	50	2.1	40	21	19	188
10.Ndra Humene	089	1,360	5.0	2,026	940	1,087	740	3.0	662	309	352	734
11.Otuwa/fd.Zala/Todawa	1,800	3,600	5.0	5,364	2,489	2,875	1,510	2.7	1,215	631	584	2,291
12.T.Dalam/Bawodobara	250	200	5.0	745	346	399	230	2.7	185	96	8	310
13.Hilijihona	100	200	5.0	298	138	160	300	2.7	08	42	39	121
14.Torowa	570	1,140	5.0	1,699	788	911	640	2.7	515	268	247	663
15.Muzoi	1,000	2,000	5.0	2,980	1,383	1,597	880	2.5	656	368	288	1,309
16.Tuhenase/Afulu	520	1,040	5.0	1,550	719	831	220	2.3	151	92	59	772
17.0yo	8,860	17,720	5.0	26,403	12,245	14,158	2,560	2.5	1,907	1,070	837	13,321
Total	32,350	60,150		89,624	41,574	48,049	20,920		16,663	8,745	7,918	40,131
Note:												

(1):Annual Cultivated Area x Unit Yield x Rp.298,000/ton (2):Annual Cultivated Area x Rp.691,000/ha (3):(1)-(2) (4):Annual Cultivated Area x Unit Yield x Rp.298,000/ton (4):Annual Cultivated Area x Unit Yield x Rp.298,000/ton

(5):Annual Cultivated Area x Rp.418,000/ha

(6):(1)-(2) (7):(3)-(6)

Table 6.3 RICE SUPPLY PLAN OF NIAS ISLAND

Year	Paddy Demand (ton)	Name of Irrigation Project	Incremental Paddy Production (ton)*	Accumulated Paddy Production(ton)
1990	40,000	h.e. 717	C1 000	63.000
1995	52,900	Mezawa/How	61,300	61,300
	* *	Muwa	42,200	103,500
2000	65,800			
2005	79,100			
2010	93,500			

Note;*:Incremental paddy production of each irrigation project is below;

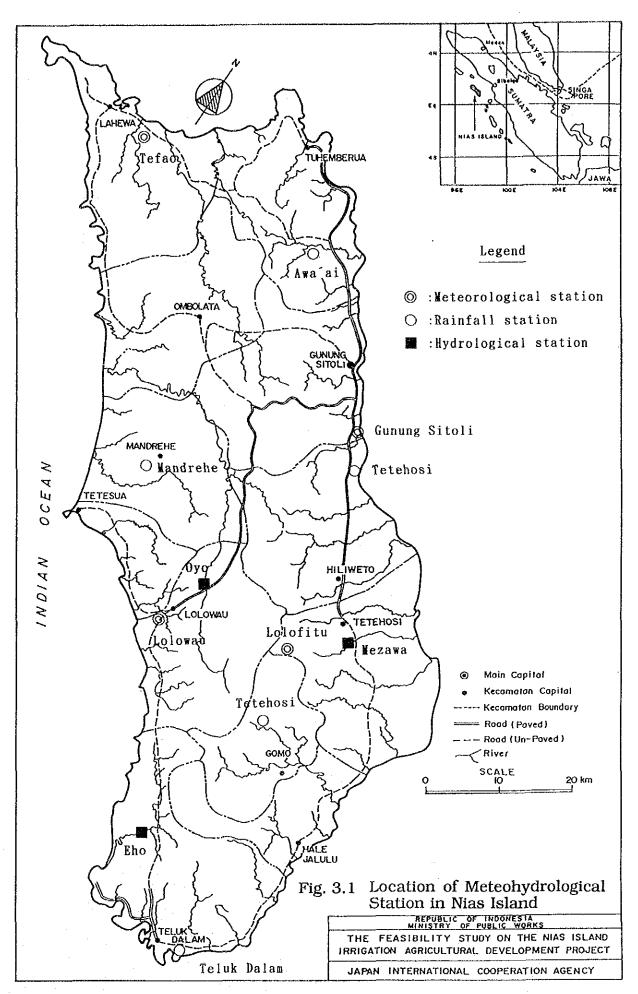
Name of Irrigation		Paddy Production (to	n)
Project	With Project Condition	Without Project Condition	Incremental Paddy Production
Mezawa/How	73,100	11,800	61,300
Muwa	43,700	1,500	42,200

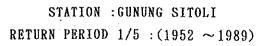
^{**:} After the implementation of Gidozebua Irrigation Project, financed by ADB, additional amount of incremental paddy will be expected.

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FIGURES





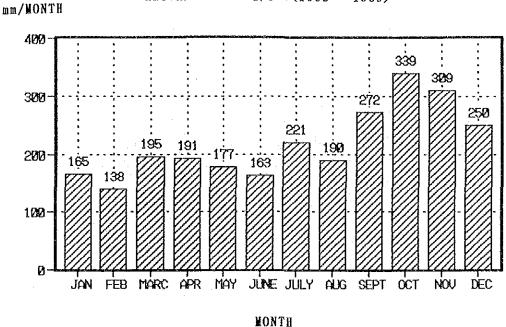
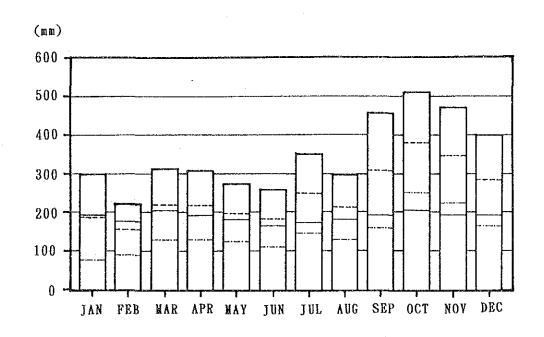


Fig. 3.2 Hyetograph at G. Sitoli

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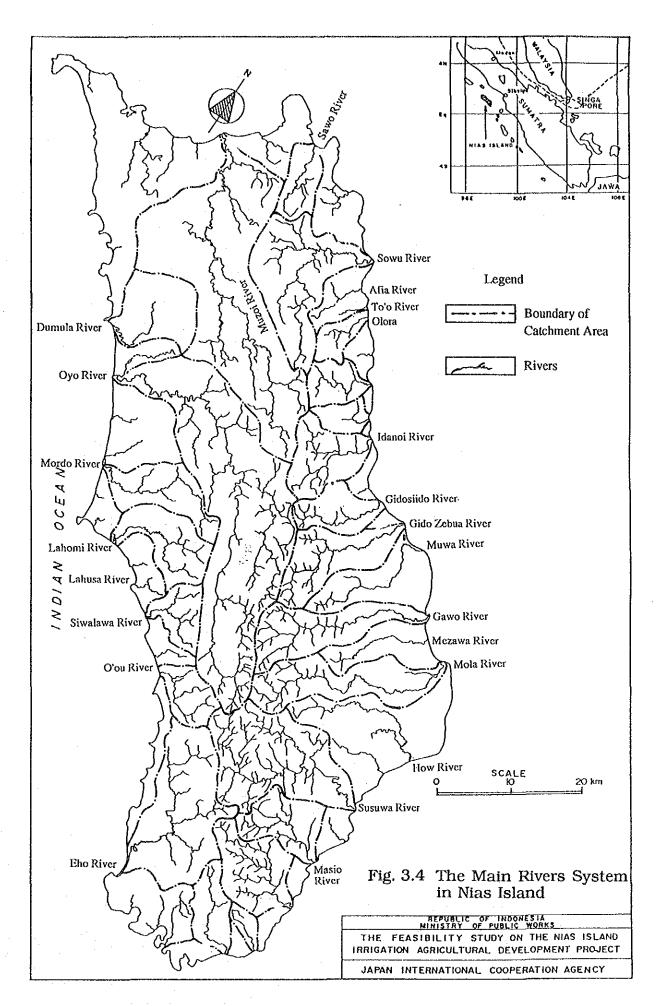


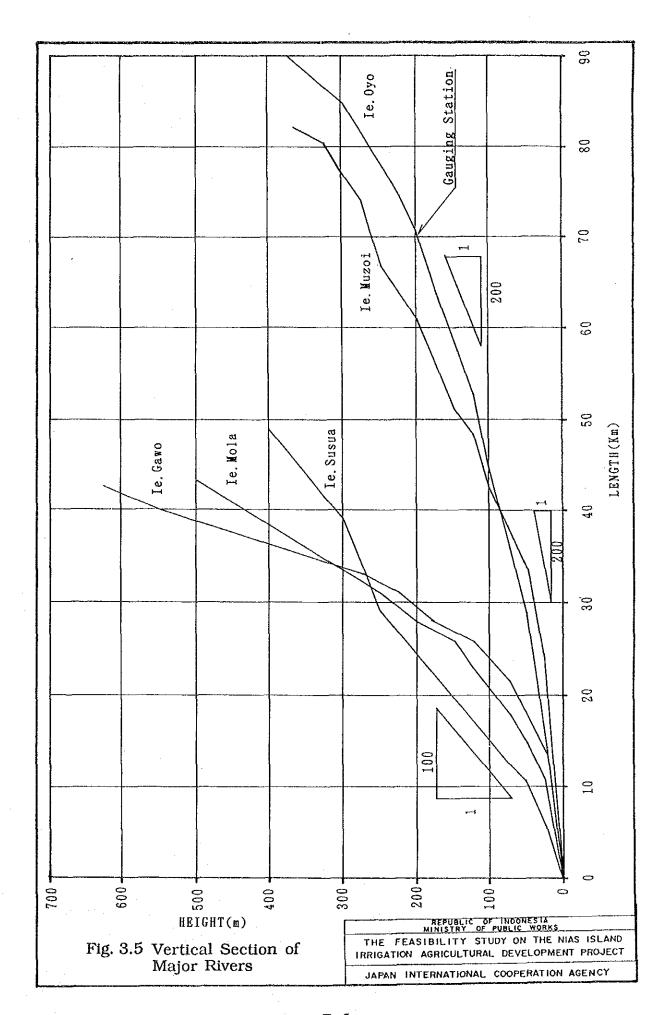
	l jan	FEB	MAR	APR	YAK	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Year	LEGEND)
E.T. Rn STD Rn+S Rn-S S/Rn	192 186 111 297 75 0.60	179 156 67 223 89 0.43	205 220 91 311 129 0.41	192 216 88 304 128 0.41	183 199 74 273 125	165 184 73 257 110 0.40	174 249 102 351 147 0.41	183 214 84 298 129 0.39	192 306 148 454 159 0.48	205 382 131 513 251 0.34	192 349 125 474 224 0.36	192 282 118 400	2941 375 3316 2566		Rm+S Rm E. T Rm-S

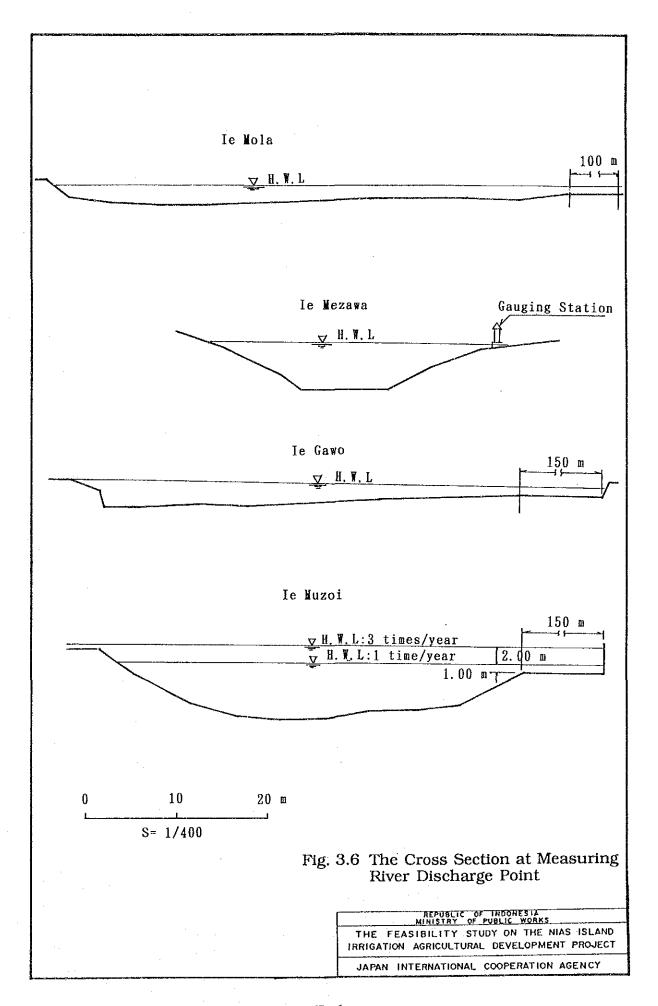
E.T. :Monthly Evapotranspiration (=ETO×1.1)
Rm :Mean monthly rainfall (mm)
S : Standard deviation
V : Coefficient of variation

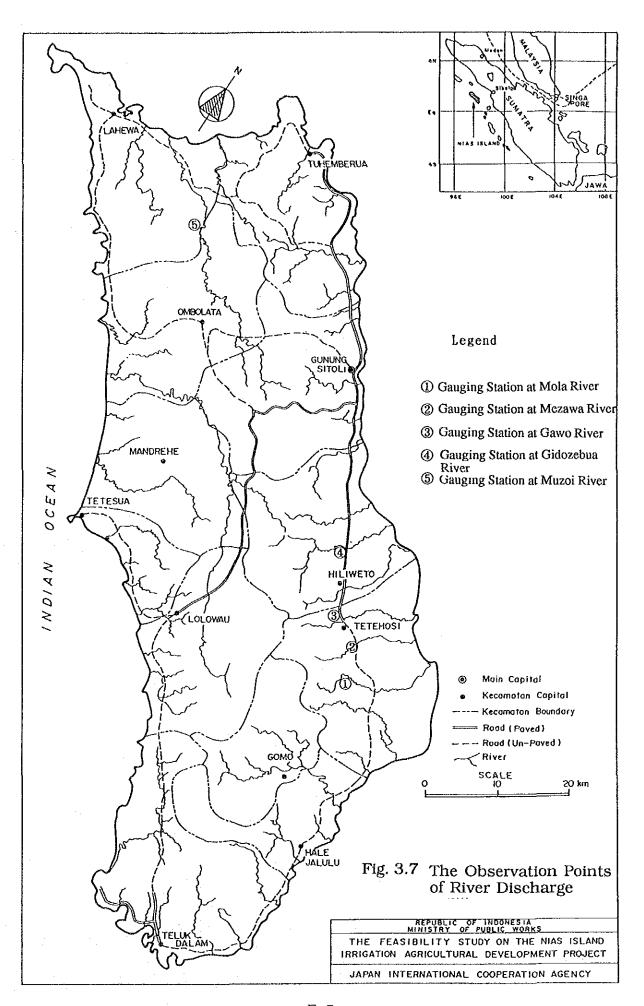
Fig. 3.3 Relation between Mean Monthly Evapotranspiration and Rainfall

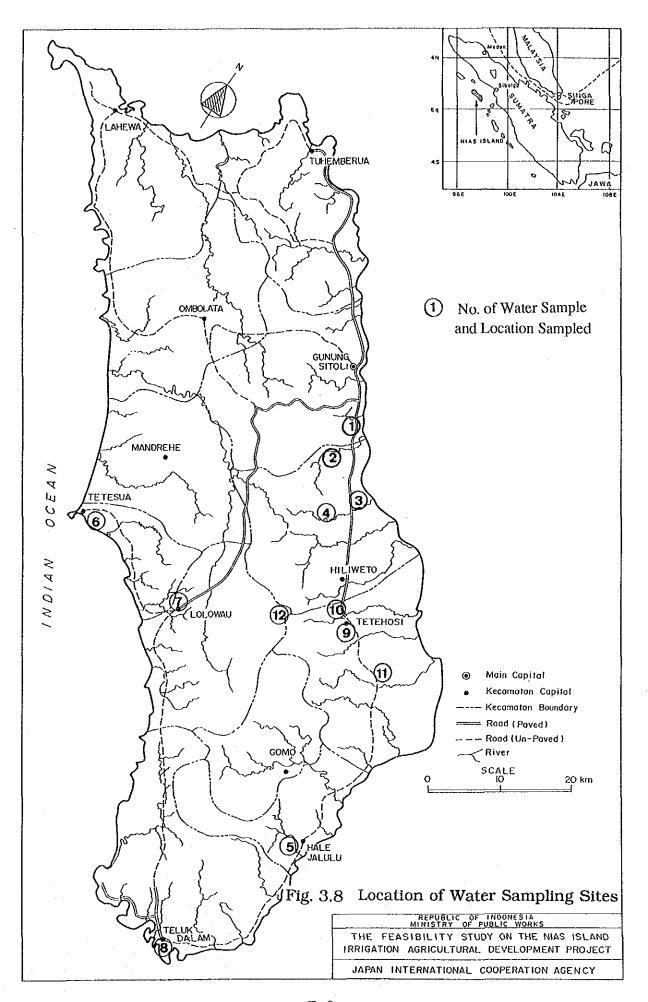
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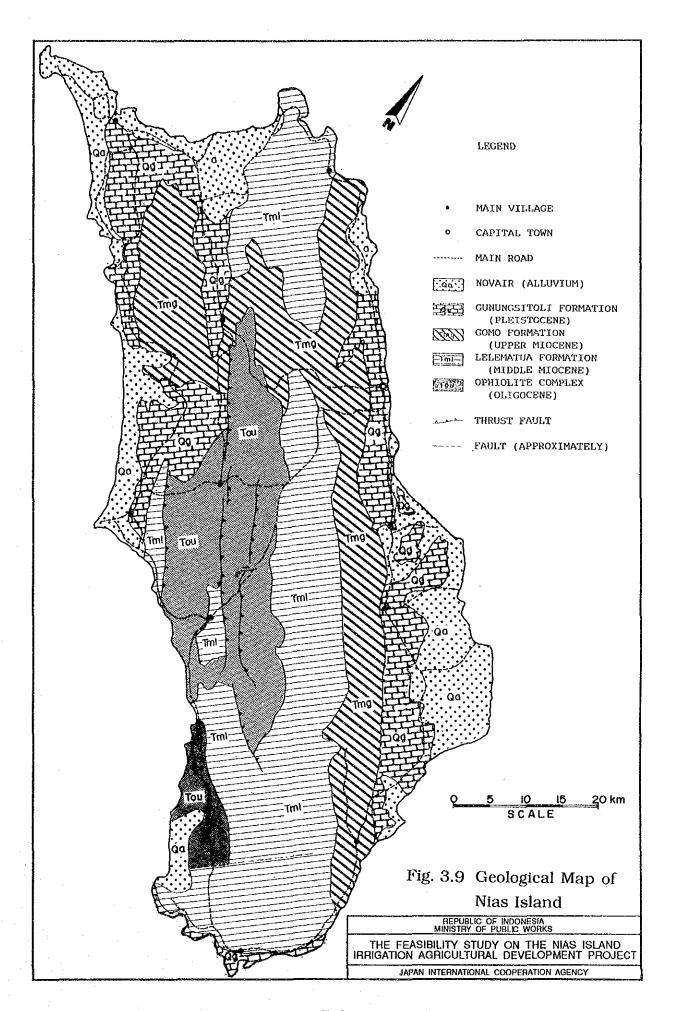


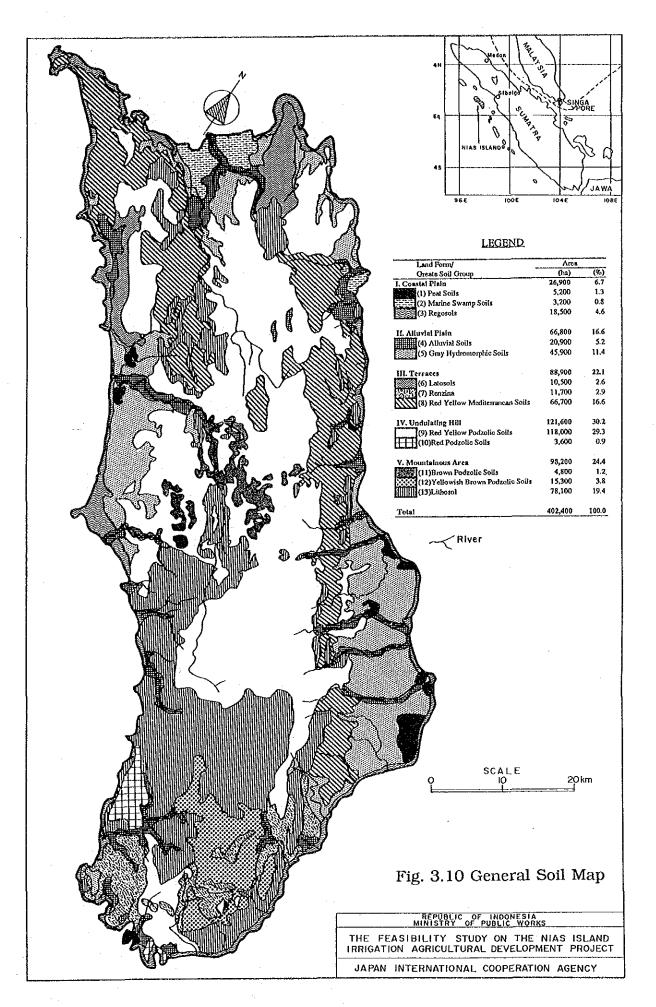


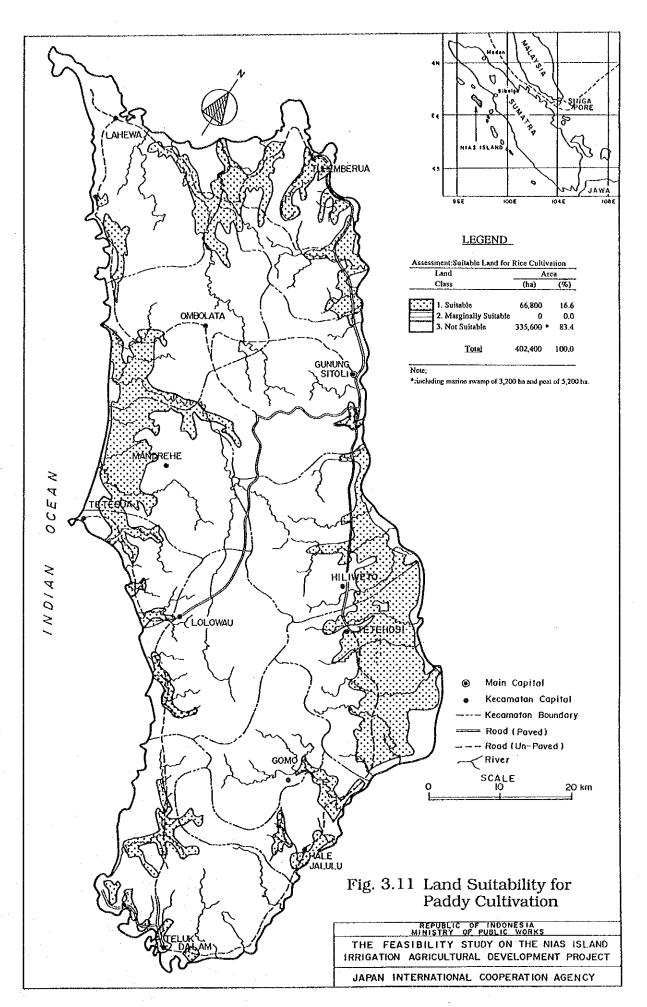


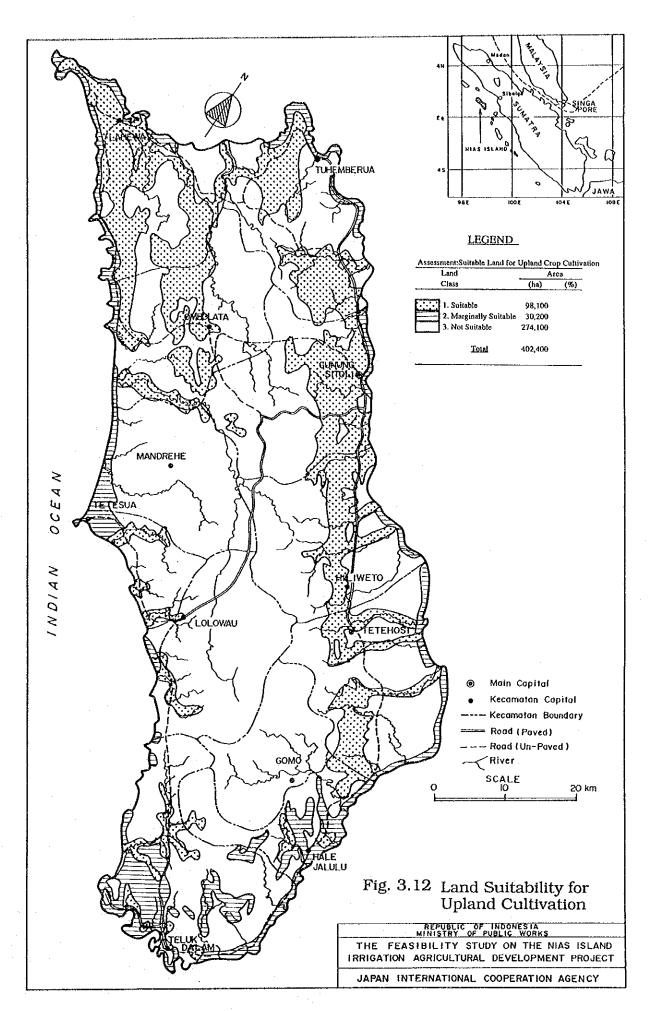


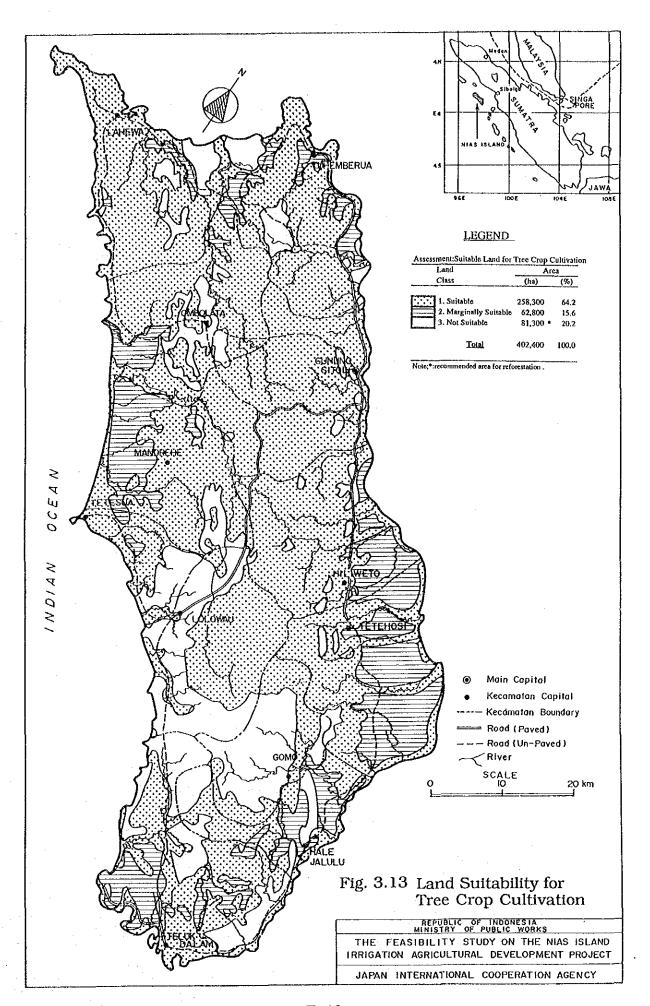


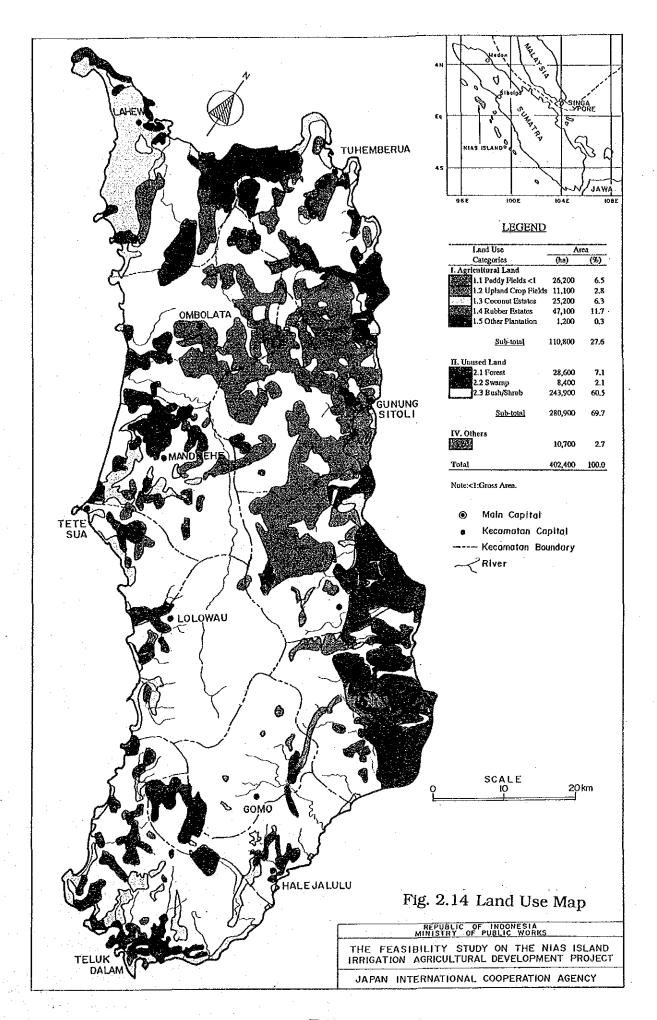


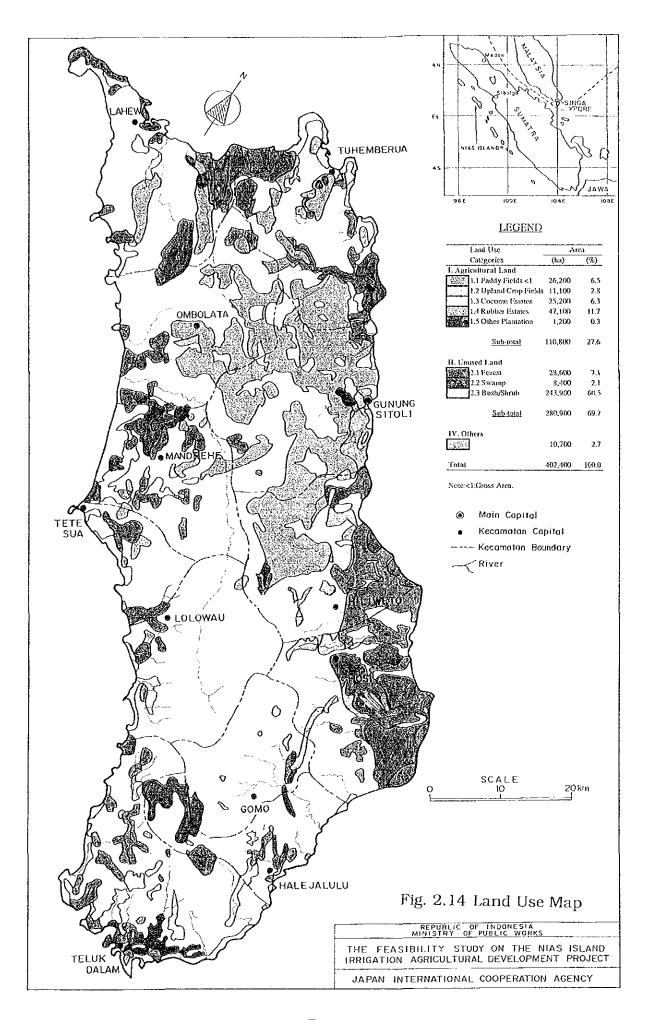


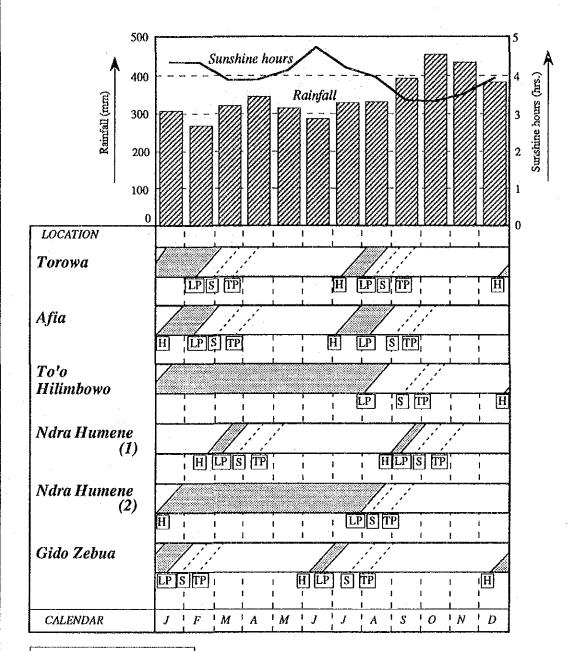












Legend

- Rainfall Ø
- Fallow period
- Land preparation LP
- Sowing
- TP Transplanting
- Harvesting

Remarks

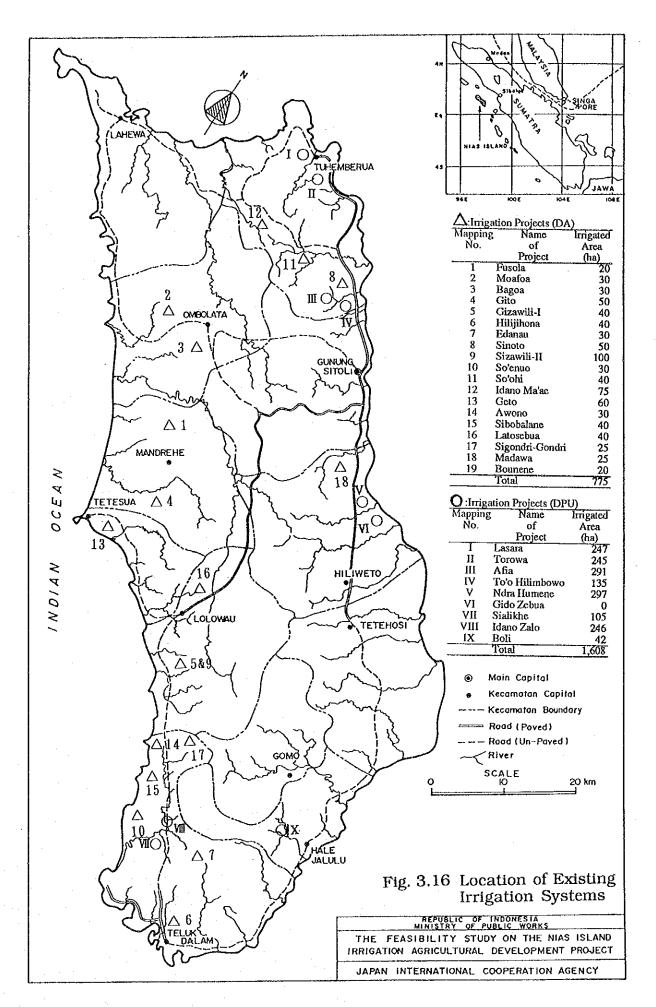
- 1. Sunshine hours are daily total from 8 AM to 4 PM. 2. Rainfall data at Sitoli Mountain Station is used (average of 85 years).

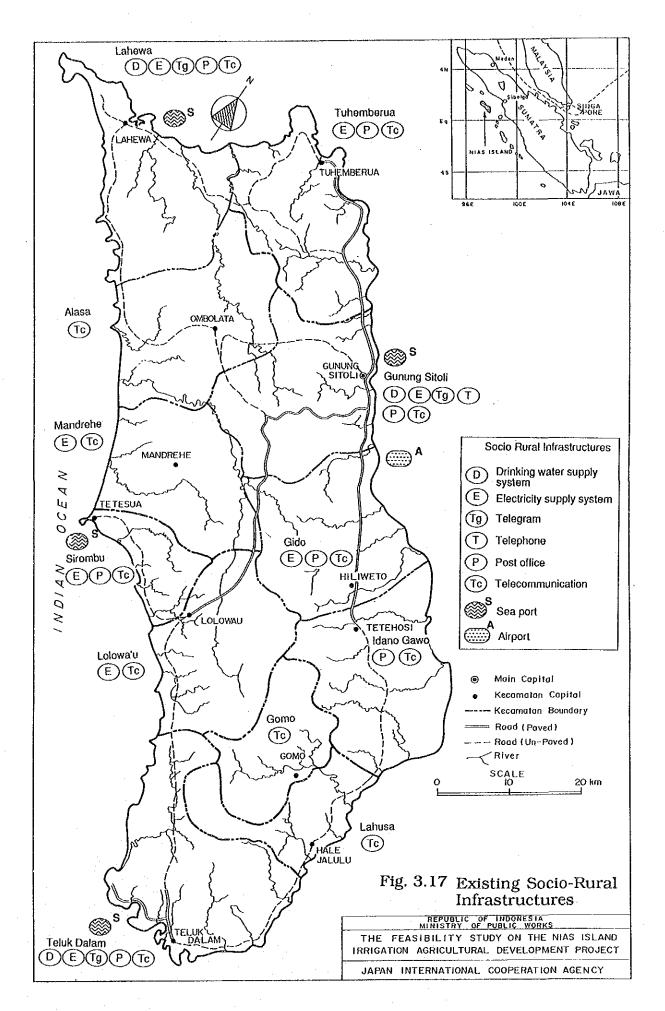
Fig. 3.15 Rice Cropping Season and Monthly Rainfall in Nias

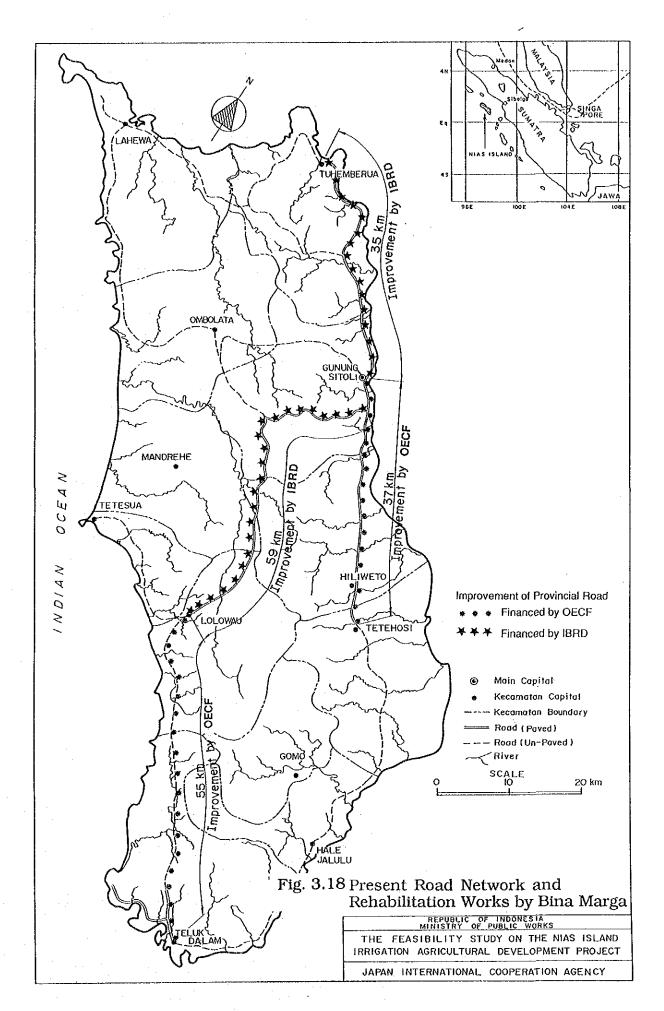
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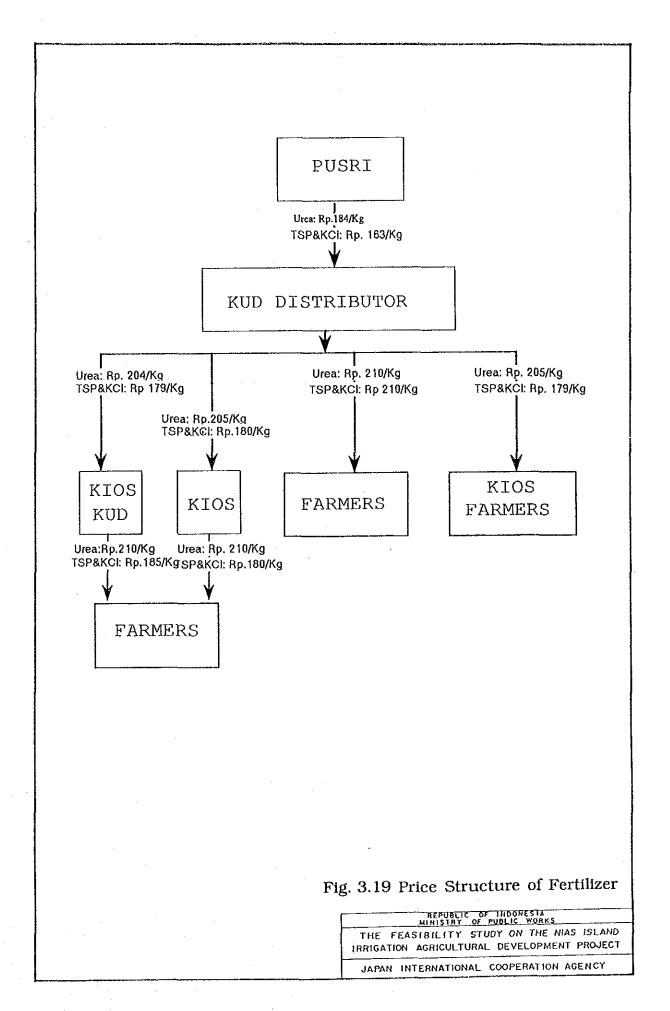
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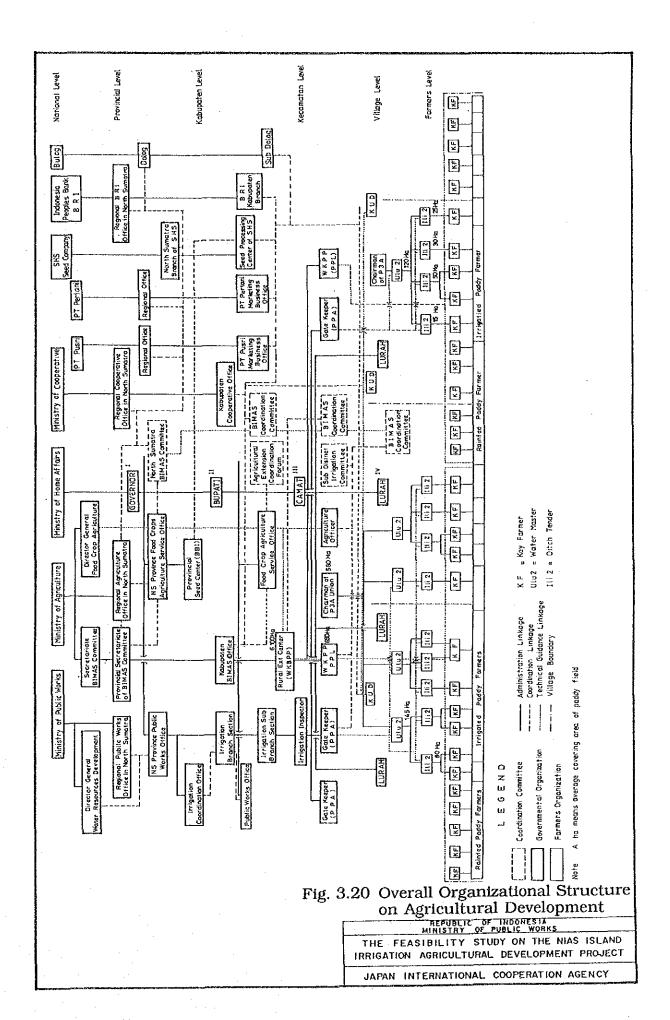
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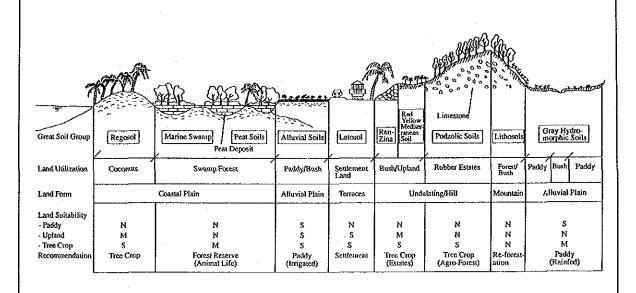
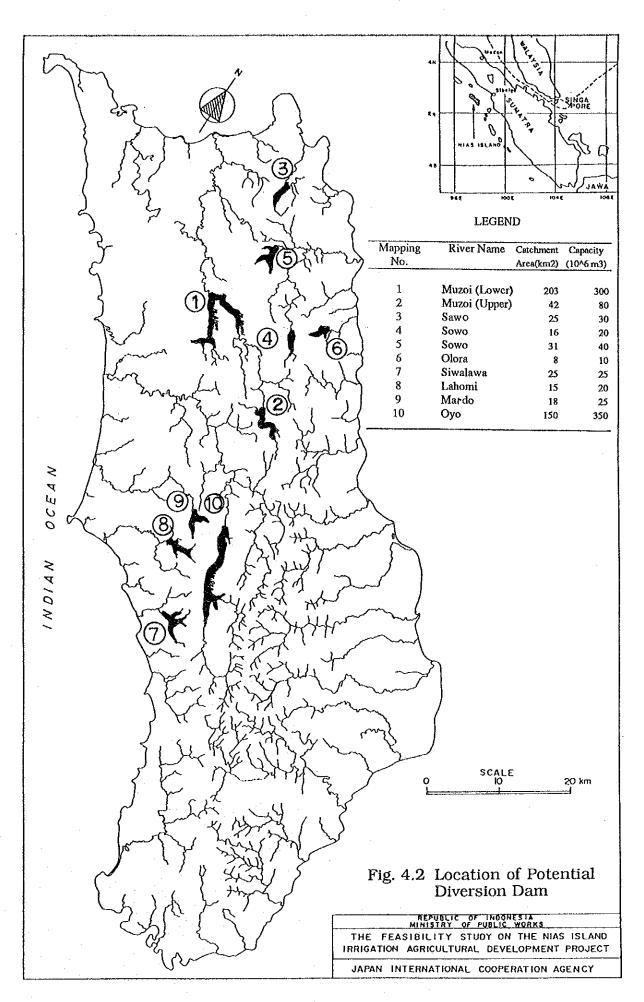
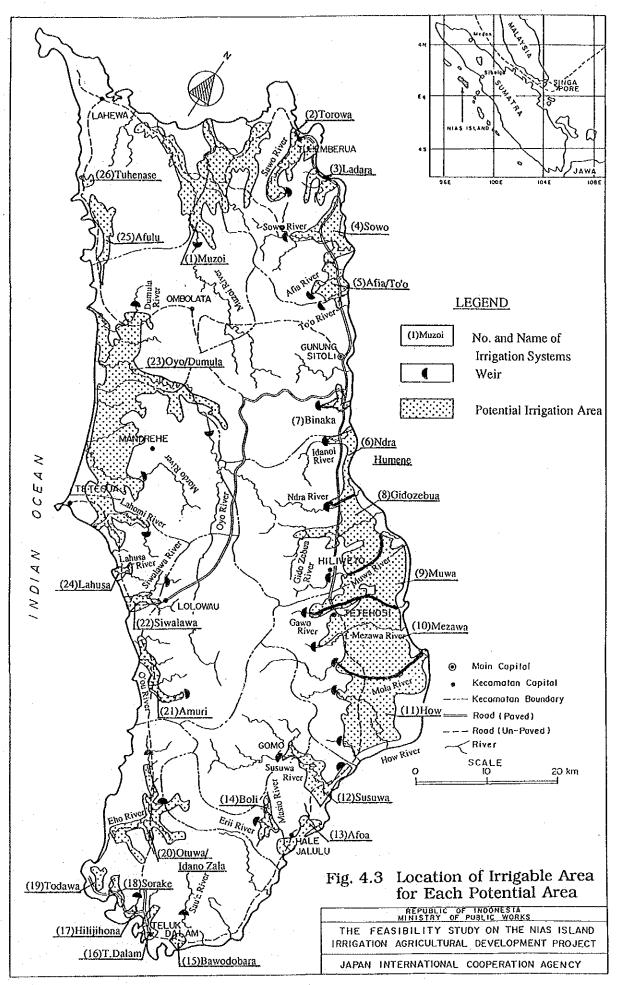


Fig. 4.1 Recommended Land Utilization from the View Point of Land Resources in Nias Island

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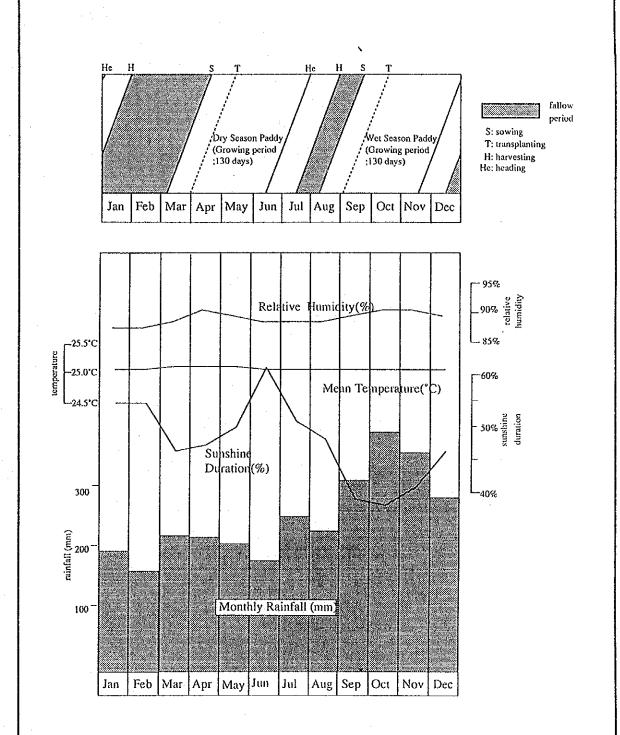


Fig. 5.1 Proposed Cropping Pattern

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