ANNEX I. AGRICULTURE AND RURAL INFRASTRUCTURES

CONTENTS

List of Tables

List of Figures

Table I-1 List of Existing Irrigation Scheme in East Timor (1/3)

Study	Strategy for Irrigation & Water Management by Agriculture Department UNTAET Data source as of 1997				Joint Assessment Mission Background Paper by World Bank Nov.1999				JICA Study Aug.2000				DAA F/S Data-1 (drawing data) by Division of Agriculture Affair UNTAET May.2001				DAA F/S Data-2 (22+4=26schemes) by Division of Agriculture Affair UNTAET May.2001				Agricultural Rehabilitation Program (ARP) by Agriculture Department UNTAET Implemented Communal Irrigation Maintenance up to 20				Proposed Program of Work for Construction by Agriculture Department UNTAET UNTAET Trust Fund & World Bank-ARP in 26				Using Data in this Study based on DAA F/S Data-1 & Data-2				Implementation or Plan by another study (Donor)
District	No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)			No.	Name of Scheme	Irrigation Area (ha)			No.	Name of Scheme	Irrigation Area (ha)				
			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional	Recovered			Potentia	Functional			Potentia	Functional	Remaining		
LAUTEM													1	FUILORO	400	400																1	FUILORO	400	400	0	
													2	IRABARE	350	350																2	IRABARE	350	350	0	
	1	LURO	150	98	1	LURO	150	98					3	LURO	100	60	1	LURO	100	60												3	LURO	100	60	40	
	2	LAIVAI	150	100	2	LAIVAI	150	150					4	LAIVAI	125	100	2	LAIVAI/ILLI	125	100												4	LAIVAI	125	100	25	
																					1	Los Palos	402	100	302												
																					2	Moro Parlamento	72	50	22												
																					3	Moro lilac	1,000	800	200												
																					4	Moro Equisi	860	500	360												
																					5	Moro Daedere	300	100	200												
																					6	Moro Daudere	200	100	100												
																					7	Moro Serelau	50	25	25												
																					8	Luro Afabubo-1	70	40	30												
																					9	Luro Afabubo-2	30	30	0												
																					10	Luro Wairoke	50	40	10												
																					11	Iliomar	1,000	200	800												
																					12	Fuiluro Technical S	20	0	20												
																					13	Moro Nasa	48	0	48	W-1	Nasa	72	48								
																										W-2	Papapa	450	300								
																										W-3	Iradarate	60	30								
																										W-4	Afumbere	75	45								
Sub-total	2		300	198	2		300	248	0		0	0	4		975	910	2		225	160	13		4,102	1,985	2,117	4		657	423		4		975	910	65	
BAUCAU													5	LARISULA	350	350														U-3	Larisula ✓	400	300	5	LARISULA	350	350	0	
	3	LAGA	300	175					1	LAGA		200	6	LAGA	300	175														W-5	LAGA (3 project)	300	180	6	LAGA	300	175	125	
	4	SEICAL-up	972	792	3	SEICAL-up	927	792	2	SEICAL-up		580	7	SEICAL-up	800	0	3	SEICAL-up	800	0	19	SEICAL-up	1,000	800	200						a) Onometa			7	SEICAL-up	800	0	800	
	5	SEICAL-down	540	190	4	SEICAL-down	540	190	3	SEICAL-down		190	8	SEICAL-down	430	140	4	SEICAL-down	430	140											b) Tulawake			8	SEICAL-down	430	140	290	World Bank
													9	CASAMETA	350	350															c) Uatutobo			9	CASAMETA	350	350	0	
													10	SAMALARI	1,000	1,000																		10	SAMALARI	1,000	1,000	0	
													11	LIASIDI	600	600																		11	LIASIDI	600	600	0	
													12	BARLATA	200	200																		12	BARLATA	200	200	0	
	6	VEMASSE	750	600					4	VEMASSE		350	13	VEMASSE	700	600																		13	VEMASSE	700	600	100	
					5	BAGUIA	1,500	0																															
																					20	Salamari 1-3 & Ba	1,225	850	375												
																					21	Uatuwa	630	300	330												
																					22	Darlate	200	180	20												
																					23	Maubu	350	200	150												
																										U-4	Motagade	450	400								
																										U-5	Tequinomata	600	250								
Sub-total	4		2,562	1,757	3		2,967	982	4			1,320	9		4,730	3,415	2		1,230	140	5		3,405	2,330	1,075	4		1,750	1,130		9		4,730	3,415	1,315	
VIQUEQUE													14	BAEDUBU	335	185	5	BAEDUBU	335	185												14	BAEDUBU	335	185	150	World Bank
	7	UAIBATI	500	300	6	UAIBATI	500	300	5	UAIBATI		300	15	UAIBATI	220	130	6	UAIBATI	220	130												15	UAIBATI	220	130	90	World Bank
	8	UATULARI-1	1,204	750	7	UATULARI-1	1,204	750	6	UATULARI-1		680	16	UATULARI-1	1,090	600	7	UATULARI-1	1,090	600												16	UATULARI 1	1,090	600	490	
	9	UATULARI-2	204	204	8	UATULARI-2	204	204	7	UATULARI-2		200	17	UATULARI-2	204	204																17	UATULARI 2	204	204	0	
	10	UATULARI-3	370	370	9	UATULARI-3	370	370	8	UATULARI-3		370	18	UATULARI-3	370	370																18	UATULARI 3	370	370	0	
													19	UIBERE	350	350																19	UIBERE	350	350	0	
													20	UATEULAU	350	350																20	UATEULAU	350	350	0	
													21	LACLUTA	250	250																21	LACLUTA	250	250	0	
	11	OEDUBU	810	650	10	OEDUBU	810	650	9	OEDUBU		650														U-1	OEDUBU	800	300								
					11	VATUDO	50	50																															
																					14	Fututo(Ossu)	100	50	50												
																					15	Irabare Nabo(Uatu	400	400	0												
																					16	Kumoli(Uatucarbau	300	300	0												
																					17	Saketo(Uatulari)	600	400	200												
																					18	Iratokoro(Uatulari)	80	50	30												
																										U-2	Uai-Eulali	400	200								
																										W-6	Wetodo	350	200								
																										W-7	Buku	450	150								
																										W-8	Haetalas	130	60								
Sub-total	5		3,088	2,274	6		3,138	2,324	5			2,200	8		3,169	2,439	3		1,645	915	5		1,480	1,200	280	5		2,130	910		8		3,169	2,439	730	
Total	11		5,950	4,229	11		6,405	3,554	9		0	3,520	21		8,874	6,764	7		3,100	1,215	23		8,987	5,515	3,472	13		4,537	2,463		21		8,874	6,764	2,110	

Table I-1 List of Existing Irrigation Scheme in East Timor (2/3)

Study	Strategy for Irrigation & Water Management by Agriculture Department UNTAET Data source as of 1997				Joint Assessment Mission Background Paper by World Bank Nov.1999				JICA Study Aug.2000				DAA F/S Data-1 (drawing data) by Division of Agriculture Affair UNTAET May.2001				DAA F/S Data-2 (22+4=26schemes) by Division of Agriculture Affair UNTAET May.2001				Agricultural Rehabilitation Program (ARP) by Agriculture Department UNTAET Implemented Communal Irrigation Maintenance up to 200				Proposed Program of Work for Construction by Agriculture Department UNTAET UNTAET Trust Fund & World Bank-ARP in 2				Using Data in this Study based on DAA F/S Data-1 & Data-2					Implementation or Plan by another study (Donor)
District	No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)		No.	Name of Scheme	Irrigation Area (ha)				No.	Name of Scheme	Irrigation Area (ha)			No.	Name of Scheme	Irrigation Area (ha)			
			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional			Potentia	Functional	Recovered				Potentia	Functional				Potentia	Functional	Remaining	
MANATUTO	12	LALEIA	180	100	12	LALEIA	180	101	10	LALEIA-L		180	22	LALEIA	265	80	8	LALEIA	265	80	24	LALEIA	100	80	20	W-9	LALEIA	450	200	22	LALEIA	265	80	185	
									11	LALEIA-R		600	23	CAIRUM	250	250														23	CAIRUM	250	250	0	
	13	LACLO	660	0	13	LACLO	660	0	12	LACLO		660	24	LACLO	660	0						LACLO(proposed)	660	0	660					24	LACLO	660	0	660	JICA
	14	SUMASSE	250	250					13	SUMASSE		250	25	SUMASSE	250	250														25	SUMASSE	250	250	0	
	15	MALARAHUN	200	150	14	MALARAHUN	200	150	14	MALARAHUN		150																							
	16	NATARBORA	500	400	15	NATARBORA	500	400	15	NATARBORA		400	26	NATARBORA	500	400										W-10	NATARBORA	200	50	26	NATARBORA	500	400	100	
																										U-6	Cacae-uman	400	150						
Sub-total	5		1,790	900	4		1,540	651	6		0	2,240	5		1,925	980	1		265	80	1		760	80	680	3		1,050	400	5		1,925	980	945	
MANUFAHI													27	SAHEN	3,121	239														27	SAHEN	3,121	239	2,882	
	17	WELALUHU	150	150	16	WELALUHU	150	150					28	WELALUHU	150	150														28	WELALUHU	150	150	0	
	18	DOTIK	100	0									29	DOTIK	100	0														29	DOTIK	100	0	100	
	19	BESUSU	150	150	17	BESUSU	150	150					30	BESUSU	150	150														30	BESUSU	150	150	0	
	20	CARAULUN	2,196	600	18	CARAULUN	2,196	1,104	16	CARAULUN		1,100	31	CARAULUN	2,196	600														31	CARAULUN	2,196	* 0	*2,196	
	21	CALOCO	200	200	19	CALOCO	200	200	17	CALOCO		350	32	CALOCO	200	200														32	CALOCO	200	200	0	
	22	QUIARAS	100	0																	28	Agarlala	9	7	2										
																					29	Akadirhun	150	0	150										
																					30	Malushun	8	5	3										
																					31	Sahen	500	200	300										
																										U-8	Clacuk	650	250						
																										W-11	Oelala	200	150						
																										W-12	Webere	200	20						
																										W-13	Manico	75	45						
																										W-14	Clere	150	40						
Sub-total	6		2,896	1,100	4		2,696	1,604	2		0	1,450	6		5,917	1,339	0		0	0	4		667	212	455	5		1,275	505	6		5,917	739	5,178	
DILI																					37	Comoro	360	30	330										
Sub-total	0		0	0	0		0	0	0		0	0	0		0	0	0		0	0	1		360	30	330	0		0	0	0		0	0	0	
AILEU					20	DAISOLI	50	50																		U-7	Banderhun	420	0						
					21	BANDERAHUN	75	75													26	Saboria	22	22	0										
																					27	Fahiria	15	15	0										
																										W-15	Sarin	90	55						
																										W-16	Aisirmau	19	15						
Sub-total	0		0	0	2		125	125	0		0	0	0		0	0	0		0	0	2		37	37	0	3		529	70	0		0	0	0	
ERMERA	23	RAILACO	100	75	22	RAILACO	100	100					33	RAILACO	75	30	9	RAILACO	75	30										33	RAILACO	75	30	45	
	24	GLENO	200	150	23	GLENO	200	0	18	GLENO		150	34	GLENO	80	40	10	GLENO	80	40										34	GLENO	80	40	40	
	25	SARE	1,050	500	24	SARE	1,050	500	19	SARE		500	35	SARE	1,050	500														35	SARE	1,050	500	550	
																					34	Tarimoro	82	25	57										
																					35	Lauala	60	20	40										
																					36	Motahare	31	0	31										
																										W-17	Samara	350	120						
																										W-18	Leguimea								
																										W-19	Managua								
Sub-total	3		1,350	725	3		1,350	600	2		0	650	3		1,205	570	2		155	70	3		173	45	128	3		350	120	3		1,205	570	635	
AINARO	26	BONUK	1,500	500									36	BONUK	270	5	11	BONUK	270	150										36	BONUK	270	5	265	
	27	CASSA	100	75									37	CASSA	185	45	12	CASSA	185	45										37	CASSA	185	45	140	
													38	OEBABA	2,158	1,000														38	OEBABA	2,158	1,000	1,158	
	28	CARAU-ULUN	1,200	0	25	CARAU-ULUN	1,200	700																											
																					32	Maunun	100	20	80										
																					33	Raibere	120	70	50										
																										W-20	Lias	60	20						
																										W-21	Manutasi	60	15						
Sub-total	3		2,800	575	1		1,200	700	0		0	0	3		2,613	1,050	2		455	195	2		220	90	130	3		120	35	3		2,613	1,050	1,563	
LIQUICA	29	LEOTALA	250	200	26	LAOHATA	250	200	20	LAOHATA		200	39	LEOTALA	80	65	13	LEOATA/LEO	80	65										39	LEOATA/LEO	80	65	15	
													40	GUICO RIGE	80	50														40	GUICO RIGE	80	50	30	
													41	GUICO	2,000	800														41	GUICO	2,000	* 0	2,000	
	30	FATUBORO	150	60	27	FATUBORO	150	60					42	LAUWELI	3,000	500														42	FAULARA	3,000	* 80	2,920	
																		FATUBORO	0	0											FATUBORO	0	0	0	no existing
																					25	Leotla	191	111	80										
																										W-22	Faulera Leotla	190	110						
Sub-total	2		400	260	2		400	260	1		0	200	4		5,160	1,415	1		80	65	1		191	111	80	1		190	110	4		5,160	195	4,965	
Total	19		9,236	3,560	16		7,311	3,940	11		0	4,540	21		16,820	5,354	6		955	410	14		2,408	605	1,803	18		3,514	1,240	21		16,820	3,534	13,286	

Note: The data source of * symbol is Irrigation Sector of ETPA.

Table I-1 List of Existing Irrigation Scheme in East Timor (3/3)

Study	trategy for Irrigation & Water Manageme by Agriculture Department UNTAET Data source as of 1997				oint Assessment Mission Background Pap by World Bank Nov.1999				JICA Study Aug.2000				DAA F/S Data-1 (drawing data) y Division of Agriculture Affair UNTAE May.2001				DAA F/S Data-2 (22+4=26schemes) y Division of Agriculture Affair UNTAE May.2001				Agricultural Rehabilitation Program (ARP) by Agriculture Department UNTAET nplemented Communal Irrigation Maintenance up to 20(					Proposed Program of Work for Construction by Agriculture Department UNTAET TAET Trust Fund & World Bank-ARP in 2(				Using Data in this Study based on DAA F/S Data-1 & Data-2					Implementation or Plan by another study (Donor)
District	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	Recovered	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	No.	Name of Scheme	Irrigation Area (ha) Potential	Functional	Remaining	
BOBONARO	31	BILIMAU	100	100									43	BILIMAU	350	100	14	BILIMAU	350	245										43	BILIMAU	350	100	250	World Bank
	32	HALICO	100	100									44	HALICAO	345	30	15	HALICAO	345	30										44	HALICAO	345	30	315	World Bank
	33	ATABAE LOES	300	300	28	ATABAE LOES	300	300					45	ATABAE LOI	190	120	16	ATABAE LOI	190	120										45	ATABAE LOI	190	120	70	
	34	MARCO	229	229	29	MARCO	229	229					46	MARCO	220	100	17	MARCO	235	235										46	MARCO	220	100	120	World Bank
	35	CAILACO	150	150									47	CAILACO/MI	100	60	18	CAILACO/MA	100	80										47	CAILACO/MI	100	80	20	World Bank
	36	MALIANA-1	2,400	750	30	MALIANA-1	2,400	750					48	MALIANA-1	2,400	750	19	MALIANA-1	2,400	750	38	MALIANA-1	2,000	1,700	300					48	MALIANA-1	2,400	750	1,650	
	37	MALIANA-2	3,000	1,500	31	MALIANA-2	3,000	1,500					49	MALIANA-2	965	400	20	MALIANA-2	965	400	39	MALIANA-2	3,000	1,500	1,500					49	MALIANA-2	965	400	565	
	38	NUNURA	150	100									50	NUNURA	185	50	21	NUNURA	185	100										50	NUNURA	185	50	135	World Bank
	39	BATUGADE	200	200	32	BATUGADE	200	200					51	BATUGADE	80	50	22	BATUGADE	80	50										51	BATUGADE	80	50	30	World Bank
																										W-23	Baso	150	120						
																										W-24	Bolubo	80	30						
Sub-total	9		6,629	3,429	5		6,129	2,979	0		0	0	9		4,835	1,680	9		4,850	2,010	2		5,000	3,200	1,800	2		230	150	9		4,835	1,680	3,155	
COVALIMA	40	BECO	1,185	800	33	BECO	1,185	800					52	BECO	1,185	800										W-25	Beco	150	50	52	BECO	1,185	800	385	
	41	OEBABA	2,158	1,000	34	OEBABA	2,158	1,000																											
	42	RAIMEAN	400	220	35	RAIMEAN	400	220					53	RAIMEAN	400	220														53	RAIMEAN	400	220	180	
																					40	Belaku	1,000	500	500										
																					41	Maukola	200	10	190										
																					42	Salele Boot 1-2	50	10	40										
																										U-10	Salele								
																										U-11	Suai								
																										W-26	Zumalai	150	50						
Sub-total	3		3,743	2,020	3		3,743	2,020	0		0	0	2		1,585	1,020	0		0	0	3		1,250	520	730	4		300	100	2		1,585	1,020	565	
OECUSSI	43	TONO	200	200	36	TONO	200	200					54	TONO	260	212	23	TONO	260	200										54	TONO	260	212	48	World Bank
	44	ROTE	350	350	37	ROTE	350	350					55	ROTE	350	350														55	ROTE	350	350	0	
	45	OEMATHITU	100	100									56	OEMATHITU	170	100	24	OEMATHITU	360	360										56	OEMATHITU	170	100	70	World Bank
	46	NAKTUKA	250	200	38	NAKTUKA	250	200					57	NAKTUKA	170	90	25	NAKTUKA	170	70										57	NAKTUKA	170	90	80	World Bank
	47	FATUSENE	350	350	39	FATUSENE	350	350																											
	48	BETOBENAIA	200	200																															
																					43	Lifau	250	200	50										
																					44	Masiana	44	44	0										
																					45	Tetumanano	10	10	0										
																										U-12	Kolansina		55						
																										U-13	Oeleu		120						
																										U-14	Oemolo		100						
																										W-27	Oecolo	98	45						
Sub-total	6		1,450	1,400	4		1,150	1,100	0		0	0	4		950	752	3		790	630	3		304	254	50	4		98	320	4		950	752	198	
Total	18		11,822	6,849	12		11,022	6,099	0		0	0	15		7,370	3,452	12		5,640	2,640	8		6,554	3,974	2,580	10		628	570	15		7,370	3,452	3,918	
Grand-total	48		27,008	14,638	39		24,738	13,593	20		0	8,060	57		33,064	15,570	25		9,695	4,265	45		17,949	10,094	7,855	41		8,679	4,273	57		33,064	13,750	19,314	

Table I-2 List of Irrigation Scheme in East Timor
(approx. larger than 100 ha schemes)

District	No.	Scheme Name	Technical or Semi-Technical	Irrigation Area (ha) (Data Source from DAA)			Damage Assessment			Main Problem	Implementation Plan
				Potential	Functional	Remaining Area to be Rehabilitated	S	L-M	U		
LAUTEM	1	FUILORO		400	400	0			O		
	2	IRABARE		350	350	0			O		
	3	LURO	Technical	100	60	40		O		main canal blocked	
	4	LAIVAI	Semi-Technical	125	100	25		O		main canal blocked	
Sub-total	4			975	910	65					
BAUCAU	5	LARISULA		350	350	0			O		
	6	LAGA		300	175	125	O			intake major damage	
	7	SEICAL-up	Technical	800	0	800	O			intake major damage	
	8	SEICAL-down	Technical	430	140	290		O		main canal problem	W/Bank-1
	9	CASAMETA		350	350	0			O		
	10	SAMALARI		1,000	1,000	0			O		
	11	LIASIDI		600	600	0			O		
	12	BARLATA		200	200	0			O		
	13	VEMASSE		700	600	100	O			weir major damage	
Sub-total	9			4,730	3,415	1,315					
VIQUEQUE	14	BAEDUBU	Technical	335	185	150		O		intake not completed	W/Bank-2(ongoing)
	15	UAIBATI	Semi-Technical	220	130	90		O		main canal blocked	W/Bank-3(ongoing)
	16	UATULARI 1	Semi-Technical	1,090	600	490	O			intake major damage	
	17	UATULARI 2	Semi-Technical	204	204	0			O		
	18	UATULARI 3	Technical	370	370	0			O		
	19	UIBERE	Semi-Technical	350	350	0			O		
	20	UATEULAU		350	350	0			O		
	21	LACLUTA		250	250	0			O		
Sub-total	8			3,169	2,439	730					
MANATUTO	22	LALEIA LEFT	Technical	265	80	185		O		intake damage	
	23	CAIRUM		250	250	0			O		
	24	SUMASSE	Semi-Technical	250	250	0			O	intake inoperable	
	25	LACLO	Semi-Technical	660	0	660	O			intake major damage	JICA (ongoing)
	26	NATARBORA	Semi-Technical	500	400	100	O			intake major damage	
Sub-total	5			1,925	980	945					
MANUFAFI	27	SAIEN		3,121	239	2,882	O				
	28	WELALUHU	Semi-Technical	150	150	0			O		
	29	DOTIK		100	0	100	O			intake inoperable	
	30	BESUSU		150	150	0			O		
	31	CARAULUN	Technical	2,196	0	2,196	O				
	32	CALOCO	Semi-Technical	200	200	0			O		
Sub-total	6			5,917	739	5,178					
ERMERA	33	RAILACO	Semi-Technical	75	30	45		O		intake poor design	
	34	GLENO	Semi-Technical	80	40	40		O		main canal damage	
	35	SARE	Semi-Technical	1,050	500	550	O			intake major damage	
Sub-total	3			1,205	570	635					
AINARO	36	BONUK	Semi-Technical	270	5	265		O		intake minor damage	
	37	CASSA		185	45	140		O		intake minor damage	
	38	OEBABA		2,158	1,000	1,158	O			intake major damage	
Sub-total	3			2,613	1,050	1,563					
LIQUICA	39	LEOATA/LEOTA	Semi-Technical	80	65	15		O		intake minor damage	
	40	GUICO RIGHT		80	50	30		O		main canal damage	
	41	GUICO		2,000	0	2,000	O			main canal damage	
	42	LAUWELI		3,000	80	2,920	O			main canal shortage	
Sub-total	4			5,160	195	4,965					
BOBONARO	43	BILIMAU	Technical	350	100	250		O		main canal blocked	W/Bank-4(ongoing)
	44	HALICAO	Technical	345	30	315		O		intake not completed	W/Bank-5(ongoing)
	45	ATABAE LOES	Technical	190	120	70		O		main canal blocked	
	46	MARCO	Semi-Technical	220	100	120		O		intake minor damage	W/Bank-6
	47	CAILACO/MELI	Semi-Technical	100	80	20		O		main canal blocked	W/Bank-7
	48	MALIANA 1	Semi-Technical	2,400	750	1,650	O			intake major damage	
	49	MALIANA 2	Semi-Technical	965	400	565	O			intake inoperable	
	50	NUNURA	Semi-Techaical	185	50	135		O		main canal blocked	
	51	BATUGADE	Technical	80	50	30		O		intake minor damage	W/Bank-8
Sub-total	9			4,835	1,680	3,155					
COVALIMA	52	BECO	Technical	1,185	800	385	O			intake major damage	
	53	RAIMEAN	Technical	400	220	180	O			intake major damage	
Sub-total	2			1,585	1,020	565					
OECUSSI	54	TONO	Semi-Technical	260	212	48		O		intake minor damage	W/Bank-9
	55	ROTE	Semi-Technical	350	350	0			O		
	56	OEMATHITU	Semi-Technical	170	100	70		O		main canal blocked	W/Bank-10
	57	NAKTUKA	Semi-Technical	170	90	80		O		intake minor damage	W/Bank-11
Sub-total	4			950	752	198					
Grand total (ha)				33,064	13,750	19,314	17	22	18		Total Recovery Area 2,123
Except Recovery Area by JICA & W/B						17,191					(JICA 660ha) (W/B 1,463ha)

Remarks: Damage Assessment
S; Seriously damaged L-M; Lightly-medium damaged U; Unaffected

Table I-3 List of National NGOs Register and Recent Activities/Program

Main four (4) national NGOs register in particular concerning rural/village water supply are shown as below:

All NGOs offices exist in Dili.

National NGOs Register

Name of NGOs	Activities	Covered area	Remarks
Bia Hula	- Water supply & Sanitation - Public health promotion - Education - Environment	- Bobonaro - Ermera - Ainaro - Aileu - Liquisa - Covalima	See Table I-4
Programa BeMos (PROBEM)	- Water supply & Sanitation - Small industry - Credit union - Training	- Lospalos - Viqueque - Baucau - Aileu	See Table I-5
Fundacao Obras ba Rai Timor Independent (FORTE)	- Water supply & Sanitation - Community development - Agriculture - Technical assistance - Small industry - Reconstruction - Livestock - Public health	- Dili - Ermera - Bobonaro - Suwai - Same	
Hamoris Timor Oan (HTO)	- Water supply and Sanitation - Agriculture - Technical assistance - Small industry - Reconstruction	- Lospalos - Viqueque - Baucau - Liquisa	See Table I-6

Table I-4 List of NGOs Concerning Rural/Village Water Supply Recent Activities and Programs

Name of NGOs : Bia Hula
Report Item : Implemented and proposed project about village water supply in 2000

District	Sub district	No.	Villages	Location/WUG	Type of Work/Activities	Construction/Workload	Status of Work		Beneficiaries		Source of Fund
							Start	Now	HH	Population	
DILI	East District	1	Bario Alto Hospital	Marabia	Rehab Exist WS & Family Latrines	15 New Family Latrines	Apr. 2000	Finished	210	1002	ETCAS/AusAID Dili
						14 Public Tanks					
						+2 New Public Tanks					
		2	Balibar	Nalau	New Family Latrines Construction	43 New Family Latrines	Apr. 2000	Finished	142	474	ETCAS/AusAID Dili
		3	Bedios Camea	Ailelehun Camea	New Family Latrines Construction	43 New Family Latrines	Feb. 2000	Finished	47	282	ETCAS/AusAID Dili
	West Dili	4	Lahane Barat	Lacbow	Rehab pipeline, public tanks/taps	9 Public Tanks	Apr. 2000	Finished	95	570	ETCAS/AusAID Dili
						+9 Public Taps+pipe line					and OW&S UNTAET
		5	Dare	SDK Dare	Build & Rehab Watsan in Primary Schools	1 New Toilet, One public tap	Sept. 2000	Finished	25	125	JICA Water Supply
					Health Education		Dec. 2000	Finished	25	125	JICA Water Supply
		6	Dare	SDN Dartau	Build & Rehab Watsan in Primary Schools	Rehab School Toilet	Sept. 2000	Finished	27	134	JICA Water Supply
					Health Education		Dec. 2000	Finished	25	134	JICA Water Supply
		7	Comoro	SDN Tasitolu	Build & Rehab Watsan in Primary Schools	Rehab School Toilet	Sept. 2000	Finished	26	132	JICA Water Supply
					Health Education		Dec. 2000	Finished	25	134	JICA Water Supply
	Atauro	8	Macadade	Anartuto	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		55	240	
		9	Macadade	Ili Timur	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		15	61	
		10	Macadade	Ainara	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		10	60	
		11	Macadade	Erane	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		56	281	
		12	Macadade	Apaktedi	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		21	120	
		13	Macadade	Berau	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		50	309	
		14	Macadade	Biketu Hakmenk	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		58	149	
		15	Macadade	Taclo	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		32	182	
		16	Beloi	Maquer	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		47	254	
		17	Beloi	Usubemasu	Rehab pipeline, public tanks/taps		Seek Donor Assistance for Reh		128	768	
COVALIMA	Suai	18	Beco/Haemanu	We Me'er	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Oct. 2000	Finished	29	174	CIDA
		19	Belekasak/Has Ain	We Mon	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Oct. 2000	Finished	70	237	CIDA
		20	Camanasa/Manekit	We Tuahun	Rehab Hand pump	Rehab Hand pump	Aug.. 2000	Finished	30	124	CIDA
		21	Ogues	Nadak	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Jul. 2000	Finished	43	172	CARE East Timor
		22	Ogues	Fatuklor	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Jul. 2000	Finished	10	64	CIDA
		23	Labarai	Labarai	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Jul. 2000	Finished	100	700	CARE East Timor
	Zumalai	24	Zulo Maliseran	We Ion	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Aug.. 2000	Finished	150	720	CARE East Timor
	Tilomar	25	Foholulik		Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Sep. 2000	Finished	26	156	CARE East Timor
	Fatululik	26	Fatululik	Aitoun	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Jul. 2000	Finished	49	196	CARE East Timor
	Fohoren	27	Laktos	Laktos 1	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Nov. 2000	Finished	48	221	CARE East Timor
		28	Datorua	Patulidun	Rehab pipeline, public tanks/taps	Rehab and construction of pipeline	Oct. 2000	Finished	41	98	CIDA

District	Sub district	No.	Villages	Location/WUG	Type of Work/Activities	Construction/Workload	Status of Work		Beneficiaries		Source of Fund
							Start	Now	HH	Population	
ERMERA	Letefoho	29	Katrai Leten	Katrai Leten	Continuation of water supply project	Construction of pipelines & tanks	Aug. 2000	Finished	84	650	Btisbane Community
		30	Katrai Leten	Tala	Continuation of water supply project	Construction of pipelines & tanks	Seek Donor Assistance for Reha		36	216	
		31	Katrai Leten	Huitertesu	Continuation of water supply project	Construction of pipelines & tanks	Seek Donor Assistance for Reha		95	570	
	Railako	32	Samatete	Aldeia/Cnua III	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		48	288	
		33	Samatete	Eralulu/Aldeia II	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		86	516	
		34	Samatete	Alldeia/Cnua III	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		68	384	
		35	Samatete	Samatete	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		64	384	
		36	Railaco Leten	Darema	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		244	1173	
		37	Railaco Leten	Railaco Leten	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		94	564	
		38	Railaco Kraik	Railaco Kraik	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		124	153	
		39	Delesu	Bohemata	New pipeline, public tank/taps construction		Seek Donor Assistance for Reha		14	153	
AILEU	Aileu Kota	40	Aileu Kota	SDN Mantane	Build & Rehab Watsan in Primary Schools	Rehab School toilet	Nov. 2000	Finished	22	112	JICA Water Supply
					Health Education		Dec. 2000	Finished	22	112	JICA Water Supply
		41	Remexio Kota	SDK Remexio	Build & Rehab Watsan in Primary Schools	Rehab School toilet	Oct. 2000	Finished	23	115	JICA Water Supply
					Health Education						
		42	Fahisoi	Deruhati	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	42	280	CARE East Timor
		43	Hautoho	Libutu	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	43	430	CARE East Timor
		44	Fahisoi	Bereliurai	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	48	341	CARE East Timor
		45	Fahisoi	Mautoba	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	48	234	CARE East Timor
	Liquideo	46	Mannucasa	Manutane	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	46	264	CARE East Timor
		47	Lacabou	Namatesu	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	80	340	CARE East Timor
		48	Namtesu	Lako	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	83	344	CARE East Timor
	Remexio	49	Maumeta	Tukeu	Rehab pipeline, public tank/taps	Rehab Water System	Aug. 2000	Finished	34	235	CARE East Timor
		50	Fadabioco	Fadabioco	Waste assessment for rehab	Rehab Water System	Aug. 2000	Finished	68	315	CARE East Timor
		51	Maumeta	Aitoi	Rehab pipeline, public tank/taps	Rehab Water System	Aug. 2000	Finished	34	186	CARE East Timor
		52	Maumeta	Aibana	Rehab pipeline, public tank/taps	Rehab School toilet	Aug. 2000	Finished	32	230	CARE East Timor
	Liquideo	53	Berteu	Berteu	Rehab pipeline, public tank/taps	Rehab Water System	Aug. 2000	Finished	146	744	CARE East Timor
	Laulara	54	Laulara	SDN Laulara	Build & Rehab Watsan in Primary Schools	Rehab Water System	Aug. 2000	Finished	26	132	JICA Water Supply
	Aileu	55	Sarlala	Sarlala	New pipeline, public tanks/taps construction		Seek Donor Assistance for Reha		72	564	
AINARO	Hatubulico	56		Surruhati	Rehab pipeline, public tanks/taps	Rehab Water System	Sep. 2000	Finished	58	441	CARE East Timor
		57		Mautoba	Waste assessment for rehab	Rehab Water System	Apr. 2000	Finished	36	181	CARE East Timor
		58		Airacalau	Rehab pipeline, public tanks/taps	Rehab Water System	Sep. 2000	Finished	78	804	CARE East Timor
		59		Nunumoge	Waste assessment for rehab	Rehab Water System	Apr. 2000	Finished	158	905	CARE East Timor
		60		TatiriQuarema	Rehab pipeline, public tanks/taps	Rehab Water System	Sep. 2000	Finished	122	814	CARE East Timor
LIQUICA	Maubara	61	Maubara	CarmelitasOrphanage	Water supply assessment and Proposal to	Rehab Water System	Aug. 2000	Pending	40	80	OXFARM Dili
					Oxfarm to start implementation						
BAUCAU	Baucau	62	Baucau	Urban Community	Campaign on O&M Sanitation for urban and		Nov. 2000	On-going	250	1234	UNOPS
					periurban communities						
								TOTAL	2568	14488	

Table I-5 List of NGOs in the Field of Rural/Village Waster Supply and Their Activities and Programs

Name of NGOs; Program BeMos (PROBEM)

Report Item: Project Report

District: Lautem

Sub district: Lospalos

No	Location	Project Activity	Goal	Remarks
1	Lautem	Meeting with official district, WSS, CNRT, Church members, Local NGO, Suco & Aldeia members.	Support the problem	March 2001
2	Lautem	Workshop. Participant: District Administrator, CNRT, WSS, Church members, Local NGO, Suco members, village leaders.	Mention, perspective and work system is a participation to know this problem	March 2001
3	Puihoro, Bemoris, Lospalos, Natura villages	Meeting with community (main objective)	All community agree with the program	April 2001
4.	Puihoro, Bemoris, Lospalos, Natura villages	To format group and pre-training construction	Group formatted and training implemented	April 2001
5	Puihoro, Bemoris, Lospalos, Natura villages	Stock non local material, Implementation in Puihoro & Bemoris villages	Finish 50 % Assembling concrete brick	May 2001
6.	Asrama Dare	TOT Training. Participant: 9 local NGO members	Implemented	May, 10 – 15 2001

Report Item; Plan for next

No	Location	Project Activity	Goal	Remarks
1	District: Lautem Sub District: Lautem Suco: Com	To implement sprinkle or arthesis water	Proposal prepared and waiting for donator	April 2001
2	District: Viqueque Suco: Beobe, Buanurak, Dilor, Ossu	Plan to training pre-construction & post construction (GTZ)	Preparation phase	End of May 2001
3	District: Aileu Sub District: Besilau	Rehabilitation& Development tools sprinkle or orthesis water	Proposal prepared and waiting for donator	April 2001
4	District: Baucau Suco: Liabala	Rehabilitation& Development tools sprinkle or orthesis water	Technic & Social Survey phase	June 2001

Report Item; Plan Activity

Month: July to September in 2001

No	Location	Activity	Total work day	Time		Responsibility	Remarks
				Start	End		
I	Viqueque a. Dilor	Community meeting, format group /water user and training for leaders.	1 1 1	18/7	20/7	CB+IGL+ML	
	b. Buanurak + Wabubu	Idem	1 1 1	22/7	24/7	CB+IGL+ML	
	c. Caraubalo (Olobai)	Idem	1 1 1	25/7	27/7	CB+IGL+ML	
	d. Beobe	Idem	1 1 1	28/7	30/7	CB+IGL+ML	
	e. Loihunu	Idem	1 1 1	31/7	2/8	CB+IGL+ML	
	f. Ossu	Idem	1 1 1	6/8	8/8	CB+IGL+ML	
	Baucau a. Laga	Idem	1 1 1	20/8	23/8	CB+IGL+ML	
	b. Baguia	Idem	1 1 1	27/8	29/8	CB+IGL+ML	
II	Viqueque & Baucau	Activity Monitoring	Twice in each location				By Coordinator
III	Viqueque (Ossu)	Take & controlling water sample	1 x /month/location	6/8	8/8	IGL + ML	
	Baucau (Venilale)	Meeting, Extension, Take water sample	Idem	13/8	15/8	CB+IGL+ML	

Obs: Training star on July, 1 to 3 2001

Table I-6 List of NGOs Concerning Rural/Village Water Supply Recent Activities and Programs

Name of NGOs; Hamoris Timor Oan (HTO)\
Report Item: Project Report

No	District	Project Activity	Goal	Remarks
1	Liquisa	- Construction of Water supply and sanitation office.	now on-going	
		- Rehabilitation of water system	now on-going	ADB budget
		- Rehabilitation of water system	now on-going	with Oxfarm
		- Rehabilitation of sanitation	finished in 2000	
2	Lautem/Lospalos	- Construction of primary school	finished in 2000	
		- Organization for small industry (Batako)	now on-going	
3	Baucau	- construction of hospital	now on-going	
4	Viqueque	- organization for farmers cooperative management	now on-going	

Table I-7 Irrigation Conditions of Each District (in 2000)

No.	District	Name of Irrigation Scheme	Designed Area (ha)	Functional Area (ha)	Rate of Double Cropping (%)	Second Cropped Area (ha) 1/
1	Lautem	Luro	150	150	0	0
		Laiyai	150	100	0	0
2	Baucau	Seisai up	792	792	30	238
		Seisai down	540	190	45	86
3	Viqueque	Uatulari III	370	370	50	185
		Uatulari I	1,204	750	0	0
		Uatulari II	204	204	45	92
		Baidubu	810	650	60	390
4	Manatuto	Laleia	180	101	0	0
		Laclo	660	0	0	0
		Malarahun	200	150	0	0
		Matarbora	500	400	10	40
		Sumasse	250	250	0	0
5	Manugahi	Carauluu	2,196	600	20	120
		Welalahu	150	150	15	23
		Keloco	200	200	15	30
6	Dili		0	0	0	0
7	Aileu	Daisoli	50	50	100	50
		Anderahun	75	0	0	0
8	Ermera	Sare	1,500	500	0	0
		Gleno	200	150	60	90
		Railaku	100	75	10	8
		Talimoro	80	25	0	0
		Lanala	60	20	0	0
9	Ainaro	Bonuk	1,500	500	0	0
10	Liquica	Leoata	250	200	50	100
11	Bobonaro	Atabae/Loes	229	229	100	229
		Maliana I	2,400	750	0	0
		Maliana II	3,000	1,500	0	0
		Batugade	200	200	100	200
		Kailako	150	150	20	30
12	Covalima	Beco	1,185	800	40	320
		Oebaba	2,158	1,000	10	100
		Raimean	400	220	40	88
13	Oecussi	Tono	200	200	0	0
		Fatusene	350	350	0	0
		Rote	350	350	35	123
		Naktuka	250	200	0	0
		Betbenaian	200	200	20	40
		Nianapn	50	50	0	0
		Oematahitu	100	100	10	10
	Total		23,593	12,876		0 2,592

Note Data source: DAA F/S Data-1

1/ Cropping season : March - June

Table I-8 Implemented and Proposed Agricultural Access Road

(from 2000 to 2001 by ARP Budget)

District	No.	Project Name	Length (km)		Remarks
			Implemented in 2000	Proposed in 2001	
LAUTEM	1	LAUTEM-LURO access road	3.0		
	2	FUILORO access road		1.0	
Sub-total			**3.0**	**1.0**	
BAUCAU	3	SEICAL-SAMALARI access road	7.0		
	4	UATUHACO access road		2.4	
Sub-total			**7.0**	**2.4**	
VIQUEQUE	5	IRABIN LETEREA			
		-AFALOICAI access road	5.0		
Sub-total			**5.0**		
MANATUTO	6	LALEIA-CAIRUI access road	4.0		
	7	NATARBORA access road		8.0	
Sub-total			**4.0**	**8.0**	
MANUFAFI	8	KYRAS-FATYBERLIU access road	1.0		
	9	BETANO to MUDATARI access road		2.2	
Sub-total			**1.0**	**2.2**	
DILI	10	MANLEUAN-INTAKE access road	4.0		
	11	BETO BARAI access road		1.2	
	12	BECAUSE access road		0.5	
	13	BEKIRA access road		5.0	
Sub-total			**4.0**	**6.7**	
AILEU	14	ASAMAU-SUKULIURAI access road	8.0		
	15	BESILAU-MADABENO access road		4.6	
Sub-total			**8.0**	**4.6**	
ERMERA	16	FATUBESI-ACALAU access road	8.0		
	17	BELULI access road		5.0	
	18	SARAMATA access road		4.0	
Sub-total			**8.0**	**9.0**	
AINARO	19	AINARO-MAUNUNO access road	3.0		
	20	BETANO-BUIFU access road	0.5		
	21	BETANO-BRF2 access road	1.0		
	22	SURUKARI access road		4.0	
Sub-total			**4.5**	**4.0**	
LIQUIICA	23	GICU-INTAKE access road	4.0		
	24	ASUMANO access road		2.0	
	25	ASUMANO II access road		2.0	
	26	TAPOMANUULU I access road		1.5	
	27	TAPOMANUULU II access road		2.5	
	28	FAHILEBO access road		2.0	
	29	FATUMASI access road		2.0	
Sub-total			**4.0**	**12.0**	
BOBONARO	30	COLEGIO-BULOBO access road	4.0		
	31	ILATLAUN access road		5.3	
Sub-total			**4.0**	**5.3**	
COVALIMA	32	BECO to INTAKE access road		3.0	
Sub-total				**3.0**	
OECUSSI	33	LIFAU access road	1.5		
	34	ROTI-MASIANA access road		1.3	
Sub-total			**1.5**	**1.3**	
Total (km)			**54.0**	**59.5**	
Grand total (km) (As of 2001)				**113.5**	

Table I-9 Progress of Irrigation Rehabilitation Program (As of December, 2002)

District	Fund source	Seriously Damaged		Light/Medium damaged	
		Code No.	Non-F. Area	Code No.	Non-F. Area
Lauten	World Bank		0		0
	MOA		0	3,4	65
	UNOPS		0		0
	Total	0	0	2	65
Baucau	World Bank		0	8*	290*
	MOA	6,7,13	1,025		0
	UNOPS		0		0
	Total	3	1,025	1*	290*
Viqueque	World Bank		0	14*, 15*	240
	MOA	16	490		0
	UNOPS		0		0
	Total	1	490	2*	240*
Manatuto	World Bank		0		0
	MOA	24,27	100	22	185
	UNOPS	25*	660*		0
	Total	1*+2	660* + 100	1	185
Manufahi	World Bank		0		0
	MOA	29	100		0
	UNOPS		0		0
	Total	1	100	0	0
Ermera	World Bank		0		0
	MOA	35	550	33,34	85
	UNOPS		0		0
	Total	1	550	2	85
Ainaro	World Bank		0		0
	MOA		0	36,37	405
	UNOPS		0		0
	Total	0	0	2	405
Liquica	World Bank		0		0
	MOA	40	1,200	38,39	45
	UNOPS		0		0
	Total	1	1,200	2	45
Bononaro	World Bank		0	42*43*45*46*50*	565*
	MOA	47,48	2,215	44,49	205
	UNOPS		0		0
	Total	2	2,215	5* + 2	735* + 205
Covalima	World Bank		0		0
	MOA	51,52,53	1,723		0
	UNOPS		0		0
	Total	3	1,723	0	0
Oecussi	World Bank		0	54*,56*,57*	198*
	MOA		0		0
	UNOPS		0		0
	Total		0	3*	198*
TOTAL	World Bank	0	0	11*	1,463*
	MOA	14	7,403	11	990
	UNOPS	1*	660*	0	0
	Total	1* + 14	660* + 7,403	11* + 11	1.463* + 990

Note : Symbol * indicates on going and/or committed projects by World Bank and UNOPS.

Table I-10 Prospective Reservoir or Dam Sites of South Coast of East Timor

No.	River Catchment	District	Length (m)	Height (m)	Area of Reservoir (ha)	Average Flow Discharge (m3/sec)
1	Be-lulic	Ainaro/ Ainaro/	575	40	107.5	31.13
2	Caraulum	Same/ Manufahi	725	50	217.5	37.31
3	Laclo do sui	Alas/ Manufahi	550	50	247.5	6.12
4	Clere	Alas/ Manufahi	725	50	330.5	12.89
5	Sahem	Boundary Manufahi/ Manatuto	350	70	388.7	12.27
6	Dilor	Barique/ Manatuto	1,000	50	601.8	9.25
7	Cuha	Ossu/ Viqueque	755	40	287.5	11.00
8	Celerec	Alas/ Manufahi	725	30	190.0	5.71
9	Bebui	Uatulari/ Viqueque	600	30	536.2	7.59

Table I-11 Prospective Weir Site of South Coast of East Timor

No.	River	Status	Length of Weir (m)
1	Belulic	Completed but damaged	75.0
2	Caraulum	Completed but damaged	75.0
3	Laclo do sul	2 places Completed but Free Intake	80.0
4	Celerec	2 places Completed but Free Intake	75.0
5	Sahem	Completed but Free Intake	82.5
6	Dilor	Completed but Free Intake	50.0
7	Luca	Completed but Free Intake	80.0
8	Cuha	Completed but Semi-technical	45.0
9	Bebui	Completed Damaged on Uatulari III	25.0

Table I-12 Water Availability for 26 Irrigation Schemes (1 : 5 Year Low Monthly Discharge)

No.	River/Spring	Scheme Name	Catchment (km^2)	River/Spring Flow Discharge (m^3/sec)												
				Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
	OECUSSEE															
1	Naktuka	Naktuka	12.0	0.4	0.4	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3
2	Tono	Tono	460.4	4.4	4.6	4.1	1.9	1.3	0.8	0.7	0.5	0.4	0.7	1.6	2.5	2.0
3	Oemathitu	Oemathitu	14.2	0.3	0.3	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2
	BOBONARO															
4	Malibaka	Nunura	283.4	5.9	5.2	3.0	2.1	1.3	0.8	0.6	1.0	1.1	1.2	2.1	2.7	2.2
5	Lotan	Batugade	19.0	1.7	1.7	1.5	0.7	0.5	0.3	0.2	0.2	0.2	0.3	0.6	1.0	0.7
6	Bulobo	Marco	83.7	3.7	4.3	2.0	1.7	1.2	1.1	0.9	0.7	0.7	0.7	1.1	1.9	1.7
7	Loes	Atabaeloes	1,919.0	1.1	1.5	1.2	0.9	0.7	0.5	0.5	0.3	0.3	0.3	0.7	0.6	0.7
8	Marobo	Bilimau	664.0	19.2	17.7	9.2	7.5	5.2	4.3	3.1	2.1	2.0	2.3	4.4	10.3	7.3
9	Boroloka	Cailaco/Maligo	1.4	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1
10	Nunurata	Halicao	1,173.5	21.2	20.7	10.1	9.0	5.7	4.9	3.6	2.3	2.3	2.6	4.8	10.9	8.2
	LIQUICA															
11	Lawele	Leoata/Leotala	288.2	3.5	4.7	4.0	2.8	2.2	1.6	1.6	0.8	0.9	1.0	2.3	1.9	2.3
12	Loes	Fatuboro	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ERMERA															
13	Geomecan	Gleno	24.2	0.4	0.7	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.2	0.3	0.3	0.3
14	Boera	Railaco	35.0	0.4	0.6	0.4	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.3	0.4	0.3
	MANATUTO															
15	Leleia	Laleia	26.8	3.6	1.8	1.6	1.4	0.8	0.7	0.3	0.2	0.2	0.4	1.5	3.8	1.3
	VIQUEQUE															
16	Uaibati	Uaibati	11.1	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.3
17	Irebere	Baedubu	358.9	6.6	13.9	8.4	5.3	8.7	5.6	1.6	0.3	0.2	0.2	0.6	2.3	4.5
	BAUCAU															
18	Seical	Seical Down	432.2	6.2	4.3	5.5	2.1	2.6	1.7	1.6	0.7	0.3	0.1	1.7	2.8	2.5
	LAUTEM															
19	Laivai	Laivai/Ililai	148.2	1.5	2.9	2.1	1.1	1.0	0.7	0.7	0.5	0.3	0.2	1.0	1.8	1.2
20	Luro	Luro	26.3	0.5	0.6	0.8	0.5	0.4	0.4	0.3	0.2	0.1	0.1	0.2	0.3	0.4
	AINARO															
21	Welulic	Bonuk	370.9	13.7	19.0	14.4	6.1	4.3	1.2	0.6	0.4	0.2	0.4	2.5	11.1	6.1
22	Welulic	Cassa	351.6	13.8	19.1	14.6	6.5	4.4	1.5	0.8	0.5	0.4	0.6	2.5	11.4	6.3
	MAJOR DAMAGED															
23	Bulobo	Maliana-I	19.8	0.9	1.0	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.4
24	Malaibaka	Maliana-II	156.4	7.3	7.6	4.6	3.3	2.8	2.4	1.8	1.6	1.5	1.7	2.7	4.2	3.4
25	Bebui	Oetalari-I	193.3	5.3	7.1	5.4	2.8	3.1	2.3	0.8	0.2	0.2	0.2	0.4	1.3	2.4
26	Seical	Seical Up	398.0	7.0	4.7	5.7	4.0	3.7	3.0	2.1	1.4	1.2	1.0	1.9	4.5	3.4

Source: Feasibility and Engineering Study in Respect of Rehabilitation of Identified Irrigation Schemes in East Timor

Note: The monthly reliable flows at the intake of 26 schemes were estimated using a rainfall-runoff model.
If the catchments are less than 20 km^2 and single crop at present, the water availabilities are neglected in the dry season.
Therefore, the field survey of water availability is need.

Table I-13 Water Requirement of 26 Irrigation Schemes

No.	River/Spring	Scheme Name	Potential Area (ha)	Water Requirement (m^3/sec)												
				Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
Unit Water Requirement per hectare (/ha)				3.2	3.2	3.2	0.0	2.6	5.1	4.3	4.3	4.3	0.0	2.0	4.0	3.0
	OECUSSEE															
1	Naktuka	Naktuka	170	0.7	0.5	0.5	0.5	0.0	0.4	0.9	0.7	0.7	0.7	0.0	0.3	0.5
2	Tono	Tono	260	0.8	0.8	0.8	0.0	0.7	1.3	1.1	1.1	1.1	0.0	0.5	1.0	0.8
3	Oemathitu	Oemathitu	170	0.5	0.5	0.5	0.0	0.4	0.9	0.7	0.7	0.7	0.0	0.3	0.7	0.5
	BOBONARO															
4	Malibaka	Nunura	185	0.6	0.6	0.6	0.0	0.5	0.9	0.8	0.8	0.8	0.0	0.4	0.7	0.6
5	Lotan	*Batugade*	80	0.3	0.3	0.3	0.0	0.2	0.4	0.3	0.3	0.3	0.0	0.2	0.3	0.2
6	Bulobo	Marco	220	0.7	0.7	0.7	0.0	0.6	1.1	0.9	0.9	0.9	0.0	0.4	0.9	0.7
7	Loes	Atabaeloes	190	0.8	0.6	0.6	0.6	0.0	0.5	1.0	0.8	0.8	0.8	0.0	0.4	0.6
8	Marobo	Bilimau	350	1.1	1.1	1.1	0.0	0.9	1.8	1.5	1.5	1.5	0.0	0.7	1.4	1.1
9	Boroloka	Cailaco/Maligo	100	0.3	0.3	0.3	0.0	0.3	0.5	0.4	0.4	0.4	0.0	0.2	0.4	0.3
10	Nunurata	Halicao	345	1.1	1.1	1.1	0.0	0.9	1.8	1.5	1.5	1.5	0.0	0.7	1.4	1.0
	LIQUICA															
11	Lawele	*Leoata/Leotala*	80	0.3	0.3	0.3	0.0	0.2	0.4	0.3	0.3	0.3	0.0	0.2	0.3	0.2
12	Loes	Fatuboro	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ERMERA															
13	Geomecan	Gleno	80	0.3	0.3	0.3	0.0	0.2	0.4	0.3	0.3	0.3	0.0	0.2	0.3	0.2
14	Boera	Railaco	75	0.2	0.2	0.2	0.0	0.2	0.4	0.3	0.3	0.3	0.0	0.2	0.3	0.2
	MANATUTO															
15	Leleia	Laleia	265	0.8	0.8	0.8	0.0	0.7	1.4	1.1	1.1	1.1	0.0	0.5	1.1	0.8
	VIQUEQUE															
16	Uaibati	Uaibati	220	0.9	0.7	0.7	0.7	0.0	0.6	1.1	0.9	0.9	0.9	0.0	0.4	0.7
17	Irebere	Baedubu	335	1.3	1.1	1.1	1.1	0.0	0.9	1.7	1.4	1.4	1.4	0.0	0.7	1.0
	BAUCAU															
18	Seical	Seical Down	430	1.4	1.4	1.4	0.0	1.1	2.2	1.8	1.8	1.8	0.0	0.9	1.7	1.3
	LAUTEM															
19	Laivai	Laivai/Ililai	125	0.4	0.4	0.4	0.0	0.3	0.6	0.5	0.5	0.5	0.0	0.3	0.5	0.4
20	Luro	Luro	100	0.4	0.3	0.3	0.3	0.0	0.3	0.5	0.4	0.4	0.4	0.0	0.2	0.3
	AINARO															
21	Welulic	Bonuk	270	0.9	0.9	0.9	0.0	0.7	1.4	1.2	1.2	1.2	0.0	0.5	1.1	0.8
22	Welulic	Cassa	185	0.6	0.6	0.6	0.0	0.5	0.9	0.8	0.8	0.8	0.0	0.4	0.7	0.6
	MAJOR DAMAGED															
23	Bulobo	Maliana-I	840	3.4	2.7	2.7	2.7	0.0	2.2	4.3	3.6	3.6	3.6	0.0	1.7	2.5
24	Malaibaka	Maliana-II	700	2.2	2.2	2.2	0.0	1.8	3.6	3.0	3.0	3.0	0.0	1.4	2.8	2.1
25	Bebui	Oetalari-I	1,090	2.2	4.4	3.5	3.5	3.5	0.0	2.8	5.6	4.7	4.7	4.7	0.0	3.3
26	Seical	Seical Up	800	2.6	2.6	2.6	0.0	2.1	4.1	3.4	3.4	3.4	0.0	1.6	3.2	2.4

Source: Urgent Irrigation Rehabilitation Project, Detailed Design Report for Laclo Irrigation System under the UNOPS

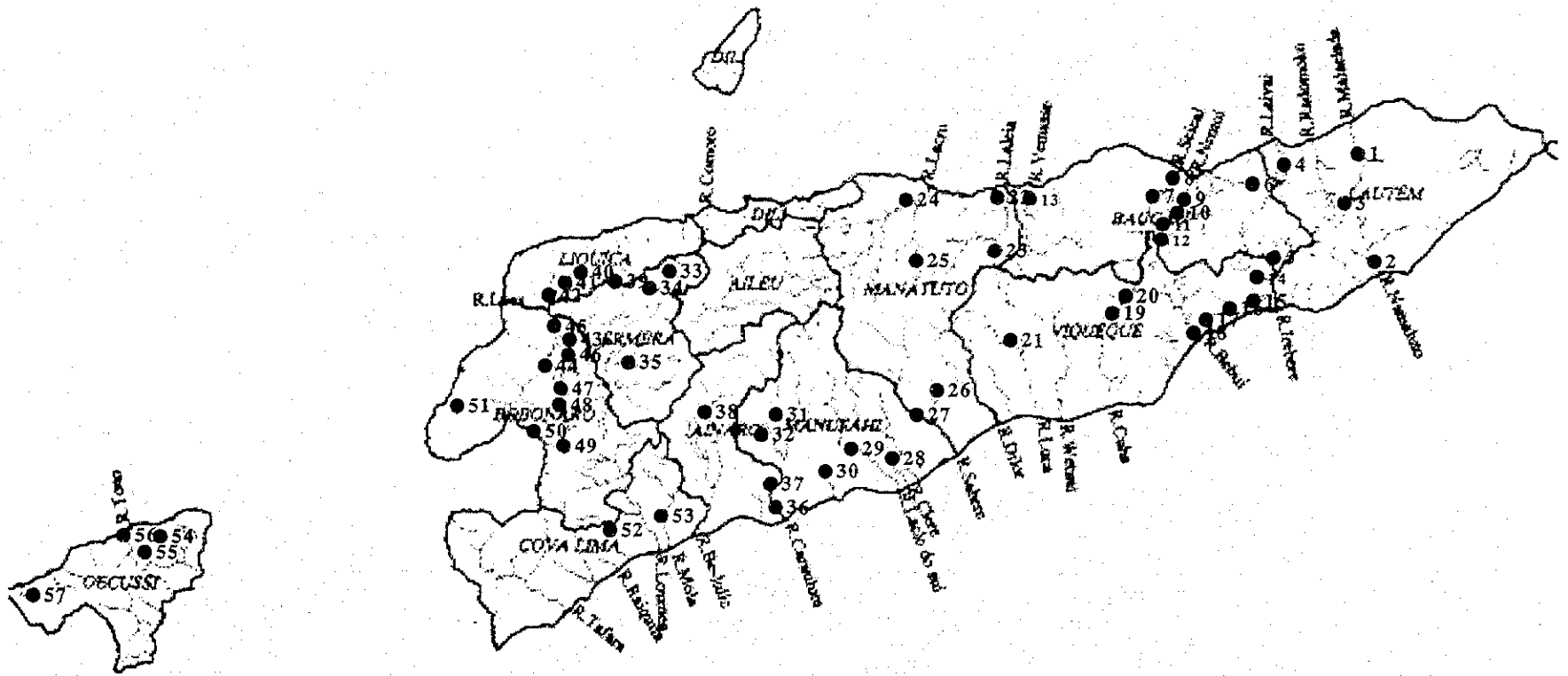
Note: The monthly water requirements of 26 schemes were estimated by Laclo irrigation data.
Therefore, the field survey of water requirement is need for implementation of the projects.

Table I-14 Cropping Intensity for 26 Irrigation Schemes

No.	River/Spring	Scheme Name	Potential Area (ha)	Crop pattern	1st crop			2nd crop			Possible Irrigable Area (ha)	Copping Intensity (%)
					Availability (m^3/sec)	Requirement (m^3/sec)	Irrigable Area (ha)	Availability (m^3/sec)	Requirement (m^3/sec)	Irrigable Area (ha)		
	OECUSSEE											
1	Naktuka	Naktuka	170	p + f	0.4	0.7	95	0.0	0.9	0	95	56
2	Tono	Tono	260	p + p	2.5	1.0	260	0.4	1.1	95	355	136
3	Oemathitu	Oemathitu	170	p + f	0.4	0.7	95	0.0	0.9	0	95	56
	BOBONARO											
4	Malibaka	Nunura	185	p + p	2.7	0.7	185	0.6	0.8	140	325	176
5	Lotan	Batugade	80	p + p	1.0	0.3	80	0.2	0.3	55	135	169
6	Bulobo	Marco	220	p + p	1.9	0.9	220	0.7	0.9	170	390	177
7	*Loes*	*Atabaeloes*	190	p + p	1.1	0.8	190	0.3	0.8	70	260	137
8	Marobo	Bilimau-	350	p + p	10.3	1.4	350	4.3	1.8	350	700	200
9	Boroloka	Cailaco/Maligo	100	p + f	0.1	0.3	35	0.0	0.5	0	35	35
10	Nunurata	Halicao	345	p + p	10.9	1.4	345	4.9	1.8	345	690	200
	LIQUICA											
11	Lawele	Leoata/Leotala	80	p + p	1.9	0.3	80	1.6	0.4	80	160	200
12	Loes	Fatuboro	-	-	-	-	-	-	-	-	-	-
	ERMERA											
13	Geomecan	Gleno	80	p + p	0.3	0.3	80	0.1	0.3	25	105	131
14	Boera	Railaco	75	p + p	0.4	0.3	75	0.1	0.3	25	100	133
	MANATUTO											
15	Leleia	Laleia	265	p + p	3.8	1.1	265	0.2	1.1	50	315	119
	VIQUEQUE											
16	Uaibati	Uaibati	220	p + p	0.3	0.7	95	0.2	1.1	40	135	61
17	*Irebere*	*Baedubu*	335	p + p	2.3	0.7	335	0.2	1.4	50	385	115
	BAUCAU											
18	Seical	Seical Down	430	p + p	2.8	1.7	430	0.3	1.8	70	500	116
	LAUTEM											
19	Laivai	Laivai/Ililai	125	p + p	1.8	0.5	125	0.3	0.5	75	200	160
20	Luro	Luro	100	p + p	0.5	0.4	100	0.1	0.4	25	125	125
	AINARO											
21	*Welulic*	*Bonuk*	270	p + p	11.1	1.1	270	0.2	1.2	45	315	117
22	Welulic	Cassa	185	p + p	11.4	0.7	185	0.4	0.8	95	280	151
	Sub-total		**4,235**				**3,895**			**1,805**	**5,700**	**135**
	MAJOR DAMAGED											
23	Bulobo	Maliana-I	840	p + f	0.4	2.7	125	0.0	4.3	0	125	15
24	Malaibaka	Maliana-II	700	p + p	4.2	2.8	700	1.5	3.0	350	1,050	150
25	Bebui	Oetalari-I	1,090	p + p	2.8	3.5	870	0.2	5.6	40	910	83
26	*Seical*	*Seical Up*	800	p + p	4.5	3.2	800	1.2	3.4	280	1,080	135
	Sub-total		**3,430**				**2,495**			**670**	**3,165**	**92**
	Total		**7,665**				**6,390**			**2,475**	**8,865**	**116**

Note: p = paddy, f = fallow

Figure I-1 Existing Irrigation Schemes



No.	Scheme Name	Area (ha)		No.	Scheme Name	Area (ha)		No.	Scheme Name	Area (ha)		No.	Scheme Name	Area (ha)	
		Potential	Functional			Potential	Functional			Potential	Functional			Potential	Functional
1	FUILORO	400	400	16	UATULARI 1	1,090	600	31	CARAULUN	2,196	0	46	MARCO	220	100
2	IRABARE	350	350	17	UATULARI 2	204	204	32	CALOCO	200	200	47	CAILACO/MELIGO	100	80
3	LURO	100	60	18	UATULARI 3	370	370	33	RAILACO	75	30	48	MALIANA 1	2,400	750
4	LAIVAI	125	100	19	UIBERE	350	350	34	GLENO	80	40	49	MALIANA 2	965	400
5	LARISULA	350	350	20	UATEULAU	350	350	35	SARE	1,050	500	50	NUNURA	185	50
6	LAGA	300	175	21	LACLUTA	250	250	36	BONUK	270	5	51	BATUGADE	80	50
7	SEICAL-up	800	0	22	LALEIA LEFT	265	80	37	CASSA	185	45	52	BECO	1,185	800
8	SEICAL-down	430	140	23	CAIRUM	250	250	38	OEBABA	2,158	1,000	53	RAIMEAN	400	220
9	CASAMETA	350	350	24	SUMASSE	250	250	39	LEOATA/LEOTALA	80	65	54	TONO	260	212
10	SAMALARI	1,000	1,000	25	LACLO	660	0	40	GUICO RIGHT	80	50	55	ROTE	350	350
11	LIASIDI	600	600	26	SAHEN	3,121	239	41	GUICO	2,000	800	56	OEMATHITU	170	100
12	BARLATA	200	200	27	NATARBORA	500	400	42	LAUWELI	3,000	80	57	NAKTUKA	170	90
13	VEMASSE	700	600	28	WELALUHU	150	150	43	BILIMAU	350	100				
14	BAEDUBU	335	185	29	DOTIK	100	0	44	HALICAO	345	30				
15	UAIBATI	220	130	30	BESUSU	150	150	45	ATABAE LOES	190	120		Total	33,064	13,750

Figure I-2 Rehabilitation and Maintenance of Roads, Location of Physical Works

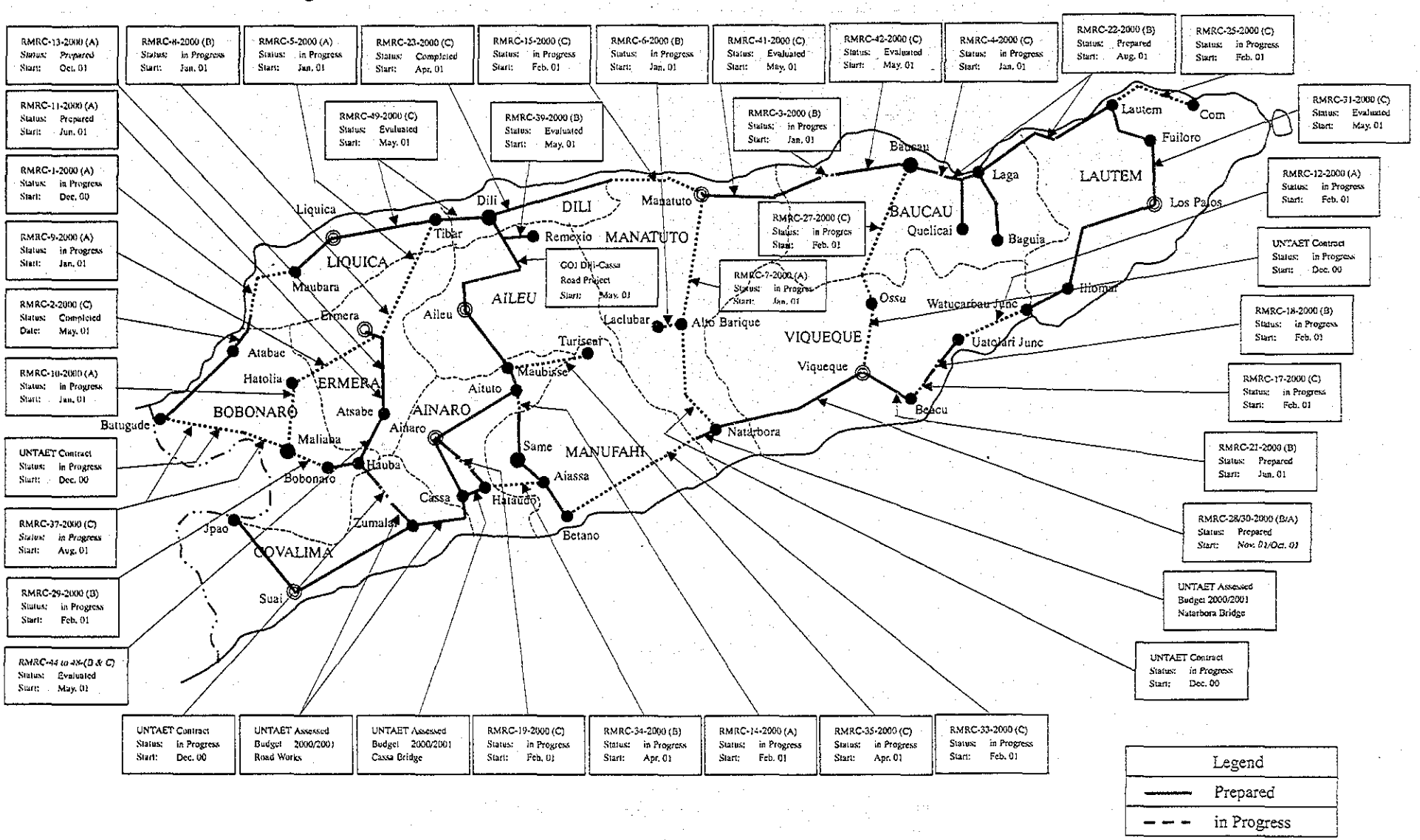
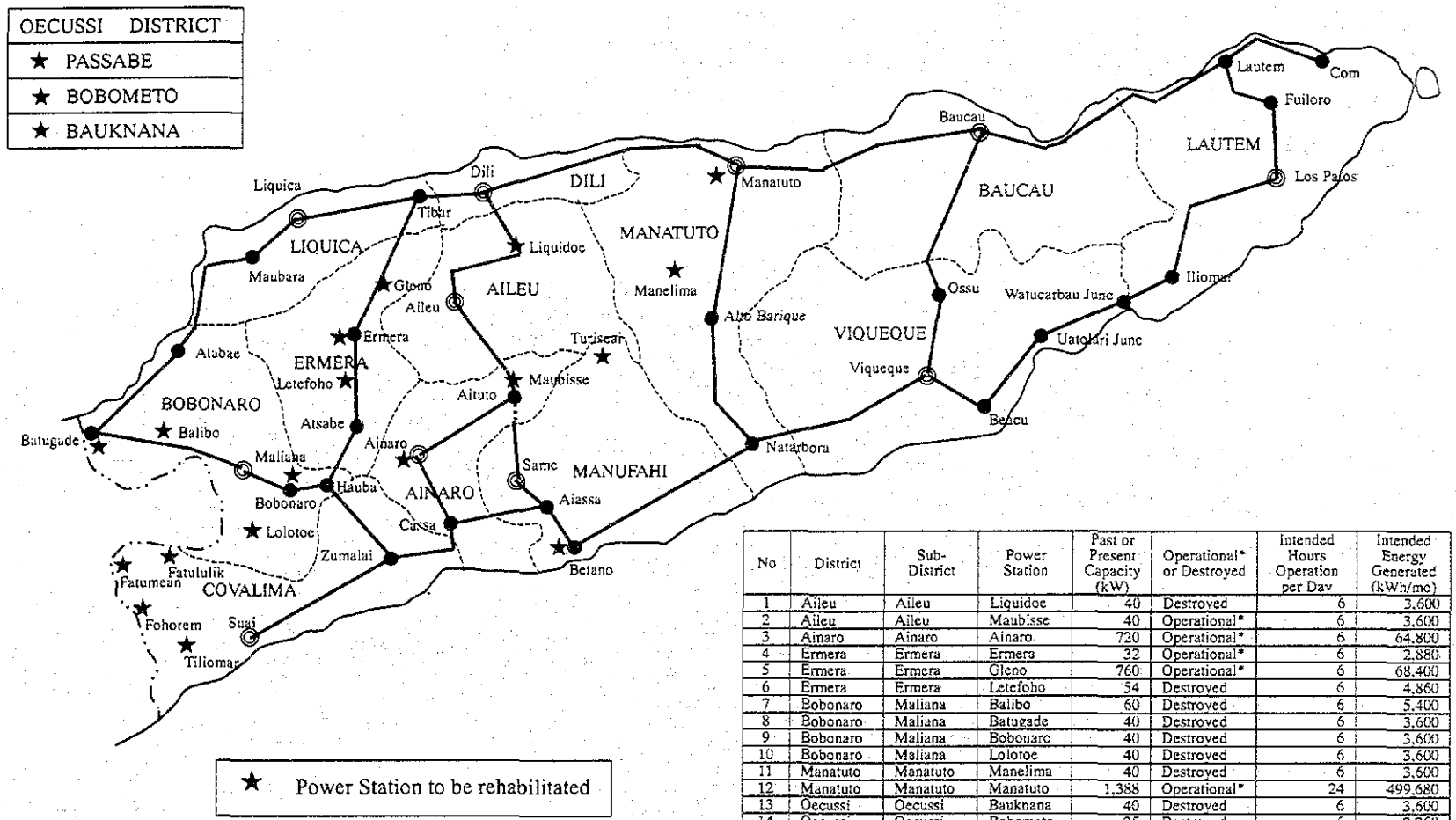


Figure I-3 Rehabilitation of Rural Power Stations



No	District	Sub-District	Power Station	Past or Present Capacity (kW)	Operational* or Destroyed	Intended Hours Operation per Day	Intended Energy Generated (kWh/mo)
1	Aileu	Aileu	Liquidoe	40	Destroyed	6	3,600
2	Aileu	Aileu	Maubisse	40	Operational*	6	3,600
3	Ainaro	Ainaro	Ainaro	720	Operational*	6	64,800
4	Ermera	Ermera	Ermera	32	Operational*	6	2,880
5	Ermera	Ermera	Gleno	760	Operational*	6	68,400
6	Ermera	Ermera	Letefoho	54	Destroyed	6	4,860
7	Bobonaro	Maliana	Balibo	60	Destroyed	6	5,400
8	Bobonaro	Maliana	Batugade	40	Destroyed	6	3,600
9	Bobonaro	Maliana	Bobonaro	40	Destroyed	6	3,600
10	Bobonaro	Maliana	Lolotoe	40	Destroyed	6	3,600
11	Manatuto	Manatuto	Manelima	40	Destroyed	6	3,600
12	Manatuto	Manatuto	Manatuto	1,388	Operational*	24	499,680
13	Oecussi	Oecussi	Bauknana	40	Destroyed	6	3,600
14	Oecussi	Oecussi	Bobometo	25	Destroyed	6	2,250
15	Oecussi	Oecussi	Passabe	40	Destroyed	6	3,600
16	Manufani	Same	Betano	40	Destroyed	6	3,600
17	Manufani	Same	Turiscai	40	Operational*	6	3,600
18	Covalima	Suai	Fatululik	40	Destroyed	6	3,600
19	Covalima	Suai	Fatumean	40	Destroyed	6	3,600
20	Covalima	Suai	Fohorem	40	Destroyed	6	3,600
21	Covalima	Suai	Tiliomar	40	Destroyed	6	3,600

Operational* put under temporary arrangements. Rehabilitation required for permanent operation.

Figure I-4 Location of Dam and Diversion Weir

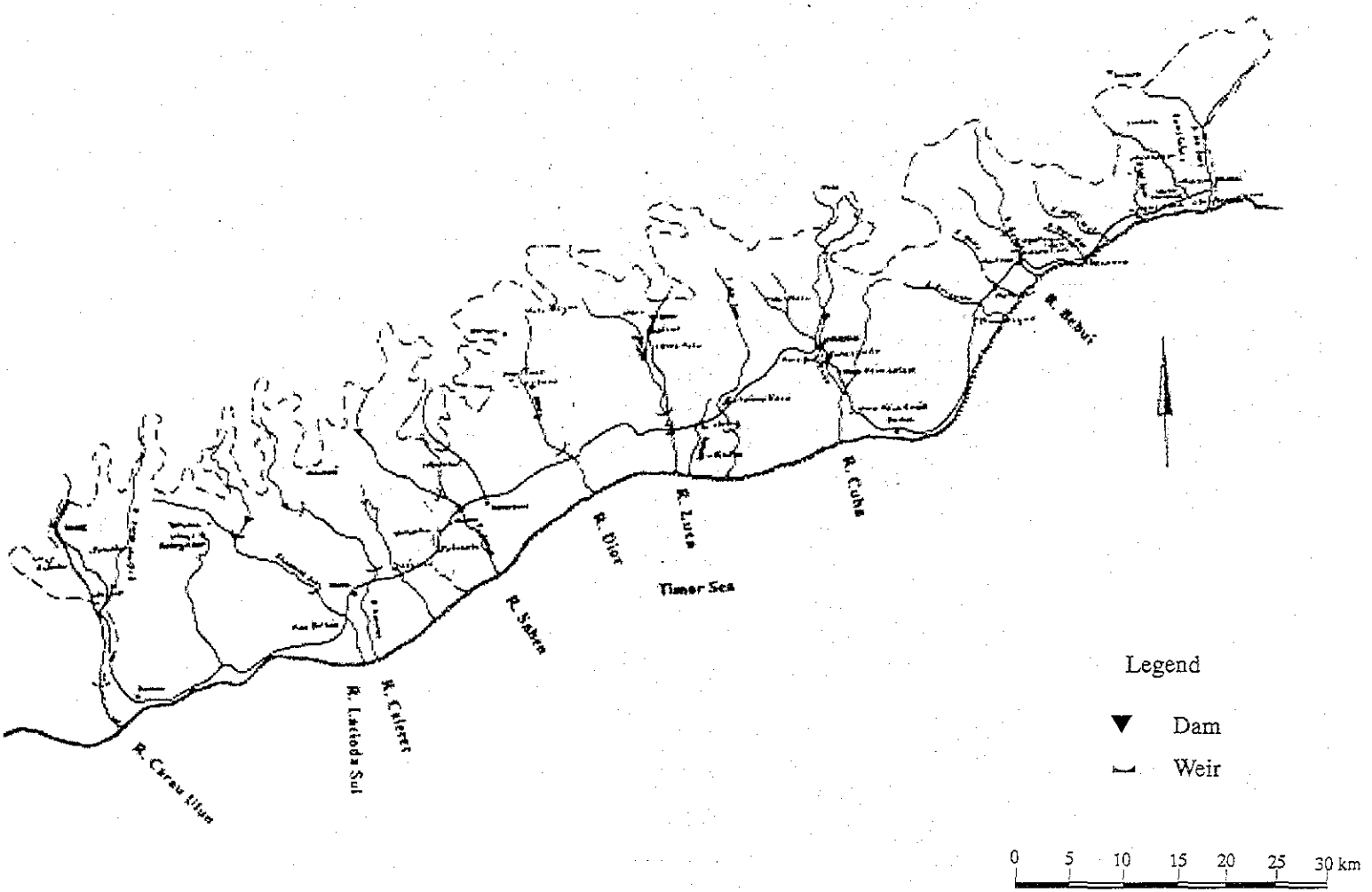
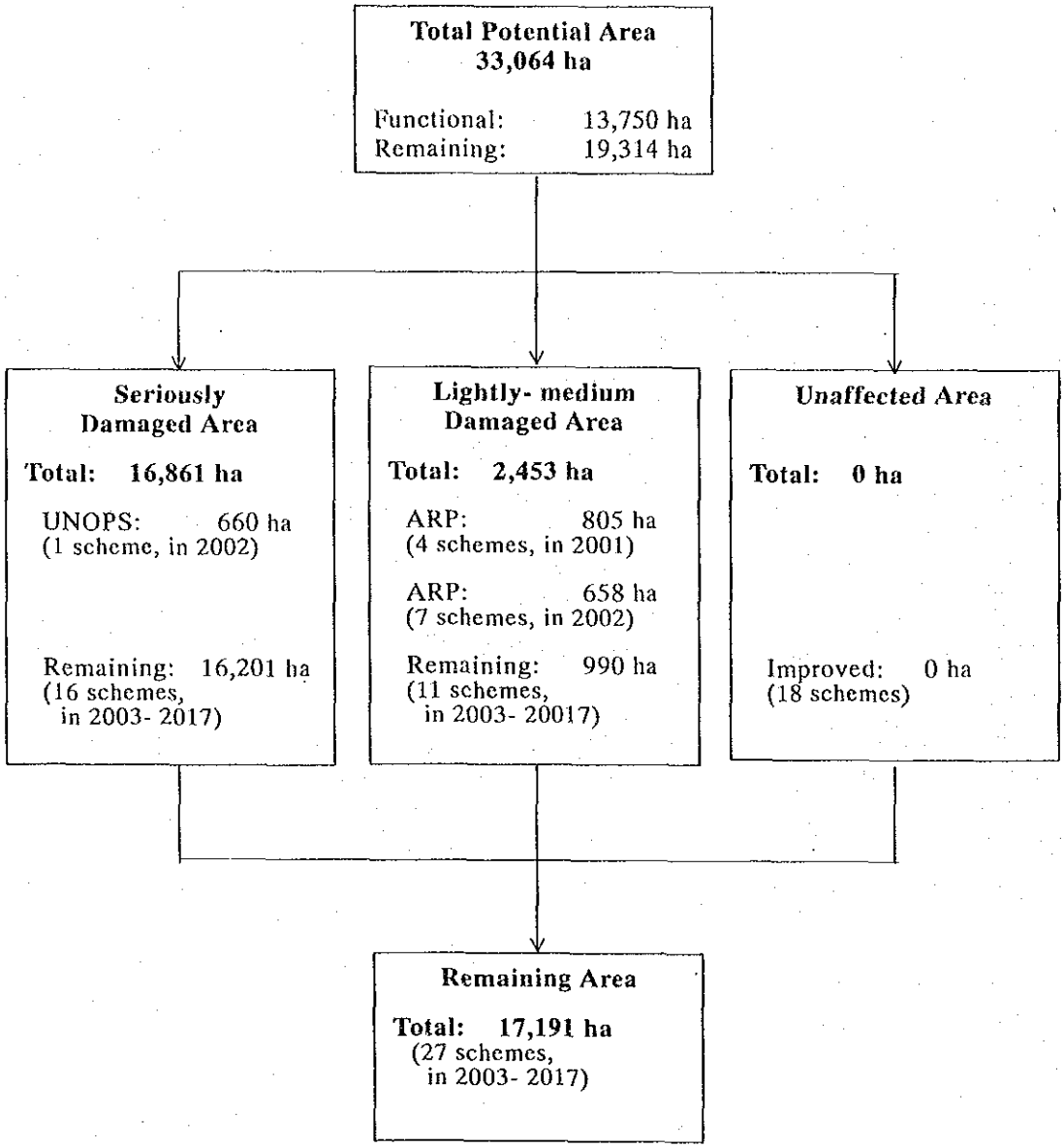


Figure I-5 Rehabilitated Irrigation Area in East Timor



ANNEX J. LIVESTOCK

CONTENTS

List of Tables

J-1. Livestock Holdings and Multiple Benefits

Almost all East Timorese households own one to several farm animals. Even in the urban areas, households maintain a few head of kampung or native chickens, and/or one or more native pigs, sometimes one or more goats or sheep. Aside from these small animals, households in the rural areas would also have cattle, buffalo, and/or horse. Almost all animals are loose, with little confinement or tethering, so they can scavenge for their own feed from grass and weeds, shrub and trees. Supplemental feeds include kitchen leftovers, crop residues, some purchased rice bran, and salt. Veterinary care is minimal, mainly in the form of vaccinations provided by DAA.

Livestock contribute multiple benefits to family welfare. They not only provide food but perhaps equally as important, serve as a means for wealth accumulation in an economy where no formal savings or banking system operates. This is why large animals are first choice for **barlaki** or dowry offered to the bride's family in marriage, or contributed to a mourning family when someone dies through the **adat** tradition. They can be sold to cover especially large expenses. Field cultivation is facilitated by draft animal power either through rencah or animal traction with plow. Animals also convert crop residues and weeds to high value products, then return back manure to fertilize the fields. This way they facilitate the nutrient cycling process without burning.

J-2. Development Opportunities

These are discussed in Chapter 5.2.5 and 5.2.6 of main report.

J-3. Development Thrusts

Refer to Chapter 6.3.1.

3.1 Additional Information

3.1.1 Bali Cattle

Meat evaluation done by Nitis (pers. comm.) has confirmed the high eating quality, tenderness and moderate marbling of Bali cattle when slaughtered at about three to four years of age. Animals in good condition may or may not undergo fattening. This is an advantage of the breed compared to temperate breeds which require high grain feeds to obtain tender meat but with high trimmable fat. Tough meat from older animals especially cull cows or bulls, are more suited for corned beef or canned meat preparations.

Cattle production was encouraged by the Indonesian government partly to support the transmigration program which allocated one female cattle per family. The first Smallholder Cattle Development Project (SCDP) shipped 44,000 head of cattle to Sumatra. In the second SCDP, 80,000 head were shipped to Sumatra and Sulawesi from 1987-1992. These projects were funded by the Indonesian government, World Bank and International Fund for Agricultural Development (IFAD). The ADB also co-funded similar projects which shipped 10,000 cattle

per year to Kalimantan over the same six-year period. Although these projects imported large numbers of Brahmans and some Droughtmasters from Australia, reproductive problems, unmanageable and wild animals led the farmers and project implementors to prefer Bali cattle or even buffalo in the latter part. This encouraged the island provinces to intensify Bali cattle production to benefit from the procurements.

The whole Timor island (east and west), and outlying islands were also encouraged by the growing demand for meat in Java, especially for festivals. In 1995, it was estimated that some 53,000 cattle and buffaloes were needed in Jakarta during the Muslim fasting month of Ramadhan (Jakarta Post 18 Feb 1995). Before the conflict, Bali cattle for slaughter were shipped out from Oecussi to Surabaya although this has abated with discontinued shipping services. Some cattle are sold to Indonesian towns near Passabe and Oe Silo, but depending on prices, cattle from Indonesia could also be sold to East Timor. Breeder female Bali cattle have also been shipped from Oecussi to Dili for redistribution to families who lost their cattle. It is important that the new government supports an intensified Bali cattle production in Oecussi so that it can continue to provide breeder heifers for redistribution.

3.1.2 Promotion of Animal Traction (AT) Use

1) Selection Criteria for Locations

a) Common Criteria. All potential AT areas should have;

- sufficient buffaloes for lowland, or cattle for upland- preferably animals less than one year old,
- farmers' expressed willingness to learn to use AT and acquire plow and implements.
- welding or metal fabrication shop(s) to provide fabrication and repair services.

b) Other Selection Criteria

(1) For Lowland Rice Farms:

- Preferably irrigated
- Sufficient water in wet season
- Soil not too sticky
- Cultivation not highly mechanized

(2) For Upland Farms:

- Not more than 40% slope, otherwise farmers are willing to contour plow
- Relatively light soil
- Relatively free of rocks, tree stumps

2) Selection Criteria for Farmer Trainees

Key farmer trainees will be selected based on the following criteria:

- Previous experience in AT
- Age. Relatively young, below 30 years old
- Literacy. Can read and write
- Willingness to undergo training at Hera
- Willingness to teach other farmers, or to rent out AT services
- Willingness to invest in part of training expenses, plow and implements, through micro finance

3) Estimate of Draft Animal Power Use

Draft Animal Power (DAP) use is roughly estimated from the latest livestock population as follows:

	1999-2000 Population	Estimated Draft Animals, No. (%)
Buffalo	48,452	29,071(60)
Cattle (Bali)	96,662	4,833(5)
Horses	20,396	1,020(5)

The estimates were done considering the following situational analyses: a) most DAP use employs the **rencah** system for field cultivation for lowland rice; b) buffaloes are most widely used, and some Bali cattle and horses; c) upland crops mainly corn intercropped with field legumes and cassava are cultivated manually; and d) **rencah** use involves groups of animals of mixed ages.

Combining the estimated 60 percent buffaloes and 5 percent cattle, they are capable of cultivating around 13,548 ha of rice land within a 30-day land preparation period per year as shown below. This represents about 65 percent of the estimated 21,000 ha rice land in 1997.

Area cultivated = No.of animal teams x Cultivable area/ team (ha) =

29,071 + 4,833 / 15 = 2,260 teams x 30 days / 5 days per ha = 13,548 ha.

The following assumptions were used:

- Average rencah team : 15 animals
- Land preparation period : 30 days per year
- Cultivation rate per team : 5 days / ha = 4 days / ha + 1 day rest
- Cultivated area per team : 6 ha in 30 days

3.1.3 *Crops + Livestock. Integrated Food and Feed Crops in Smallholder Farms for Pigs and Poultry*

Since extensive rearing system of pigs and chickens prevail in smallholder farms, a small increase in supplemental feeds could result in high incremental improvements in terms of:

- Increased reproductive rates
- Faster growth rates or shortened marketability

This can be illustrated for a typical smallholder upland farm below. By increasing cultivated area from one to 1.5 ha, there will be feeds sufficient for one pig or 10 chickens from the additional yields, assuming insignificant increase in family consumption and/or marketable surplus. These estimates are based on a year's 60 percent feed for a mature animal; the 40% is assumed to be scavenged by the animal itself. Furthermore, turnover for chicken is about two per year, or a bird is consumed at about six months old.

Item	Crops						
	Maize	Cassava	Sweet Potato	Pigeon Pea	Cowpea	Kidney Bean	Sorghum
Without Project (1 ha)							
Area (ha)	0.7	0.1	0.1	0.02	0.02	0.05	-
Yield(t/ha)	1.0	4.0	2.0	0.15	0.2	0.4	-
Actual yield (t)	0.7	0.4	0.2	0.003	0.004	0.02	-
Less: Consumed(t)	0.7	0.3	0.2	0.003	0.004	0.02	
Available feedgrain,(t)	0	0.1	0	0	0	0	
With Project (1.5 ha)							
Area (ha)	1.0	0.1	0.2	0.05	0.05	0.05	0.05
Yield (t/ha)	1.0	4.0	2.0	0.15	0.2	0.4	1.0
Actual yield (t)	1.0	0.4	0.4	0.008	0.01	0.02	0.05
Less: Consumed (t)	1.0	0.3	0.3	0.005	0.007	0.02	0.05
Available feedgrain(t)	0	0.1	0.1	0.003	0.003	0	0.05

Estimated Available feeds: 256 kg

Cassava	100 kg
Sweet potato	100
Pigeon pea	3
Cowpea	3
Sorghum	50

Estimated Feed Supplement; kg/head/day, 60% requirement for:	Pig	Chicken
Kg/day	0.6	0.06
Kg/year	220	22

3.1.4 Water Buffalo

1) Origin and Distribution

Bubalus bubalis (Bovidae), or swamp buffalo, probably descended from wild buffaloes of India, Bangladesh, Pakistan and Malaysia (Webster and Wilson 1980).

West Timor had "wild buffaloes and hogs enough" for hunting in 1699 (Dampier 1703). They were also being exported from East Timor to Ambon in the 1850s, and probably even earlier (Bickmore 1989).

Moa, an island of 349 square kilometer off the northeast tip of East Timor, has long raised buffaloes for export and for traditional status. In 1988, the buffalo population was estimated at 15,000, and increasing to overstocking level on native grasses *Andropogon ambonicus, Eragrostis curvula,* and *Melinis minutofolia.,* as well as *Imperata* cylindrica. Ownership of animals is limited to a minority of the population, as in other islands (Brinckmann 1988).

2) Extensive Rearing System

An extensive buffalo rearing system prevails in East Timor, usually in herds up to 50 heads of mixed ages, grazing on communal pastures and fallow fields, with or without a herdsman. Breeding is uncontrolled, with inbreeding from cows and heifers mating indiscriminately with males 2 years or older. Some of the older, more aggressive males are castrated then sold. A few large animals are observed to have Murrah breed infusion, a breeding effort which was not sustained by the Indonesians

Few societies in Timor and Maluku islands (NT & M) use the milk, although a cheese called **susuruti** was known from Amarasi, West Timor. It was made by coagulating the milk with juice of the plant *Wrightia calicyna* (Apoc.) (Terra 1958).

3.1.5 Other Cattle Breeds including Dairy

1) Ongole or Nellore

The Dutch introduced Ongole or Nellore from India in the 1920s (Crippen International 1975). The principal Ongole producing provinces are Sumba and Lombok. In the early 1980s, a few head were also introduced in East Timor before that of Droughtmasters. Ongole is one of four Indian or zebu cattle breeds that were used in developing the American Brahman (or simply Brahman). At this time (early 80s), the International Brahman Breeders Association decided that all such foundation breeds and Indu-Brazil, which is a similar breed developed in Brazil, could all be included in the Brahman registry. Thus, some breeders in the U.S., Australia and Latin America maintain specific lines such as Nellore, Red Brahman, etc. Indu-Brazil is distinguished by its large pendulous ears.

Droughtmaster is a brown to red Australian breed developed from Brahman, Ankole- an African breed and Shorthorn from the U.S. The shipment of Droughtmasters were brought to

East Timor around 1998, as a Presidential gift (of Soeharto).

For dairy, about 25 Holstein Frieisian heifers and bulls were brought in by the Indonesians around 1998. These are found in farms at Dare in Dili and Don Bosco in Fuiloro. They operate as demonstration- instructional, rather than commercial farms. The Don Bosco herd was not being milked as of July.

It is important to include water buffaloes in a dairy development effort, they being tropical animals that are already widespread, and owned by many people. A similar demonstration buffalo dairy herd crossbred with Murrah is planned to be initiated at the University farm in Hera.

2) Horses

Meilink-Roelfsz (1962) reported that horses were being bred and exported from several NT islands including Timor from the 1500s to early 1600s. Lilley (1997) believes these horses may have originated from Sumba. They are very important for transport especially in remote areas with no roads or little vehicular transport. They are also used for road work in Lombok, and imported from Sumbawa (Crippen International 1980). The horses are also well adapted, requiring little or no concentrate feed supplementation unlike in the case of the larger breeds of Arabian or Quarterhorse. Only occasional feeding with rice bran is done in the villages, and this may be given with the drinking water and some salt. Efforts to improve horses should concentrate on selecting good stallions for breeding, along with improved feed supplementation. Crossbreeding is not advisable.

3) Small Livestock

Farmers and poor people generally keep goats or sheep, pigs and chickens for food and for cash income. Less capital is needed than for the large animals, and they reproduce faster. They can be sold readily to cover expenses for school or other household necessities. They also provide small amount of meat for the family's consumption, compared to the larger animals slaughtered for festivals and special occasions. Most are also raised under subsistence type feeding and management.

a) Goats and Sheep

Goats are also commonly raised by almost all farm families, and provide an alternative for the poor who cannot afford cattle or buffalo. Herds could be observed within the coastal areas which may belong to a few families. Although intensified production by confinement feeding has proved successful in the more crowded Java, it has its own problems aside from additional feeding labor and respiratory diseases and mange especially when the pens are wet in the rainy season. Very limited introductions of larger breeds like Anglo Nubian has minimal impact on upgrading the predominantly native breed (kambing kacang) found all over Indonesia.

Sheep of the fat-tail Barbados breed were probably introduced by the Portuguese in the 1880s, and sometimes graze with goats or go by themselves in sizable herds. The Indonesian government discouraged further introductions because they are known to be a carrier of the

Jembrana disease (MCF) of Bali cattle. Sheep are reported to reproduce less than goats, but are consumed similarly. Wool is not used at all.

b) Pigs

The pig may have been domesticated from its wild relative which still exist today. As such, they manage as scavengers with little feed supplementation and veterinary support except for vaccinations from the infectious diseases. Although the meat may tend to be too fat when old (beyond 1 year), but is relatively low in fat when consumed at 6- 8 months old. Crossbreeding it with improved breeds such as Large White and Duroc Jersey results in better meat, faster growth and larger mature weight. The crossbreds would however require housing, more nutritious feed and parasite control which could not be provided by average households.

Crossbreeding it with the Chinese "Meihan" is advocated since this breed is also a foraging one and of very high litter size of more than 15. Don Bosco at Fuiloro has imported one such barrow. Foraging for their feed maybe economical but may make native pigs destructive to crops if not partly confined. The extensive rearing system is ironically being done by pig raisers in Europe and U.S., who now raise some growing/fattening pigs in the ground with shelter. This is done partly to cater to the "natural or organic" meat market, and more "humane" treatment advocated by the "Animal Rights" movement.

In addition to improving its reproductive rate, extensive feed supplementation can be taught to farmers by way of the traditional food crops like sweet potato and field legumes as discussed in Sect. 3.1.3 above. Occasional deworming can also be done to control internal parasites.

Commercial piggeries would eventually be established by private investors to provide more tender and lean meat, but at a higher price, and subject to economics of production. In the near term, a low buying power and market demand may not justify additional investments in facilities, aside from commercially mixed feed and imported ingredients. The government can promote the right investment climate through more stable supply of feeds such as rice bran and yellow corn. For instance, more corn could be produced by using imported fertilizer, instead of importing the corn itself. More corn for animal feed should not aggravate seasonal shortages of (human) food cereal supplies.

c) Chickens

(1) Native Chickens

Like the pig, kampung or native chicken was also domesticated form the wild jungle fowl, which could still be found in the mountainous parts of the country. They are also raised extensively to forage for their own feed, and given supplemental grains, kitchen leftovers, and crop residues. Hens would hatch a clutch of up to twelve chicks then brood and care for them for a few months, thus limiting their production to about two clutches per year, instead of three to four if the chicks are reared and fed separately at one month age. Minimal supplemental feeding also prolongs the growing period of young chickens to about six months instead of four when given supplemental feeds. Although chickens are small and consummable, poor farm families are constrained to sell them, including eggs to meet needs for cash especially for school

children. Increased feed supplementation could be pursued through farm-produced feeds as discussed in Sect. 3.1.3 above.

Occasional Newcastle disease infestation is a major hindrance to continued expansion of the chicken population, but vaccination has been promoted by the DAA. Indirectly, chicken husbandry and their survival from disease are influenced by cockfighting. Being a popular men's pastime, cockfighting is widely practiced, especially with the end of Indonesian anti-gambling restriction. Notwithstanding the negative social implication for gambling, fighting cocks and native chickens are raised together. Birds survive from range rearing, and more vigorous or "battle- tested" cocks are used for breeding, to incorporate the hardiness trait. Better care and feed for these cocks also benefit the rest of the flocks, especially growing chicks which may share in part of the supplemental feeds. Somewhat tough, especially from birds more than six months old, native chicken meat is however relished for being tasty when steamed or boiled. Breeding efforts to incorporate broiler bloodline into the native often result in more tender meat but crossbreds would also be less hardy, and require more feed supplement to attain their larger size.

There is a growing niche market for "organic" or "happy chickens" in the developed countries, and even layers are allowed part- time on grass pasture, in order to produce more natural carotene- supplemented eggs. Similarly, roasted native chicken meat is also appealing to a discriminating market in urban centers of Thailand, Malaysia, Philippines and Indonesia.

(2) Commercial Chicken Breeds

Commercial broiler and layer farms were encouraged during the Indonesian regime, and it is foreseeable that their revival will be dictated by market forces, through private sector initiative. As of July, commercially-produced eggs were widely available in Dili and most district centers, mostly coming from Surabaya. Frozen broilers were limited to a few supermarkets in Dili, Baucau, and elsewhere. Private entrepreneurs are expected to fill the demand gap for eggs and broilers- and be cost-effective with commercially mixed feeds partly imported from the outside.

d) Ducks

A small number of ducks and muscovy or perching ducks are found in some villages especially in lowland rice areas. Since they seek water to scavenge for their feed, they may also be useful in partly controlling rice pests, especially the giant snail.

4) Strategy for Promoting Improved Feed Supplies

The recommended strategy is to promote maximum planting of multi-purpose food crops and fodder trees, in descending order of priority:

- Smallholder maize farms intercropped with legumes and multipurpose trees
- Grasslands
- Uncultivated upland, including Improved Fallow System

a) Smallholder Maize Farms

Rice farms are used for grazing during the fallow period in the dry season, except in irrigated areas. Growing supplemental forage is impractical. In uplands, maize is intercropped with a variety of legume grains for (human) food, and animal feed such as additional straw for ruminants, and feedgrain for non-ruminants. Fencelines could closely planted with multi-purpose trees (MPTS), preferably legumes like lamtoro, *Gliricidia, Sesbania,* and *Calliandra-* which are valuable for dry season fodder. More sparse plantings over the field is also practiced, as these are lopped off in the late dry season thus minimizing shading for the food crops. *Hibiscus* is a suitable fenceline species even in waterlogged rice fields.

b) Grasslands

Majority of croplands are bordered by grasslands that lead to the more mountainous forests. Most of these grasslands are inhabited by *Imperata, Capellipedium, Themeda,* and other minor grasses, and interspersed brush and weeds such as *Chromolaena* and *Lantana.* Frequency and intensity of grazing by buffalo, cattle, goats and sheep is governed by relative numbers of animals, slope and suitability of vegetation for grazing. Well-utilized grazing areas would need some form of grazing management, perhaps through farmers' associations. Trainings could be done to follow up on some of the Indonesian and Australian project initiatives, accompanied by overseeding of siratro- to demonstrate beneficial availability of green feed in the dry season.

Delineation of these grazing areas should also be made with the concurrence of Forestry officers so as to address concerns on fires, protection of residual trees, and even wildlife conservation.

In some of the cooler highlands such as Aileu, Ainaro, Mantuto, Bobonaro, natural grasslands also abound, and presently grazed by cattle, buffaloes, horses, goat and sheep and sometimes combination of one or more. The more fertile areas, up to about 40% slope, could be planted to kikuyu grass. This effort should be done with trial plots in suitable locations that can be supervised collaboratively between Livestock and Forestry officers within the district and sub-districts. Limited planting materials could be multiplied in collaboration with the "Seeds of Life Project", specifically in its Ailieu location.

c) Uncultivated Land

(1) Hedgerow Intercropping

Uncultivated and/or sloping fallow land could also be planted to MPTS, especially in consonance with soil conservation measures such as contoured hedgerows. Hedgerows could be laid out to allow sufficient space for food crops in the alleys (see Sect h below).

(2) Improved Fallow System

The "improved fallow system" is so- named as an improvement over the natural fallow, or on the contoured hedgerows. The area is fully planted with legume MPTS, then harvested after about five years, followed by two years of food crops, then back to legume trees. With no

intermittent cutting, five-year old trees may be harvested for sawn or round timber, pulpwood, fuelwood or other uses.

d) Food and Fodder Crops

Since majority of animals are owned by smallholder farm households, increased amount of traditional food crops also provides feed for animals. Notwithstanding limitations in land area and labor, these food/fodder crops are either intercropped with maize, and/or non-staples so that animals will not compete for the household food supply and/or marketable produce. Good examples are pigeon pea, cowpea, and rice bean- all consumed as immature pods, but the remaining mature seeds can be cracked for chicken or pig feed. Rice bean also twines with maize, the remaining vines help improve feeding value and palatability of stover when consumed together by cattle or buffaloes. Sorghum grain could be fed as whole seeds to chickens. Sugarcane is a suitable home garden crop for (human) chewing; and as high energy reserve feed for ruminants when young canes are chopped with the leaves for fodder. The crops can be grouped as follows:

(1) Traditional Food, Root Crops/Legumes

Cassava/sweet potato
Pigeon pea -**tunis** (*Cajanus cajan*)
Cowpea- **fore talein** (*Vigna unguiculata*)
Rice bean- (*V. umbellata*)

(2) Other food crops: minor grains and sugarcane

Sorghum (*Sorghum bicolour*)(=*vulgare*)
Millet (*Setaria italica*)
Job's tears (*Coix lachryma-jobi*)
Sugarcane (*Saccharum officinarum*)

(3) Minor Grains

Sorghum is often termed as one of "minor grains" which may include Job's tears and millet. It is the 4th most important cereal grain; and is suited to arid and semi-arid conditions where maize may fail. In subsistent farms, planting limited amounts could be fed to chickens and pigs with little competition for human food.

Job's tears is used as cereal and ornament for thousands of years (Glover, 1971). It is found growing in some home gardens.

Millet- its production would encourage people to develop a more rigid seasonal clearing and planting scheme (Bellwood, 1991c). With job's tears, it is one of the earliest grains grown in the NT&M.

Sorghum - an African plant, it is believed to have been introduced to SE Asia via East Africa and India by the early traders. Occasional stands are observed; but not being cultivated.

(4) Multipurpose trees (MPTS)

(a) Lamtoro

The Indonesian cattle distribution programmes recognized lack of forage during the dry season as a major limiting factor (Gutteridge 1987). Lamtoro (Leucaena leucocephala) has been the most widely- used supplemental fodder introduced, notwithstanding the Psyllid infestation of the mid 1980s. Although the psyllid is observed to be still present in East Timor, the trees have adapted and tolerate the partial damage.

Much has been written about lamtoro hedgerows for erosion control cum-animal fodder. The Sikka model from Flores Island was promoted from the 1950s and by the 1980s it has shown its effectiveness in controlling erosion, and allowing shorter fallow periods for food crops along the alleys. At the same time, it led to expansion of the cattle industry through intensive cut-and carry feeding. The effort expanded to support cattle production in West Timor, was later termed **lamtoronisasi** (de Wolfe 1989), only to be confronted by the Psyllid infestation around 1986.

The Sloping Agricultural Land Technology or SALT was developed similarly in Mindanao, Philippines by the Baptist Church. It also built in the contour hedgerows of lamtoro, and allowed food crops within the alleys. Livestock (goats) was later incorporated in a variation of the model. Psyllid infestation has also promoted other legumes such as *Gliricidia sepium* and the shrubs *Flemingia macrophylla*.and *Desmodium renzonii.*

Aside from its leaf fodder, lamtoro wood is also a high quality fuelwood, which is an important alternative to the Eucalyptus alba fuelwood being gathered all over. The Improved Fallow System of planting lamtoro or other legume trees in slash-and-burn swiddens, then clear-cutting it in year 4-5 improves the following food crop yields for two years before returning again to the trees. Lamtoro wood from 7-10 year old trees could also be sawn for furniture use.

(b) Gliricidia

Gliricidia sepium is of Latin American origin, and being promoted as substitute or companion planting to lamtoro for diversification. It is noted for its tolerance to drought and acid soil, and ease of propagation from mature cuttings or seeds. Seeds could be planted directly or mature cuttings planted towards the end of dry season. As such, it could be planted in multiple rows to create living fences or fire breaks on open grasslands. Trees provide excellent fuelwood either from young branches or mature wood, which could compare with Eucalyptus alba. Its hard wood is also used for parquet floors.

For fodder, cutting the branches before the dry season around May would promote regrowth and prevent defoliation and flowering in dry season from July- August. Some *Gliricidia* stands are observed in most districts, albeit not as common as lamtoro. These could serve as sources of seed or cuttings. Seeds could also be procured from the Philippines.

(c) Other Legume Trees and Shurabs; Vines

1) Other Tree Legumes:

Calliandra calothyrsus - was introduced by Indonesians, a small tree suitable for fencelines, hedgerows.

Sesbania grandiflora - is commonly planted in upland swiddens with maize, for dry season feeding.

Pithecelobium dulce - is a thorny tree suitable for fences, good browse for goats and sheep. Fruits are edible but some may be rancid.

2) Shrubs:

Flemingia.and Desmodium; Stylosanthes sp.- were introduced by Australian projects. Stylos are prone to fire damage in dry season.

3) Vines:

Siratro (Macroptilium atropurpureum)- also introduced by Australian projects; and is observed growing wild in roadsides in almost all districts including Dili. It thrives and produces seeds in the dry season, suitable for overseeding grasslands and home fencelines.

Centrosema pubescens- is an indigenous weed in uplands, albeit not so common. It could be overseeded together with siratro.

4) Non-Legume Trees:

Hibiscus tillaceus- is an indigenous non-legume tree, with broad leaves and yellow bell flowers, it is planted as ornamental shade tree in home lots. It is well- adapted even in waterlogged conditions but may not do well in shallow soil where it is too dry. Prof. I.M. Nitis at Udayana University, Bali has done field trials on its propagation in the mid 80s, and determinined its feeding value for cattle and goats (Pers. Communication). It is easy to propagate by cuttings especially for fencing, and is also planted to support vanilla.

Other indigenous non-legume trees are palatable fodder sources, including *Ficus benjamina, Erythrina variegata* and other species. These could be harvested for fodder and fuelwood, but not recommended for propagation, because of their low value for other uses.

5) Improved Grasses:

These include napier or King's grass (*Pennisetum purpureum*), *Bracharia decumbens*, Chloris gayana and Kikuyu grass (*Pennisetum clandestinum*). Kikuyu is a creeping grass but grow upright to about about 0.3 m high (1 ft) if uncut for some time. It is succulent and highly suitable for the cool highlands for all ruminants, horses, and even as a green soilage feed for pigs and chickens. Planting materials could be obtained from Baguio, Philippines and perhaps some of the highland research stations of Indonesia.

Vetiver grass (*Vetiveria sizanioides*) has also been used in establishing contour

hedgerows because of its effective erosion control features, i.e., the alternative NVS or natural vegetative strips. It is not a fodder species, and it can be planted as the initial hedgerow, then later interplanted with legumes such as pigeon pea and the tree legumes.

5) Wilddlife and Bees

a) *Wildlife*

Virtually all districts have at least patches of forest that support some wildlife including birds, wild chickens, pigs and deer. Fires in the dry season limits such wildlife numbers, especially in the driest Eucalyptus alba and E. urophylla forests. Human habitation and/or clearing for crops also reduce wildlife habitats near the crowded centers of Dili and the other towns. For broad land use and occupancy, the government needs to establish conservation and forestry laws and implement these accordingly. By so doing, wildlife will also be part of the overall concern for conservation and biodiversity towards the long term.

As shown in the Suco survey, people can still hunt for some wild animals for food. But informal inquiries indicate a drastic reduction of such game animals. Therefore, biodiversity conservation would also need to consider supervised game hunting in limited areas, since these could be devised to earn revenues from hunting licences and entry fees. This hunting concern would also be a realistic accommodation since a hunting ban could not be realistically implemented anyway. In practical terms, wild chickens and pigs could be relatively easier to manage with some supplemental feeding stations and hunting season regimes timed with the natural breeding cycles of the animals.

b) Honey and Beeswax

East Timor, like all the NT&M islands have populations of wild bees (*Apis dorsata*). During the sixteenth and early seventeenth centuries, beeswax and honey were important export products from Timor (Meilink-Roelofsz 1962), and along with sandalwood, attracted Javanese traders well before the Portuguese. It was almost as important as sandalwood during the early nineteenth century, and briefly became the most important export in the mid-nineteenth century; but declined after the 1920s. The products were taken to Aru islands, then to Ambon or Ujung Pandang. Honey from Sumbawa has become famous in Indonesia, although its collection is declining. This is partly due to insufficient economic return that would attract new collectors (Clarence-Smith 1992).

Present wild honey populations are closely associated with the *Paraserianthes*- coffee plantations of Ermera, Eilieu, Manufahi, Ainaro and parts of Bobonaro, Covalima, and Manatuto. This is because of the abundance of the flowering trees and coffee, including *Eucalyptus* over wide areas that would sustain the bee colonies.

Raw honey is presently sold at about 5,000 Rupiah per liter close to the source, but this is about 25,000 Rupiah in Dili. Imported honey, duly processed and packaged sells at about 6.25- 6.78 US$ per kilo equivalent (62,500- 67,800 Rupiah) in Dili, as of July @Rp10,000 =$1.

Commercial honey production is led by China, U.S., Argentina, Ukraine and Mexico. Leading importers are the U.S., Germany and Japan. In the U.S., out of about 125,000 apiculturists, only about 2,400 depend on it for their income. Average U.S. commercial

production is 40 kg per colony, and 9-18 kg of beeswax per ton of honey harvested.

Some problems in wild honey trade include the difficult task of gathering from tall trees, adulteration, and competition from commercial honey. Cursory examination of some honey traded indicates adulteration. Some quality control measures are needed, but the more difficult task is in detecting adulterated products and/or properly labelling and standardizing the product.

The existing, albeit reduced market for beeswax and honey has encouraged small-scale projects to improve the wild honey business as well as introduce apiculture through the use of a domesticated Indonesian bee, *Apis cerana* (Apidae). Some NGOs have also started some such projects.

Beeswax, the material derived from the bees' hive, is chiefly made into candles as early as the Roman times and in Europe since the middle ages. Since the early 19th century, ordinary candles have been made from mixtures of paraffin wax, stearic acid (solid fatty acid), and beeswax; along with hydrogenated vegetable oils and other waxes. A special design feature called "bee space" in commercial hives makes it possible to remove both wax and honey without destroying the hive. Present uses of beeswax other other than for candles are those in pharmaceuticals and cosmetics..

J-4. Research and Development (R&D)

Closely synergistic to the economic development concern is a continuing Research and Development effort to help insure the availability of technical manpower and knowhow; and to facilitate information flow. Related to this is the concern for an independent body such as the academe, to foster an objective or unbiased environment. Additional integrating elements would further strengthen the R&D effort, among which are:

4.1 Collaboration

Joint program with academe, colleges and universities, i.e., the University of East Timor. This is to enable professors and students in the university to work with government agriculture officials, and :

- Conduct research at tandem with government thrusts, and
- Obtain in-field experience working with farmers

4.2 Integration

The move to integrate research and extension functions as a government strategy in assisting farmers is also the trend in developing countries. This is consistent with the shift to involve farmers in the problem identification and research priority-setting "bottom-up vs. top-down" process. It is also a realization that researchers (and academics) learn from farmers' knowledge and field-level experience.

A state of normalcy has also to be anticipated, which will eventually normalize trade with Indonesia. When this happens, East Timor would be able to access information lost

during the conflict, from Research Centers and Universities within the NT& M region (Nusa Tenggara and Maluku).

Some of these R & D centers and Universities are as follows:

Kupang, West Timor:

- Forestry Research Institute
- Nusa Cendana University
- Widya Mandira Catholic University

Lombok:

- University of Mataram, Mataram
- Department of Agriculture- Home Gardens Field Station, Narmada, Mataram
- West Nusa Tenggara Regional Library, Mataram

Maluku

- Pattimura University, Poka, Ambon
- Maluku Regional Library, Ambon

J-5. Protein and Calorie Availability from Livestock

Indonesian country estimates revealed that meat, eggs and milk accounted for roughly four gram or seven percent of total daily protein intake, which is less than that from fish (12 %).

Per capita availability of calories and protein by commodity group (in g/capita/day):

					1997		1998			
	Others	Meat	Eggs	Milk	Fish	Others	Meat	Eggs	Milk	Fish
Calories	2,767	38	15	9	36	2,889	40	15	10	37
Protein55.01	2.59	1.10	0.46	6.81	57.68	2.67	1.13	0.48	6.87	

J-6. References

Belwood, P. 1991. The Austronesian Dispersal and Origin of Languages. *Scientific American* Jul: 70-75.

Bickmore, A.S. 1991 (1869). *Travels in the East Indian Archipelago. Singapore:* Oxford University.

Brinckmann, W.L. 1988. *The Island of Moa Buffalo Project Livestock Sector Study.* Denver: Intl. Agrl. College of Denver for the Maluku Regional Planning and Devt. Proj. LTA-72.

Clarence-Smith, W.G. 1992. Planters and smallholders in Portuguese Timor in the 19C and 20C. *Indonesian Circle* 57: 15-30

Crippen International. 1975. *Lombok Island Water Resources Development Phase I. Vol. 4. Technical Report No. 7-Animal Husbandry.* CIDA, Ottawa, for Directorate General of Water

Resources Development, Ministry of Public Works, Jakarta.

Dampier, W. 1703-09. *A voyage to New Holland, etc. in the year 1699.* London.

Glover, I.C. 1971. Prehistoric research in Timor. In *Aboriginal Man and Environment in Australia.* Eds D.J.Mulvaney and J. Golson. 158-81. Canberra: Australian National Univ.

Gutteridge, R. 1987. *Nusa Tenggara agricultural support project forage production technical report No. 8.* ACIL Australia Pty. Ltd. Victoria, Australia.

Lilley, R.J. 1979. Komodo National Park. In: *The Ecology of Nusa Tenggara and Maluku.* Monk, K.A., Y de Fretes, and G. Reksodiharjo-Lilley (Eds.). vol. V. Periplus Editions, Sing. Pp. 807- 811.

Meilink-Roelofsz, M.A.P. 1962. *Asian trade and European influence in the Indonesian archipelago between 1500 and about 1630.* The Hague: Martinus Nijhoff.

Terra, W.J.A. 1958. Farm systems in South-east Asia. *Netherlands J. of Agrl. Sci.* 6(3): 157-182.

Webster, C.C. and P.N. Wilson. 1980. *Agriculture in the Tropics.* London: Longmans Press.

Wolfe de. 1989. *Dryland Farming System Project: review of project planning and implementation.* CARE International.

Table J-1 Estimated Population of Livestock in East Timor, 1997

No	DISTRICT	ANIMAL SPECIES									
		CATTLE	DAIRY CATTLE	BUFFLALO	HORSE	GOAT	SHEEP	SWINE	LOCAL CHICKEN	PEDIGREE CHICKEN	DUCK
1	AILEU	2770		1247	406	5865	90	7472	19960	0	217
2	AINARO	4109		9315	3849	7508	162	14025	43608	0	1262
3	BAUCAU	5211		13922	3115	27766	25397	42331	37931	0	105
4	BOBONARO	41169		10866	5830	32408	564	59445	78203	0	2633
5	COVALIMA	41120		4638	4505	9740	149	30623	48525	0	1662
6	DILI	382		160	872	31536	498	48746	95295	470559 (b) 33624 (1)	4538
7	ERMERA	2885		3535	3754	10918	551	28138	65157	0	842
8	LAUTEM	4609		9680	1324	7772	431	23724	21423	0	2950
9	LIQUICA	3715		1683	2551	22525	405	26801	56428	0	631
10	MANATUTO	3563		4840	957	12723	3793	8749	14868	0	1108
11	MANUFAHI	4542		2406	1380	3815	109	14410	33833	0	2887
12	OECUSSI	27771		2074	2751	24169	269	23676	31784	0	4538
13	VIQUEQUE	477		9452	1498	6189	773	34333	38340	0	5186
	TOTAL	146523		73818	32792	202934	33191	362473	585355	504183	28559

Table J-2 Estimated Population of Livestock in East Timor, 1999-2000

No	DISTRICT	ANIMAL SPECIES									
		CATTLE	DAIRY CATTLE	BUFFLALO	HORSE	GOAT	SHEEP	SWINE	LOCAL CHICKEN	PEDIGREE CHICKEN	DUCK
1	AILEU	1828	0	1926	252	3787	57	4929	12635	0	132
2	AINARO	2709	0	6071	2401	4847	99	9252	27604	0	771
3	BAUCAU	3439	0	8896	1942	17927	15601	27926	24010	0	75
4	BOBONARO	27168	0	6943	3617	20924	346	39216	49502	0	1609
5	COVALIMA	27139	0	2963	2809	6289	92	20202	30716	0	1015
6	DILI	249	6	102	540	20362	306	32158	40214	0	2772
7	ERMERA	1886	0	2259	2329	7049	338	18563	412450	0	514
8	LAUTEM	3027	24	6185	827	5018	265	15651	13561	0	1802
9	LIQUICA	2452	0	1075	1582	14543	250	17681	35719	0	385
10	MANATUTO	2351	0	3093	597	8215	2330	5772	9412	0	677
11	MANUFAHI	2998	0	1537	860	2463	67	9506	21416	0	1763
12	OECUSSI	18329	0	1325	1706	15605	165	15619	20119	0	2772
13	VIQUEQUE	3087	0	6040	934	3996	475	22649	24269	0	3168
	TOTAL	96662	30	48451	20396	131025	20391	239124	350422	0	17455

Source: Provincial Office, Department of Agriculture, Indonesia