Time table for the decrease of firewood supply in the surveyed villages

District	Seka Chekorsa					Gera			
Village	Elke Togobe	Kishe	Komo Hari	Shebe Mofa	Sombo Daru	Dedo Boge	Dusta	Gore daka	Sadi Loya
Community	Sufa	Kishe No.1 No.3	Hari	Daso	Ramie	Boge	Dusta (town)	Chone	Sadi, Kerabie
Ethnic %	095, Y 5	A10,Y30,O10	O99	O100	O96		095.5	O100	O60,A40
Population	1,711	4,831	6,148	3,897	6,496	2,687	3,537 (1,225)	1,774	2,941
Established	1950	1975	1950	1950	1950	1957	1950	1950	1950
1950s	Sufficiency		Sufficiency	Sufficiency	Decrease	Sufficiency	Sufficiency	Sufficiency	Sufficiency
1960s							Decrease		
	Decrease					Decrease			
1970s		Decrease					Shortage	Decrease	
			Decrease						Decrease
1980s				Decrease	Shortage				
	Shortage	Shortage	Shortage			Shortage		Shortage	Shortage

Note: Ethnic A:Amhara. O:Oromo. Y:Yem
Population:The 1994 Census of Population and Housing. 1996

Appendix Tab. 27 Preference ranking of species collected for firewood

District	Village	Community	First		Second		Third	
			scientific name	common name	scientific name	common name	scientific name	common name
Seka	Kishe	NO.1.No.3		Hada		Soyaama		Tureujjee
Chekorsa	Komo Hari	Hari	*Erytrina Brucei*	Waleenso	*Myrica salicifolia*	Rejjii	bamboo	Leomon
	Sombo Daru	Ramie	*Celtis africana*	Cheke	*Myrica salicifolia*	Rejjii	*Maytenus senegalensisi*	Komboolca
	Yanga Deo	Deo	*Prunus africanus*	Homi	*Maesa lanceolata*	Abayi	*Diospyros abyssinica*	Lokko
	Elke Togobe	Busasie	*Myrica salicifolia*	Rejjii	*Maesa lanceolata*	Abayi		Kussayie
Gera	Dedo Boge	Boge	*Pysium africana*	Omoo	*Bersama abyssinicus*	Lolchiisa	*Ekebergia capensis*	Sombo
	Dusta	Dusta Town	*Macaranga lophostigna*	Wangoo	*Allophlus abysinicus*	Sehor	*Sygysium guinegnse*	Baddessae
	Gore Daka	Chone	*Macaranga lophostigna*	Wangoo	*Millettia ferruginea*	Askra	*Maesa lanceolata*	Abayi
	Sadi Lova	Sadi.Rova	*Olea welwitschii*	Gagama	*Macaranga lophostigna*	Wangoo	*Allophylus abyssinicus*	Sehoo

Appendix Tab. 28 Production of seedlings in the nurseries of DADO (1996)

group	species	Seka Chekorsa					Gera				total
		Kachama	Gibe	Dato	Sombo	subtotal	Kola Bucha	Wanja Kersa	Gure Genji	subtotal	
Tree	Acacia decurrens	450	2,916	1,231	2,000	6,597	0	0	0	0	6,597
Tree	Acacia saligna	300	1,450	2,316	2,000	6,066	0	0	0	0	6,066
Tree	Albizia spp	195	313	0	0	508	0	0	0	0	508
Tree	Cordia africana	0	100	0	0	100	0	0	0	0	100
Tree	Cupressus lusitamica	0	3,483	10,205	8,400	22,088	0	0	0	0	22,088
Tree	Eucalyptus spp	36,090	54,380	45,971	77,050	213,491	75,000	100,000	48,000	223,000	436,491
Tree	Grevillea robusta	0	1,157	0	0	1,157	0	0	0	0	1,157
Tree	Hagenia abyssinica	245	400	1,405	1,280	3,330	0	0	0	0	3,330
Tree	Leucaena leucocephala	0	1,149	723	1,000	2,872	0	0	0	0	2,872
Tree	Milletia ferruginea	0	50	0	1,200	1,250	0	0	0	0	1,250
Tree	Susbania saspensis	0	1,162	0	0	1,162	0	0	0	0	1,162
	subtotal	37,280	66,560	61,851	92,930	258,621	75,000	100,000	48,000	223,000	481,621
Fruit	Annona muricata	0	450	698	0	1,148	0	0	0	0	1,148
Fruit	Avocado	0	137	0	0	137	0	0	0	0	137
Fruit	Papaya	0	150	1,200	400	1,750	0	0	0	0	1,750
	subtotal	0	737	1,898	400	3,035	0	0	0	0	3,035
Coffee	Coffee arabico 7440	170,242	0	0	272,252	442,494	0	—	0	0	442,494
	total	207,522	67,297	63,749	365,562	704,150	75,000	100,000	48,000	223,000	927,150

(66)

Appendix Tab. 29 Average number of seedlings (per household) received from DADO nursery

District	Village	Community	Seka Chekorsa				Gera			Community average
			Kachama	Gibe	Dato	Sombo	Kola Bucha	Wanja Kersa	Gure Genji	
Seka Chekorsa	Atro Sufa	Atro Sufa				167				167
	Beke	Beke				407				407
	Bidaru Tuli	Bidaru Tuli			191					191
	Boba Roge	Boba Roge			364					364
	Buyo Kofe	Buyo Kofe	322	224						301
	Deto Kersu	Deto Kersu			385					385
	Elke Tonjo	Elke Tonjo		131						131
	Gibe Baso	Gibe Baso		808						808
	Kusaro Gibe	Kusaro Gibe	194							194
	Liluchaha	Liluchaha				100				100
	Meti	Meti		216	637					362
	Sebeka Debiye	Sebeka Debiye				397				397
	Sekala Geenefo	Sekala Geenefo		224						224
	Shashamanee	Shashamanee				183				183
	Sonbo	Sonbo				261				261
	Sonbo Daru	Sonbo Daru				211				211
	Wushanea Koche	Wushanea Koche		348	359					356
	Seka Chekorsa District average									317
Gera	Chira	Chira town							600	600
	Chira	Gure Kaso							480	480
	Chira	Gure Genji							545	545
	Chira	Werware							800	800
	Kacha Handaracha	Kachotula						1,000		1,000
	Kacho Handaracha	Anderacha						1,667		1,667
	Kola	Kola Bulcha					3,500			3,500
	Kola	Kembibit					1,667			1,667
	Sedi Loya	Loya yukro						1,000		1,000
	Wanja Sulaja	Kola Sulaja					1,333			1,333
	Wanja Sulaja	Wanja Kersa						833		833
	Gera District average									1,042
	average of the each nursery		308	413	375	251	2,027	1,053	585	466

Appendix Tab. 30   Percentage of DADO nursery seedling recipients
by village (1996)

District	Village	total no.of household	no.of household received seedlings	percentage %
Seka	Atro Sufa	802	23	2.9
Chekorsa	Beke	923	43	4.7
	Bidaru Tuli	976	10	1.0
	Boba Roge	1,367	21	1.5
	Buyo Kofe	1,523	138	9.1
	Deto Kersu	1,552	58	3.7
	Elke Tonjo	681	20	2.9
	Gibe Baso	610	50	8.2
	Kusaro Gibe	806	13	1.6
	Liluchaha	1,108	21	1.9
	Meti	888	29	3.3
	Sebeka Debiye	635	15	2.4
	Sekala Geenefo	1,166	15	1.3
	Shashamanee	1,150	20	1.7
	Sonbo	932	150	16.1
	Sonbo Daru	1,495	100	6.7
	Wushanea Koche	962	100	10.4
	subtotal	17,576	826	4.7
Gera	Chira	1,162	82	7.1
	Kacho Handaracha	250	40	16.0
	Kola	1,057	22	2.1
	Sedi Loya	626	25	4.0
	Wanja Sulaja	938	45	4.8
	subtotal	4,033	214	5.3
	total	21,609	1,040	4.8

Appendix Tab. 31　Result of homestead plantation survey

Block	District	Village	Community	Hose. No.	Ethnic Group	Planted year Oldest	Planted year most new	participat F	participat H.H	participat W	participat C	participat E	participat DA	Acquisition own tree	Acquisition neighbors	Acquisition purchass	Acquisition district	Acquisition others	species CaS	species Ci	ranking F	ranking H	ranking Sale	ranking other	needs seeds	needs seedlings
Belete	Seka C.	Kishe	Kishe No.1	1	Yem	1988	?	◎	◎								◎		◎◎		2	1	3			◎
			Kishe No.1	2	Yem	1988	?		◎		◎						◎		◎◎		3	2		1		◎
			Kishe No.1	3	Yem	1988	1991		◎								◎		◎		2	1				◎
			Kishe No.1	4	Yem	1977	?		◎	◎								◎			2	1	3			◎
		Sebe Mofa	Daso	5	Oromo	1987	1995		◎						◎				◎◎			1	2			◎
			Daso	6	Oromo	1991	1996		◎										◎			1	2		◎	
			Daso	7	Oromo	1947	?		◎						◎				◎			1				◎
			Daso	8	Oromo	1994	1996		◎							◎			◎			1	2			◎
Gora	Gora	Chira	Chira town	9	Oromo	1990	1995		◎		◎				◎				? ◎			1	2		◎	◎
			Dagoie	10	Oromo	1996	1996				◎	◎				◎				◎		1	1			◎
			Boncha	11	Amhara	1995	1995		◎		◎					◎				◎		1	2			◎
			Ata	12	Amhara	1995	1995		◎	◎	◎		◎			◎	◎		◎			1	2			◎
		Wegecha	Sato	13	Oromo	1971	1994		◎		◎			◎					?	◎	2	1	3			◎
			Kere	14	Oromo	1984	1996		◎		◎			◎					◎		2	1	1			◎
			Siso	15	Oromo	1972	1996		◎		◎			◎					◎		2	1	3			◎
			Siso	16	Oromo	1967	1996		◎		◎			◎					◎		2	1	4	3		◎

Note:participant F: fater, H.H:house head, W;wife, C;children, E;ompliment, DA:development agent

species Ca;E.camaidulensis, S;E.saligna, Ci;E.citriodra

ranking of purpose F;firewood, H;construction wood for house

Appendix Tab. 32 Preference ranking of species to he planted for firewood

District	Village	Community	First	Second	Third
Seka	Kishe	No.1,No.3	*Cupressus lusitanica*	*Eucalyptus spp.*	*Millettia ferruginea*
Chekorsa	Komo Hari	Hari	*Eucalyptus spp.*	*Cupressus lusitanica*	*Hagenia abyssinica*
	Sombo Daeu	Ramie	*Eucalyptus spp.*	*Cupressus lusitanica*	*Millettia ferruginea*
	Elke Togobe	Busasie	*Eucalyptus spp.*	*Maesa lanceolata*	*Cupressus lusitanica*
Gera	Dedo Boge	Boge	*Eucalyptus spp.*	*Cupressus lusitanica*	indigenous spp.
	Dusta	Dusta town	*Eucalyptus spp.*	—	—
	Gore Daka	Chone	*Eucalyptus spp.*	—	—
	Sadi Loya	Loya,Sadi	—	—	—

Note: "--" No answer.

Appendix Tab. 33 (1) Production models for timber and Transmission pole production

1) Transmission pole/Timber
Species:Group 2, *Eucalyptus grandis/Eucalyptus saligna*
Plants/ha: 1,600
Site class: 24 m³/ha
Production model No. 7

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn.	Thinn.	Thinn. rate (%)	After thinn.	Volume/tree (m³)	Volume m³/ha Before thinn.	Thinn.	Thinn. rate (%)	After thinn.	Increment (m³)	Annual increment (m³)	Annual growth rate (%)	Thinned/Removed m³/ha Sawlogs	Trans. pole	Small poles	Fuel-wood	Tons/ha Branches and tops	Twigs
0	0	0.0	1600																	
1			1440																	
4	13.8	12.4	1350	550	41	800	0.0400	54.0	14.0	26	40	54.0	13.5	82.5	4.5		6.0	8.0	0.7	1.2
6	18.2	16.8	800	400	50	400	0.1325	106.0	33.0	31	73	66.0	33.0	41.6	7.7		16.5	12.0	1.1	1.7
9	23.1	23.9	400	150	38	250	0.4103	164.1	55.1	34	109	91.1	30.4	30.4	15.0		25.4	22.0	1.5	1.8
13	27.0	32.5	250	100	40	150	0.7992	199.8	59.8	30	140	90.8	22.7	20.8	15.0	6	23.8	15.0	1.5	1.9
18	30.1	38.5	150	150	100	0	1.4100	211.5	211.5	100	0	71.5	14.3	10.2	74.0	74	32.5	41.5	3.1	3.3

2) Timber
Species:Group 3, *Cupressus lusitanica/Grevillea robusta/Pinus patula*
Plants/ha: 1,600
Site class: 24 m³/ha
Production model No. 9

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn.	Thinn.	Thinn. rate (%)	After thinn.	Volume/tree (m³)	Volume m³/ha Before thinn.	Thinn.	Thinn. rate (%)	After thinn.	Increment (m³)	Annual increment (m³)	Annual growth rate (%)	Thinned/Removed m³/ha Sawlogs	Trans. pole	Small poles	Fuel-wood	Tons/ha Branches and tons	Twigs
0	0.0	0.0	1600								60	60	12.0							
1			1440																	
5	7.1	11.2	1310		0	1310	0.0458	60			87	75	25.0	41.7						
8	12.6	17.8	1310	570	44	740	0.1031	135	48	36	157	124	31.0	35.6	3		8	37	15.2	0.8
10	15.9	21.1	740		0	740	0.2014	149							27		5	22	17.9	4.1
12	17.7	24.4	740	240	32	500	0.2851	211	54	26	231	162	27.0	17.2						
14	19.8	26.9	500		0	500	0.4120	206							65		5	18	20.8	4
16	21.0	29.2	500		0	500	0.5260	263												
18	22.5	32.2	500	150	30	350	0.6380	319	88	28										
20	23.2	34.0	350		0	350	0.7686	269												
22	24.3	35.8	350		0	350	0.8971	314							328		8	50	64.7	13.4
24	24.9	37.1	350			350	1.0057	352			386	155	19.4	8.4						
26	25.5	38.3	350				1.1029	386	386	100										

Source: The Orgut-Swedforest Consortium, Forest Products Pricing and Marketing Study Vol.2, Ministry of Agriculture,1990

Appendix Tab. 33 (2) Production models for *Eucalyptus globulus* Special

1) Fuelwood regime
Species: *Eucalyptus globulus*
Plants/ha: 4,444 (1.5 by 1.5)
Site class: 18 m³/ha

Production Model Special

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn.	Stems/ha Thinn.	Thinn. rate (%)	After thinn.	Volume/tree (m³)	Volume m³/ha Before thinn.	Volume Thinn.	Thinn. rate (%)	After thinn.	Sawlogs	Trans. pole	poles	Fuel-wood	Branches and tops	Twigs
0			4444					0									
1			4000					0									
2	5.0	3.2	3900					27									
3	7.0	4.9	3800					53									
4	8.7	6.0	3700					75									
5	10.2	7.0	3600					97									
6	11.7	8.0	3500					123							23	100	4.6	5.3
7	13.1	9.0	3500					150							40	110	5.2	5.8
8	14.5	10.0	3500					177							60	117	5.7	6.3
9	15.8	10.9	3400					205							70	135	6.2	6.8
10	17.1	11.7	3400					235							80	155	6.7	7.2
11	18.3	12.5	3300					260							90	170	7.3	7.6
12	19.4	13.3	3300					286							100	186	6.2	8.0

Coppice stand Fuelwood regime

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn.	Stems/ha Thinn.	Thinn. rate (%)	After thinn.	Volume/tree (m³)	Volume m³/ha Before thinn.	Volume Thinn.	Thinn. rate (%)	After thinn.	Sawlogs	Trans. pole	poles	Fuel-wood	Branches and tops	Twigs
0			11000														
1			10500	5500	15	5000				15	16				5	0	2.8	5.5
2	5.0	3.2	5000					31									
3	7.0	4.9	4800					50									
4	8.7	6.0	4800					86									
5	10.2	7.0	4600					112									
6	11.7	8.0	4600					141							26	115	5.3	6.0
7	13.1	9.0	4600					173							46	127	6.0	6.6
8	14.5	10.0	4400					204							69	135	6.5	7.2
9	15.8	10.9	4400					235							81	154	7.0	7.8
10	17.1	11.7	4400					270							92	178	7.4	8.3
11	18.3	12.5	4200					299							104	195	7.8	8.8
12	19.4	13.3	4200					329							115	214	8.2	9.2

Source: The Orgut-Swedforest Consortium, Forest Products Pricing and Marketing Study Vol.2, Ministry of Agriculture, 1990

Production model No.13
Species: Group 4 *Juniperus procera/Podocarpus gracior*
Plants/ha: 2,500
Site class: 12 m³/ha   For Timber

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn	Stems/ha Thinn	Stems/ha Thinn. rate (%)	Stems/ha After thinn	volume/tree (m³)	Volume m³/ha Before thinn	Volume m³/ha Thinn	Volume m³/ha Thinn. rate (%)	Volume m³/ha After thinn	Increment (m³)	Annual increment (m³)	Annual growth rate (%)	Thinned Sawlogs	Thinned Trans. pole	Thinned Small poles	Thinned Fuel-wood	Tons/ha Branches and tops	Tons/ha Twigs
5	3.2		2500			2000													3.0	5.5
8	5.5		2000			1800													1.5	2.8
10	7.8	12.5	1700	700	41	1000	0.0706	120	25	21	95	120	12.0				5	20		
12	9.2	15.0	1000	50	5	950		Select pruning									10	30		
18	16.5	20.7	950	350	37	600	0.2158	205	50	24	155	110	13.8	1.80	10		10	35	1.0	1.5
25	20.5	28.0	600	200	33	400	0.4417	265	65	25	200	110	15.7	1.40	20		10	30	0.9	1.1
35	25.0	34.0	400	150	38	250	0.8000	320	90	28	230	120	12.0	0.60	45		15	30	0.7	1.0
50	27.5	36.0	250	250	100		1.3200	330	330	100		100	6.7	0.20	230		50	50	0.8	1.1

Production model No.15
Species: Group 5 *Aningeria adolfi-friderici/Cordia africana/Croton macrostachyus/Ekebergia rueppelium*
Plants/ha: 2,500
Site class: 12 m³/ha   For Timber

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn	Stems/ha Thinn	Stems/ha Thinn. rate (%)	Stems/ha After thinn	volume/tree (m³)	Volume m³/ha Before thinn	Volume m³/ha Thinn	Volume m³/ha Thinn. rate (%)	Volume m³/ha After thinn	Increment (m³)	Annual increment (m³)	Annual growth rate (%)	Thinned Sawlogs	Thinned Trans. pole	Thinned Small poles	Thinned Fuel-wood	Tons/ha Branches and tops	Tons/ha Twigs
10	6.8	8.0	2500			1800			Cleaning											
20	14.8	18.0	2250	450	20	1000	0.1167	210	60	29	150	210	10.5					60	2.1	0.2
30	20.3	26.3	1800	800	44	650	0.2850	285	80	28	205	135	13.5	0.90				80	3.5	0.5
40	23.5	34.9	1000	350	35	400	0.5308	345	90	26	255	140	14.0	0.70	10			80	1.7	0.2
50	25.1	41.6	650	250	38	200	0.9250	370	90	24	280	115	11.5	0.50	30			60	1.5	0.1
60	27.5	50.0	400	200	50		1.9000	380	380	100		100	10.0	0.40	250			130	1.4	0.1
			200	200	100														3.0	0.3

Production model No.16
Species: Group 6 *Hagenia abyssinica/Olea welwischii/Prunus africana/Syzygium guineense*
Plants/ha: 2,500
Site class: 6 m³/ha   For Timber

Age	Tree height (m)	DBH (cm)	Stems/ha Before thinn	Stems/ha Thinn	Stems/ha Thinn. rate (%)	Stems/ha After thinn	volume/tree (m³)	Volume m³/ha Before thinn	Volume m³/ha Thinn	Volume m³/ha Thinn. rate (%)	Volume m³/ha After thinn	Increment (m³)	Annual increment (m³)	Annual growth rate (%)	Thinned Sawlogs	Thinned Trans. pole	Thinned Small poles	Thinned Fuel-wood	Tons/ha Branches and tops	Tons/ha Twigs
10	8.5	6.5	2500			1700			Cleaning											
20	12.0	14.5	2250	550	24	1000	0.0735	125	35	28	90	125	6.3					35	2.7	0.5
30	14.4	19.5	1700	700	41	600	0.1600	160	40	25	120	70	7.0	0.80				40	1.5	0.2
40	16.6	24.5	1000	400	40	400	0.2917	175	45	26	130	55	5.5	0.50			5	45	1.2	0.1
50	18.4	29.1	600	200	33	250	0.4500	180	50	28	130	50	5.0	0.40	10		10	40	1.0	0.1
60	19.7	33.1	400	150	38		0.7200	180	180	100		50	5.0	0.40	125		10	55	1.0	0.1
			250	250	100														.2	0.2

Source: The Orgut-Swedforest Consortium, Forest Products Pricing and Marketing Study Vol.2, Ministry of Agriculture, 1990

Appendix Tab. 34   Computation of allowable timber harvest volume

Timber production area(Gera Forest from Compartment 1 to 15)   26,500ha
Standing volume   320.4m³/ha
Incremental yields(EFAP Annex 1.3 Table 2, Attachment Table 2.1) 0.98m³/ha/year

Incremental rate   0.306%

> l : Cutting cycle
> s : Selective cutting rate
> p : Incremental rate

$(m - m \cdot s)1.0p^l = m$

$(1 - s)1.0p^l = 1$

$1.0p^l = \dfrac{1}{1 - s}$

$l \cdot \log 1.0p = \log 1 - \log(1 - s)$

$l = \dfrac{-\log(1 - s)}{\log 1.0p}$

$s = 0.2$

$l = \dfrac{-\log 0.8}{\log 1.00306} = \dfrac{0.09691}{0.001327} \fallingdotseq 73$

$26,500 \div 73 \fallingdotseq 363(ha)$
$320.4 \times 0.2 \times 363 = 23,261(m³)$

$s = 0.1$

$l = \dfrac{-\log 0.9}{\log 1.00306} = \dfrac{0.04576}{0.001327} \fallingdotseq 34.5 \fallingdotseq 35$

$26,500 \div 35 \fallingdotseq 757(ha)$
$320.4 \times 0.1 \times 757 = 24,254(m³)$

Estimation of illegal felling volum by encroachment
   Encroachment area : 263ha(Within Gera Forest, F1)

Encroachment area(Within F1, Timber production area) $= \dfrac{\text{Timber production area}}{\text{Within Gera Forest, F1}}$

$= 263 \cdot \dfrac{26,500}{57,600} \fallingdotseq 121(ha)$

On the assumption that 70% of the encroachment will be prevented when the Management Plan is carried out.

$121 \times 0.3 = 36.3(ha)$
$320.4 \times 36.3 \fallingdotseq 11,630(m³)$

Appendix Tab. 35 (1) Felling volume calculation for existing forest plantation

Appendix Tab. 35 (2)　Felling volume calculation for existing forest plantation

Forest	Com	Sub Com P.	Species	Area (ha)	Planted year	Stems /ha	Age	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)
Belete	2	33	P. patula	12.8	1988	1,895	9	8	8	54.3	695	6.03	13	14	36	1,032	44	1,116	143	14						15				
Belete	2	34	P. patula	4.0	1988	2,520	9	10	9	121.5	486	13.50	4	14	28	277	32	969	197	15						16				
Belete	3	35	P. patula	15.1	1987	1,620	10	10	10	76.7	1,158	7.67		15						16						17				
Belete	3	20	P. patula	1.0	1986	1,467	11	15	17	171.0	171	15.55		16						17						18				
Belete	3	21	P. patula	2.2	1986	1,467	11	15	17	171.0	171	15.55		14						18					4	19	28	408	30	543	284
Belete	2	28	P. patula	3.2	1985	1,240	12	17	18	204.0	755	17.00		17						18					9	19	28	2,156	30	615	615
Belete	4	36	P. patula	9.0	1985	1,224	12	19	24	445.1	3,488	36.93		17						22						23				
Belete	2	27	R. patula	19.3	1981	780	16	21	26	367.9	7,100	22.99		21						23						24				
Belete	2	18	P. patula	1.0	1980	640	17	25	28	472.6	473	27.79		22						28						29				
Belete	2	17	P. patula	1.9	1975									27						28						29				
Belete	2	21	P. patula	1.9	1975	670	34	34	36	1,182.4	2,209	52.84		17											13			2,854			
全林				70							17,411 Thin	17				1,309															

Main harvest

Forest	Com	Sub Com P.	Species	Area (ha)	Planted year	Stems /ha	Age	Avr. DBH (mm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)	Area (ha)	Age	Thinn. Volume % (m³)		Stems/ha after thinn %	Volume after thinn /ha(m³)
Belete	6	12	C. equisetii folia	16.2	1976	445	21	13	12	32.1	520	1.53	1	16	30	58	30	910	135											
Belete	2	15	H. abyssinica	0.6	1990	1,360	7	12	9	77.3	46	11.04																		
Belete	3	45	H. abyssinica	12.3	1984	1,500	13	14	10	105.2	1,294	8.09																		
Belete	2	22	J. procera	1.3	1975	967	22	24	18	295.0	384	13.41																		
Belete	3	22	mixed	1.1	1986	1,300	11	11	9	104.0	114	9.45	1	16	30	58														
				31.5							2,358 Thin	1				58														

Main harvest

(76)

Appendix Tab. 35 (3) Felling volume calculation for existing forest plantation

Forest	Com P.	Sub Com P.	Species	Planted year	Age	Stems /ha	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)
Belete	2	33	P. patula	1948	9	1,953	30	18	54.3	695	6.03		17					12.8	18	28	895	30	781			19				
Belete	2	34	P. patula	1948	9	2,520	10	9	121.5	485	13.50		17						18							19				
Belete	3	35	P. patula	1987	10	1,890	10	10	76.7	1,188	7.67	15	18	28	790	30	809	135		19							20				
Belete	3	20	P. patula	1985	11	1,467	15	17	171.0	171	15.55	1	19	28	117	30	760	300		20							21				
Belete	3	21	P. patula	1985	11	1,467	15	17	171.0	376	15.55	2	19	28	257	30	760	300		20							21				
Belete	2	28	P. patula	1985	12	1,240	17	15	204.0	765	17.00		20							21							22				
Belete	3	36	P. patula	1985	12	1,725	19	24	443.1	3,968	36.93		20							21							22				
Belete	2	27	P. patula	1981	16	790	21	25	357.9	7,100	22.99		24							25					6	28	100	3,192	100	
Belete	2	18	P. patula	1980	17	840	24	26	472.5	473	27.79		25							26					1	27	100	819	100	
Belete	2	17	P. patula	1976	22								30							31						32				
Belete	2	21	P. patula	1975	22	470	34	36	1,182.4	2,299	52.84		30							31						32				
					70					17,411 Thin		18		1,364				13		865				6		4,011			
										Main harvest																			

At 70

Forest	Com P.	Sub Com P.	Species	Planted year	Age	Stems /ha	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems/ha after thinn. %	Volume after thinn. (m³/ha)
Belete	6	12	C. equisetifolia	1976	21	445	13	12	32.1	520	1.53																			
Belete	2	15	H. abyssinica	1990	7	1,360	12	9	77.3	46	11.04																			
Belete	3	45	H. abyssinica	1984	13	1,300	14	10	105.2	1,294	8.09																			
Belete	2	22	L. procera	1975	22	987	24	18	295.0	384	13.41	1.0	30	30	191	30	677	440												
Belete	3	22	mixed	1986	11	1,300	11	9	104.0	114	9.45																			
					31.5					2,358 Thin		1.0		191															
										Main harvest																			

Appendix Tab. 35 (4) Felling volume calculation for existing forest plantation

Appendix Tab. 35 (5) Felling volume calculation for existing forest plantation

Forest	Comp	Sub Comp	Species	Area (ha)	Planted year	Age	Stems/ha	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume (m³)	% thin.	Stems/ha after thinn.	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	% thin.	Stems/ha after thinn.	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	% thin.	Stems/ha after thinn.	Volume after thinn. (m³/ha)
Belete	2	30	C. lusitanica	9.6	1987	10	1,040	15	12	136.4	1,501	15.64							9.6	16	785	30	657	210		17				
Belete	2	29	C. lusitanica	27.3	1984	13	1,000	20	15	219.3	5,987	16.87	27.3	18	3118	30	700	294	9.6	19						20				
Belete	2	24	C. lusitanica	21.2	1981	16	790	26	18	340.6	7,221	21.29	21						21	22	4402	32	537	484		23				
Belete	2	19	C. lusitanica	4.0	1990	17	640	23	18	245.4	982	14.44	22							23							24				
Belete	2	20	C. lusitanica	8.3	1976	22	700	31	26	737.1	6,284	34.41	27							28							29				
Belete	2	23	C. lusitanica	8.7	1975	22	587	29	26	487.4	4,240	22.15	27							28							29				
Belete	3	34	C. lusitanica	9.6	1978	19	647	25	20	350.0	3,360	18.42	24						9.6	25	1516	32	454	304	4.4	20	2564	30	700	149
Belete	3	47	C. lusitanica	44.1	1984	13	1,000	14	11	94.0	4,145	7.23	1							19							22				
Belete	3	49	C. lusitanica	3.2	1982	15	1,000	17	14	224.0	717	14.93	20							21							22				
Belete	3	50	C. lusitanica	12.5	1982	15	733	20	15	199.0	2,488	13.27	20							21							22				
Belete	3	42	C. lusitanica	8.5	1986	11	1,300	11	9	126.1	1,194	12.28	8.5	16	830	32	804	278		17						22				
Belete	3	44	C. lusitanica	6.8	1992	17	1,040	17	14	199.0	1,353	13.27	6.8	20	705	30	756	287		21						22				
Belete	3	46	C. lusitanica	1.9	1992	17	1,040	17	14	199.0	378	13.27	1.9	20	197	30	756	287		21						22				
Belete	3	40	C. lusitanica	3.8	1980	17	800	18	14	191.0	726	11.24	3.8	22	406	32	544	249		23						24				
Belete	3	10	C. lusitanica	0.6	1982	16	1,790	15	16	299.5	180	19.97	20							21						0.6	22	103	30	847	440
Belete	4	11	C. lusitanica	2.7	1976	21	620	23	17	224.6	606	10.70	26							27						2.7	28	270	30	434	257
Belete	6	13	C. lusitanica	6.7	1976	21	640	19	19	258.5	1,732	12.31	26							27						6.7	28	770	30	476	296
Belete	6	14	C. lusitanica	34.2	1976	21	620	23	22	323.1	11,050	16.39	26							27						34	28	4913	30	434	249
Belete	6	21	C. lusitanica	1.3	1976	21	800	23	16	293.0	381	13.96	26							27						1.3	28	169	30	580	335
Belete	3	52	C. lusitanica	17.6	1982	16	1,133	19	15	268.0	4,541	17.20	20							21							22				
Belete	2	14	C. lusitanica	5.0	1990	12	1,660	12	10	96.0	480	13.71	12						5.0	13	316	32	594	172		14				
Belete	3	16	C. lusitanica	4.2	1990	7	1,560	12	10	95.9	403	13.70	12						4.2	13	299	32	594	172		14				
Belete	3	33	C. lusitanica	13.5	1985	12	1,640	16	14	267.1	3,606	22.26	17							18							19				
Belete	2	29	C. lusitanica	7.6	1994	13	1,340	15	10	121.2	921	9.32	18							19							20				
Belete	3	30	C. lusitanica	36.0	1994	16	1,600	16	12	214.6	7,726	16.51	18							19							20				
Belete	3	31	C. lusitanica	13.3	1994	12	2,000	14	12	219.7	2,922	16.90	16							17							18				
Belete	3	18	C. lusitanica	40.7	1986	17	1,640	17	17	344.9	14,200	31.72	16						4.1	17	242	32	570	161		18				
Belete	3	17	C. lusitanica	4.1	1986	12	1,687	12	8	113.0	483	10.27	16							17							18				
Belete	3	14	C. lusitanica	2.7	1986	11	700	15	14	102.0	275	9.27	16							17							18				
Belete	3	19	C. lusitanica	7.6	1986	11	1,000	16	12	184.0	1,398	16.77	16						7.6	17	1652	32	1000	262	3.4	18	321	32	993	229
Belete	3	14	C. lusitanica	3.4	1986	11	1,460	14	11	142.8	446	12.96	16							17						4.5	18	384	32	1034	204
Belete	3	15	C. lusitanica	4.1	1986	13	1,520	13	13	132.3	542	12.03	14							15							16				
Belete	6	32	C. lusitanica	21.0	1991	6	1,400	7	5	29.9	628	4.98	14							15							16				
Belete	6	27	C. lusitanica	2.1	1987	10	1,520	13	11	132.0	277	13.20	15							16							17				
Belete	6	29	C. lusitanica	8.0	1987	10	700	14	5	40.0	640	8.00	15							16							17				
Belete	6	31	C. lusitanica	4.4	1987	10	683	13	6	81.0	359	8.10	15							16							17				
Belete	6	28	C. lusitanica	4.4	1987	10	587	15	6	81.0	356	8.10	16						24	17	2111	30	600	229		18				
Belete	6	25	C. lusitanica	23.7	1984	11	1,280	15	12	170.7	4,046	13.52	8							9							10				
Cora	16	33	C. lusitanica	8.8	1990	9	1,575	10	9	71.0	3,451	10.14	48.6	12	1960	32	600	115		13						14				
Cora	16	34	C. lusitanica	8.0	1990	7	1,575	10	9	71.0	568	10.14	8	12	323	32	600	115		13						14				
Cora	16	29	C. lusitanica	15.7	1990	8	640	17	10	74.2	1,165	8.24	14							15							16				
Cora	16	30	C. lusitanica	48.5	1988	9	640	14	19	74.2	3,599	8.24	14							15							16				
Cora	16	26	C. lusitanica	10.9	1985	12	1,440	14	17	165.5	1,804	13.79	17							18							19				
Cora	16	27	C. lusitanica	8.8	1984	13	990	19	19	270.4	2,459	21.49	18							19							20				
Cora	16	24	C. lusitanica	18.1	1985	14	1,300	19	20	389.6	6,835	28.19	19							20							21				
Total				708.3							114,629		105		7534				115		10603				97		4463			

114,629 Thin.

Main harvest

Appendix Tab. 35 (6) Felling volume calculation for existing forest plantation

Forest	Comp.	Sub Comp.	Species	Area (ha)	Planted year	Age	Stems / ha	Avr. DBH (cm)	Avr. TH (m)	Volume / ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Age	Area (ha)	Thinn. Volume (m³)	%	Stems / ha after thinn.	Volume after thinn. /ha(m³)	Age	Area (ha)	Thinn. Volume (m³)	%	Stems / ha after thinn.	Volume after thinn. /ha(m³)	Age	Area (ha)	Thinn. Volume (m³)	%	Stems / ha after thinn.	Volume after thinn. /ha(m³)
Belete	2	30	C. lusitanica	9.6	1967	10	1,300	15	12	136.9	1,501	13.64	18						19						20					
Belete	2	29	C. lusitanica	27.3	1964	13	1,000	20	15	219.3	5,987	16.87	21						22						23					
Belete	2	24	C. lusitanica	21.2	1961	16	790	26	18	340.6	7,221	21.29	24						25						28					
Belete	2	19	C. lusitanica	4.0	1960	17	640	23	18	245.4	902	14.44	25	30	492	72	476	287	26						27					
Belete	2	20	C. lusitanica	8.3	1975	22	700	31	30	757.1	6,284	34.41	30	100	5063	100			31						32					
Belete	2	23	C. lusitanica	9.6	1975	22	587	28	26	447.4	4,240	22.15	30						31	100	3423	100			32					
Belete	3	34	C. lusitanica	9.6	1978	19	667	28	20	350.0	3,360	18.42	27						28						29					
Belete	3	47	C. lusitanica	44.1	1964	13	1,000	14	11	94.0	4,145	7.23	21						22						23					
Belete	3	49	C. lusitanica	3.2	1962	15	1,000	16	17	224.0	717	14.93	23						24						25					
Belete	3	50	C. lusitanica	12.5	1962	15	733	20	16	199.0	2,488	13.27	23						24						25					
Belete	3	42	C. lusitanica	8.5	1966	11	1,300	11	9	135.1	1,144	12.28	19						20						21					
Belete	3	44	C. lusitanica	6.8	1962	15	1,060	17	14	199.0	1,353	13.27	23						24						25					
Belete	3	46	C. lusitanica	1.9	1962	15	1,080	17	14	199.0	378	13.27	23						24						25					
Belete	3	40	C. lusitanica	3.8	1960	17	800	18	14	191.0	726	11.24	25						26						27					
Belete	6	10	C. lusitanica	0.6	1962	15	1,760	15	16	299.6	180	19.97	23						24						25					
Belete	6	11	C. lusitanica	2.7	1976	21	620	23	19	224.6	606	10.70	29						30						31					
Belete	6	13	C. lusitanica	8.7	1976	21	620	23	19	288.5	1,732	12.31	29						30						31					
Belete	4	16	C. lusitanica	34.2	1976	21	620	25	17	323.1	11,050	13.31	29						30						31					
Belete	6	21	C. lusitanica	1.3	1982	15	1,130	23	16	293.0	381	13.96	29						30						31					
Belete	6	52	C. lusitanica	17.6	1982	15	1,130	19	15	264.0	4,541	17.20	23	2N	1928	30	476	367	24						25					
Belete	2	14	C. lusitanica	5.0	1990	7	700	12	10	96.0	480	13.71	15						16						17					
Belete	2	16	C. lusitanica	4.2	1990	7	1,560	12	10	95.9	403	13.70	15						16						17					
Belete	3	32	C. lusitanica	13.5	1945	14	1,840	16	14	267.1	3,606	22.26	20	2N	493	30	634	167	21						22					
Belete	3	29	C. lusitanica	7.6	1984	13	1,340	15	10	121.2	921	9.32	21	2N	4137	30	762	296	22						23					
Belete	3	30	C. lusitanica	36.0	1964	13	1,600	12	12	214.6	7,726	16.51	21	2N	1566	30	990	303	22						23					
Belete	3	31	C. lusitanica	13.3	1964	13	2,000	14	12	219.7	2,922	16.90	19						20						21	2N	3041N	30	404	620
Belete	3	16	C. lusitanica	40.7	1986	11	1,840	17	17	348.9	14,200	31.72	19						20	40.7					21					
Belete	3	17	C. lusitanica	4.1	1985	11	1,867	12	8	113.0	463	10.27	19						20						21					
Belete	3	18	C. lusitanica	2.7	1986	11	700	15	14	102.0	275	9.27	19						20						21					
Belete	3	19	C. lusitanica	7.6	1986	11	1,600	16	12	184.0	1,394	16.73	19						20						21					
Belete	3	14	C. lusitanica	3.4	1986	11	1,460	14	11	132.8	480	12.9N	17						20						21					
Belete	3	15	C. lusitanica	4.1	1986	11	1,520	13	11	132.3	542	12.05	17						20						21					
Belete	4	32	C. lusitanica	21.0	1991	6	1,400	9	5	29.9	628	4.9N	14						18						19					
Belete	6	27	C. lusitanica	2.1	1987	10	1,520	13	11	132.0	277	13.20	18						19						20					
Belete	6	29	C. lusitanica	8.0	1987	10	700	14	5	80.0	640	8.00	18						19						20					
Belete	6	30	C. lusitanica	6.9	1987	10	683	18	6	81.0	559	8.10	18						19						20					
Belete	6	31	C. lusitanica	4.4	1987	10	683	15	6	81.0	366	8.10	18						19						21					
Belete	6	28	C. lusitanica	23.7	1984	13	1,260	15	12	170.7	4,046	15.52	19						20						21					
Gera	16	33	C. lusitanica	8.N	1994	3	1,575	10	9	71.0	581	10.14	15						16						17					
Gera	16	32	C. lusitanica	48.6	1990	7	1,575	10	9	71.0	568	10.14	15						16						17					
Gera	16	29	C. lusitanica	15.7	1988	9	640	17	11	74.2	1,165	8.24	17						16	15.7	1N	2N	444	225	19					
Gera	16	30	C. lusitanica	44.5	1988	9	640	17	11	74.2	1,599	8.24	17						16					225	1N	1371	30	444	244
Gera	16	26	C. lusitanica	10.9	1945	12	1,490	12	12	166.5	1,804	13.79	20						18	10.9	21	2N	1044	30	564	244
Gera	16	27	C. lusitanica	N.N	1986	13	960	18	19	279.4	2,450	21.49	21						18	N.N	22	2N	1754	30	672	518
Gera	16	24	C. lusitanica	18.1	1983	14	1,300	19	20	368.6	6,835	26.19	22						18	18.1	23	2N	4734	30	910	673
				604.3							118,629 Thin. / Main harvest		74.4 / 4.0		N616 / 5063				53.6 / 4		8503 / 3423				89		14413			

Appendix Tab. 35 (7) Felling volume calculation for existing forest plantation

Appendix Tab. 35 (8) Felling volume calculation for existing forest plantation

Forest	Co mp.	Sub Comp.	Species	Area (ha)	Planted year	Age	Stems/ha	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems /ha after thinn.	% thinn.	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems /ha after thinn.	% thinn	Volume after thinn. (m³/ha)	Area (ha)	Age	Thinn. Volume (m³)	%	Stems /ha after thinn.	% thinn	Volume after thinn. /ha(m³)
Belete	2	12	E. saligna	2.5	1996	11	1,017	14.7	21	151.0	383	13.9	16						17							18						
Belete	2	13	E. saligna	1.9	1996	11	1,170	21	26	193.3	367	17.6	16						17							18						
Belete	2	26	E. saligna	1.5	1991	16	990	15	18	205.3	3,121	12.8	21						22							23						
Belete	2	31	E. citriodora	7.6	1996	11	746	7	7	18.3	139	1.7	16						17							18						
Belete	2	32	E. citriodora	5.1	1995	11	746	7	7	18.0	92	1.6	16						17							18						
Belete	3	23	E. saligna	2.5	1989	16	1,100	15	20	297.0	714	18.9	13						14							15						
Belete	3	24	E. saligna	6	1989	16	1,033	18.6	18.9	114.0	644	14.3	13						14							15						
Belete	3	25	E. saligna	0.9	1989	16	1,100	15	20	297.2	230	18.9	13						14							15						
Belete	3	26	E. saligna	1.4	1989	16	1,100	15	22	297.2	402	18.9	13						14							15						
Belete	3	27	E. saligna	5.4	1989	16	1,210	16	23	303.1	1,637	18.9	13						14							15						
Belete	3	28	E. saligna	3.6	1994	12	1,400	12	14	101.4	365	12.7	13						14							15						
Belete	3	37	E. grandis	27	1994	13	1,070	16	22	340.2	9,207	26.2	18						18							20						
Belete	3	38	E. citriodora	18	1995	12	1,046	13	15	130.7	2,457	10.9	17						18							19						
Belete	3	39	E. citriodora	12	1995	12	1,160	13	14	135.0	1,553	11.3	17						18							19						
Belete	3	40	E. camaldulensis	2.1	1990	17	980	16	18	221.9	466	13.1	22						23							24						
Belete	3	41	E. grandis	11	1992	15	400	22.3	24.6	920.0	3,640	21.3	20						21							22						
Belete	3	43	E. globulus	20	1992	15	1,140	11	12	95.2	1,942	10.6	14						15							16						
Belete	3	51	E. grandis	14	1992	15	540	20.8	22.5	222.0	3,185	16.5	20						21							22						
Belete	5	12	E. saligna	9.3	1996	11	4,555	16	21	101.0	949	9.2	16						17	23.8 19 34	2980 98	655	257			18						
Belete	6	7	E. saligna	24	1984	23	1,057	12	17	159.5	3,796	12.5	18						18							20						
Belete	6	8	E. globulus	4.4	1982	25	1,400	6	9	42.6	187	2.8	20						21							22						
Belete	6	9	E. saligna	8.4	1982	16	1,060	11	15	154.6	1,298	10.3	20	8.4	21 34	998 38	676	228			22						
Belete	6	14	E. camaldulensis	4.2	1994	13	1,360	15	10	31.1	131	10.4	8		9						10						
Belete	6	15	E. saligna	12	1979	28	990	19	19	184.4	2,344	10.5	23		24						25						
Belete	6	17	E. camaldulensis	6.4	1976	31	185	31	26.8	192.0	1,037	7.7	6.4	26 100	2115 100				27	28						
Belete	6	20	E. camaldulensis	3.7	1993	14	890	7	10	41.8	165	10.6	9		10						11						
Belete	6	22	E. saligna	2.6	1995	27	2,500						7		8						9						
Belete	6	23	E. saligna	1.3	1984	23	900	28	27.4	170.0	225	13.3	18		19						20						
Belete	6	24	E. saligna	3.7	1983	14	1,040	10	10	47.7	176	5.4	19	3.7	21 30	130 30	648	87			20						
Belete	6	25	E. saligna	36	1984	13	1,270	11	11	108.5	3,928	8.4	18	36.2	20 30	2994 30	702	187			19						
Belete	6	26	E. saligna	14	1984	13	1,040	9	13	179.3	2,456	13.8	18	13.7	20 30	1810 30	984	201			19						
Gera	16	26	E. grandis	3.2	1985	22	890	25	24	889.2	827	57.3	12 12 30	506 40	528	984			18							19						
Gera	16	28	E. saligna	11	1986	11	770	19	22	260.5	2,761	23.7	10.6 16 30	1890 40	467	872			17							18						
Gera	16	31	E. globulus	5.8	1986	11	680	22	23	295.6	1,644	26.7	5.5 16 30	1008 40	178	419			17							18						
Belete	3	25	E. gra. & cam.	9.2	1982	15	617	17	22	137.0	1,260	9.13	20						21							22						
Belete	3	48	E. gra. & cam.	22	1982	12	650	12	11	177.0	3,806	11.80	17						21							22						
Belete	5	13	Mixed E.	28	1985	12	678	12	12	80.0	186	9.85	0.9 26 100	380 100					18							19						
Belete	6	18	Mixed E.	0.9	1976	21	200	31	19	207.0		9.86	2 26 30	259 40	284	1021			27							28						
Belete	6	19	Mixed E.	2	1976	21	440	23	21	212.0	424	10.10							27							28						
				368							40,432 Thin		19.4	3948					32.2	3984						505	4834						
										Main harvest		7.3	2945																				

(82)

Appendix Tab. 35 (9) Felling volume calculation for existing forest plantation

Forest	Co mp.	Sub Comp.	Species	Area (ha)	Planted year	Age	Stems/ha	Avr. DBH (cm)	Avr. TH (m)	Volume /ha (m³/ha)	Total volume (m³)	M.A.I. (m³/ha/y)	Age	Area (ha)	Thin. Volume (m³)	%	Stems /ha after thin.	Volume after thin. /ha(m³)	Age	Area (ha)	Thin. Volume (m³)	%	Stems /ha after thin.	Volume after thin. /ha(m³)	Age	Area (ha)	Thin. Volume (m³)	%	Stems /ha after thin.	Volume after thin. /ha(m³)
Belete	2	12	E. saligna	2.6	1986	11	1,017	14.7	21	163.0	383	13.9	19						20						21					
Belete	2	13	E. saligna	1.9	1986	11	370	23	25	169.3	367	17.6	19						20						21					
Belete	2	29	E. saligna	15	1981	16	880	15	18	208.3	3,121	12.8	24						25						26					
Belete	2	31	E. citriodora	7.6	1985	11	745	7	7	18.3	139	1.7	19						20						21					
Belete	2	32	E. citriodora	5.1	1985	11	745	7	7	18.0	92	1.6	19						20						21					
Belete	3	23	E. saligna	2.5	1984		1,100	16	20	287.0	718	35.9	16						17						18					
Belete	3	24	E. saligna	6	1989		933	13.6	18.9	114.0	684	14.3	16						17						18					
Belete	3	25	E. saligna	0.8	1989		1,100	15	20	287.2	230	35.9	16						17						18					
Belete	3	26	E. saligna	1.4	1989		1,100	15	20	287.2	402	35.9	16						17						18					
Belete	3	27	E. saligna	5.4	1989		1,210	16	14	303.1	1,637	37.9	16						17						18					
Belete	3	28	E. saligna	3.5	1989		1,400	12	22	101.4	355	12.7	16						17						18					
Belete	3	32	E. grandis	27	1984	13	1,070	16	22	340.2	9,287	28.2	21						22						23					
Belete	3	37	E. citriodora	19	1985	13	1,046	13	15	130.7	2,487	10.9	20						21						22					
Belete	3	38	P. citriodora	12	1985	13	1,100	13	14	136.0	1,630	11.3	20						21						22					
Belete	3	39	P. camaldulensis	2.1	1990	17	600	16	18	221.9	465	15.1	25						26						27					
Belete	3	41	E. grandis	11	1982	15	600	21.3	24.6	320.0	3,648	21.3	23						24						25					
Belete	3	43	E. grandis	20	1984		1,140	11	12	95.2	1,962	10.6	17						18						19					
Belete	3	51	E. grandis	14	1982	15	550	20.8	22.5	202.0	3,155	15.5	23						24						25					
Belete	6	12	E. saligna	9.5	1985	11	555	16	21	101.0	949	9.2	19						20						21					
Belete	6	7	E. saligna	24	1984	13	1,057	12	17	159.6	3,796	12.3	21						22						23					
Belete	6	8	E. globulus	4.4	1987	16	1,000	6	9	42.8	187	2.8	23						24						25					
Belete	6	9	E. saligna	8.4	1982	15	1,030	11	15	154.8	1,299	10.8	23						24						25					
Belete	6	14	E. camaldulensis	4.2	1984	20	1,360	8	10	31.1	131	10.4	11						12						13					
Belete	6	16	E. saligna	12	1979	18	440	19	19	189.4	2,349	10.6	26						27						28					
Belete	6	17	E. camaldulensis	6.4	1976	21	182	11	26.8	162.0	1,037	7.7	29						30						31					
Belete	6	20	E. camaldulensis	3.7	1993	4	830	7	10	41.8	155	10.5	12						13						14					
Belete	6	22	E. saligna	2.6	1985	22	2,500	4				13.3	10						11						12					
Belete	6	23	E. saligna	1.3	1984	14	100	28	27.4	173.0	225	13.3	21						22						23					
Belete	6	24	E. saligna	3.7	1985	13	1,040	8	10	47.7	176	3.4	22						23						24					
Belete	6	25	E. saligna	46	1984	13	1,270	8	11	108.5	3,928	8.4	21						22						23					
Belete	6	28	E. saligna	14	1984	13	1,640	9	13	179.3	2,456	13.8	21						22						23					
Gera	16	29	E. grandis	12	1985	12	880	25	34	689.2	827	57.4	20						21						22					
Gera	16	29	E. saligna	11	1986	11	770	19	22	260.5	2,781	23.7	19						20						21					
Gera	16	31	E. globulus	5.6	1986	11	630	22	25	293.8	1,644	26.7	19						20						21					
Belete	2	25	E. gra.+ cam	9.2	1982	15	617	17	22	137.0	1,260	9.13	23						24						25					
Belete	3	48	E. gra.+ cam	22	1984	13	650	20	22	173.0	3,806	11.80	20						21						22					
Belete	3	13	Mixed E.	25	1985	12	678	12	11	80.0	2,000	6.67	20						21						22					
Belete	6	18	Mixed E.	0.9	1976	21	200	31	19	202.0	186	9.86	24						30						31					
Belete	6	19	Mixed E.	2	1976	21	440	23	21	212.0	424	10.10	24						30						31					

60,632 Thin

Main harvest

(83)

Appendix Tab. 36 (1)　Yearly reforestation plan　(Belete Forest)

Forest name	Division	Subcompartment No.	Compartment No.	Forest / None-forest	Area (ha)	Elevation (max.)(m)	Elevation (min.)(m)	Slope (%)	Soil type	Type	Area available to plant (%)	Area available to plant (ha)	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	Toatl	Remarks
Belete	02	001		f.	266.0	1,940	1,620	34.0	CMd	F3	80	213						30	110	73			213	
	02	008		f.	34.0	2,100	2,040	18.0	CMd	F3	80	27								27			27	
	02	010		f.	61.0	1,860	1,540	40.4	CMd	F3	100	61						61					61	
	03	001		f.	809.0	2,160	1,580	30.0	CMd, NTh, CMe	F3	70	566	60	120	120	120	120	26					566	
	03	004		f.	97.0	2,376	2,040	29.3	NTh-CMd, NTh	F3	80	78									78		78	
	03	006		f.	195.0	2,300	2,080	27.2	NTh	F3	80	156									46	110	156	
	06	003		f.	65.0	1,960	1,740	40.0	NTh, NTh-CMd	F3	80	52	52										52	
Subtotal					1,527.0							1,153	112	120	120	120	120	117	110	100	124	110	1,153	
	02	018		f.	1.0	2,120	2,040	1.0	Cmu	PL		4											4	Pinus patula, year11
	02	020		f.	8.3	2,120	2,040	8.3	Cmu	PL		2					2						2	Cupressus lusitanica
	02	021		f.	1.9	2,120	2,040	1.9	Cmu	PL		4									4		4	Pinus patula
	02	023		f.	8.7	2,120	2,080	8.7		PL		4										4	4	Cupressus lusitanica
	02	027		f.	19.3	2,300	2,120	19.3	NTh,NTh-CMd	PL		1						1					1	Pinus patula, year11
	06	018		f.	0.9	1,460	1,280	43.3	CMd,CNd-NTh	PL		6						6					6	
	06	017		f.	6.4	1,460	1,280	43.0	CMd,CNd-NTh	PL		17						7					17	
Subtotal					46.5							17					2	7			4	4	17	
					1,573.5							1,170	112	120	120	120	122	124	110	100	128	114	1,170	

Nursery establishment　　Belete (0.8ha)

Appendix Tab. 36 (2) Yearly reforestation plan (Gera Forest)

Forest name Gera				Site condition					Type	Area available to plant (%)	Area available to plant (ha)	Plant plan										Total	Remarks
Forest / None-forest	Compartment No.	Subcompartment No.	Area (ha)	Elevation (max.)(m)	Elevation (min.)(m)	Slope (%)	Soil type					year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10		
F	08	005	173.0	2,280	2,080	21.3	NTh,Lpd-NTh	P3	80	138						138						138	
F	08	015	286.0	2,200	2,020	11.4	NTh,LPg-LVh	P3	80	229				200	29							229	
F	08	016	91.0	2,120	2,060	11.5	NTh	P4	80	73				73								73	
F	08	019	501.0	2,120	1,900	12.9	NTh,LPg-LVh	P3	80	401	100	200	101									401	
F	08	021	49.0	2,040	1,940	11.5	NTh	P3	90	44			44									44	
F	08	023	76.0	2,000	1,880	22.5	NTh,LVh-NTh	P4	100	76			76									76	
F	08	028	14.0	1,960	1,940	11.5	NTh,LVg-LVh	P3	100	14						14						14	
F	08	029	59.0	2,000	1,900	5.0	NTh,NTh-LPu	P3	90	53						53						53	
F	09	008	75.0	2,000	1,920	16.5	NTh,LVg,NTh-LPu	P3	90	68						68						68	
F	09	011	40.0	1,980	1,940	5.0	NTh	P3	100	40						40						40	
F	13	010	53.0	2,440	2,360	40.0	NTh	P4	100	53										53		53	
F	15	012	131.0	2,440	2,260	23.5	NTh	P4	100	131										131		131	
F	16	002	194.0	2,220	2,060	20.3	NTh	P3	70	136					136							136	
N	16	007	70.0	2,080	2,020	22.5	NTh	OT	80	56	56											56	
F	16	008	27.0	2,340	2,320	40.0	NTh	P3	90	24									24			24	
N	16	013	319.0	2,000	1,920	5.0	NTu,NTh	OT	60	191						150	41					191	
F	16	014	303.0	2,200	1,940	22.7	NTh	P3	90	273							273					273	
F	16	020	223.0	2,060	1,940	17.8	NTh	P3	90	201								201				201	
F	16	022	132.0	2,040	1,940	13.5	NTh	P3	90	119								119				119	
F	18	023	190.0	2,320	2,200	22.9	NTh	P4	90	171									171			171	
F	18	025	127.0	2,320	2,280	14.6	NTh,LVg-LVh	P3	90	114									114			114	
F	19	002	140.0	2,460	2,260	32.3	NTh	P3	80	112										112		112	
			3,273.0							2,717	156	200	221	273	303	325	314	320	309	296		2,717	
																Sedi			Dede-Boge				

Nursery setablishment

(85)

Appendix Tab. 37 Tending work plan for existing plantations

Forest	Comp.	Sub Comp.	Species	Area (ha)	Planted year	1 Area (ha)	1 Age	1 remarks	2 Area (ha)	2 Age	3 Area (ha)	3 Age	4 Area (ha)	4 Age	4 remarks	5 Area (ha)	5 Age	6 Area (ha)	6 Age	6 remarks	7 Area (ha)	7 Age	8 Area (ha)	8 Age	9 Area (ha)	9 Age	10 Area (ha)	10 Age	remarks
Cera	16	32	Cupressus lusitanica	48.6	1990	49	8	1st		9		10	49	11	high		12		13		14		15		16		17
Cera	16	34	Cupressus lusitanica	8.0	1990	8	8	1st		9		10	8	11	high		12		13		14		15		16		17
Cera	16	30	Cupressus lusitanica	48.5	1988	49	10	access		11	49.0	12 1st		13			14	49	15	high		16		17		18		19
Belete	6	29	Cupressus lusitanica	8.0	1987		11		8	12 high		13		14			15		16			17		17		18		19
Belete	6	30	Cupressus lusitanica	6.9	1987		11		7	12 high		13		14			15		16			17		17		18		19
Belete	6	31	Cupressus lusitanica	4.4	1987		11		4	12 high		13		14			15		16			17		18		19		20
Belete	3	14	Cupressus lusitanica	3.4	1986	3	12 1st			13		14	3	15	high		16		17			18		19		20		21
Belete	3	15	Cupressus lusitanica	4.1	1986	4	12 1st			13		14	4	15	high		16		17			18		19		20		21
Belete	3	16	Cupressus lusitanica	40.7	1986	41	12 1st			13		14	41	15	high		16		17			18		19		20		21
Belete	6	28	Cupressus lusitanica	23.7	1986		12		24	13 high		14		15			16		17			18		19		20		22
Belete	3	33	Cupressus lusitanica	13.5	1985		13		14	14 1st		15	14	16			17 high		18			19		20		23		25
Belete	3	44	Cupressus lusitanica	6.8	1982		16		7	17 high		18		19			20		21			22		23		24		25
Belete	3	52	Cupressus lusitanica	17.6	1982		16			17	18.0	18 high		19			20		21			24		26				27
Belete	3	19	Cupressus lusitanica	4.0	1980	4	18 high			19		20		21			22		23			24		26				19
Belete	2	33	P. patula	12.8	1988	13	10 1st			11		12	13	13 high			14		15			16		17		18		19
Belete	2	34	P. patula	4.0	1988	4	10 1st			11		12	4	13 high			14		15			16		17		18		19
Belete	3	20	P. patula	1.0	1985		12		1	13 high		14		15			16		17			18		19		20		21
Belete	3	21	P. patula	2.2	1984		12		2	13 high		14		15			16		17			18		19		20		22
Belete	2	28	P. patula	3.7	1985	4	13 1st			14		15	4	16 high			17		18			19		20		21		22
Belete	2	18	P. patula	1.0	1980	1	18 high			19		20		21			22		23			24		25		26		27
Belete	6	22	E. saligna	2.6	1995	3	3 Weeding		4		5		6			7		8			9		10		11		12

| Total | | | | 188 | | 3 Weeding 49 access 126 1st 5 high | | | 67 | 14 1st 53 high | 67 | Weeding access 49 1st 18 high | 126 | Weeding access 126 high | | 14 | Weeding access 14 high | 49 | Weeding access 49 high | | Weeding access 1st high | | Weeding access 1st high | | Weeding access 1st high | | Weeding access 1st high |

Appendix Tab. 38   Check list of tree species for planting in social forestry

tree species	uses				programmes			
	fuelwood	poles	fruit	honey	school	family	buffer zone	apiculture
Acacia albida	*			*		*		*
Acacia decurrens	*	*			*	*		*
Acacia saligna	*			*	*	*		*
Albizia schimperiana	*					*		
Aningeria-adolfi federicii				*				*
Annona muricata			*	*	*	*		
Citrus-orange, mandarin			*	*	*	*		*
Cordia africana				*	*			*
Cupressus lusitanica	*	*			*	*	*	
Eriobotrya japonica, loquat	*	*	*	*	*	*	*	*
Eucalyptus. grandis	*	*			*	*	*	
Eucalyptus. saligna	*	*			*	*	*	
Eucalyptus. citriodora	*	*			*	*	*	
Gatama				*				*
Grevillea robusta	*	*			*	*		
Hagenia abyssinica	*	*			*	*		
Leucaena leucocephala	*					*		
Maesa lanceolata	*				*	*		
Millettia ferruginea	*				*	*		
Ocotea kenyensis	*				*	*		
papaya			*		*	*		
Persea americana, avacado			*		*	*		
Sesbania sasban		*			*	*		

(87)

Appendix Tab. 39   Average number of household in communities selected for social forestry
(scale of community participation)

Social forestry	District	Village	No.of H.Hold	No. of Community	Ave..No.of H.Hold
School nursery	Seka Chekorsa	Sombo	932	9	104
	Gera	Chira	536	8	67
Family planting	Seka Chekorsa	Kishe	1,033	5	207
		Sombo Daru	1,495	16	93
	Gera	Chira	536	8	67
		Wegecha	531	4	133
Buffer zone planting	Seka Chekorsa	Elke Togobe	1,534	14	110
		Komo Hari	1,352	12	113
	Gera	Gore Dako	370	3	123
		Dusta	784	8	98
		Dedo Boge	660	8	83
Total			9,763	95	103

Appendix Tab. 40   Numeration for the cost of school nursery (per site)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1	committee	no. of meetings	12times	100	1,200
		allowance	10persons*8times	70	5,600
	equipment&tools				10,000
	seed collection		10persons*10days	4	400
	subtotal				17,200
2	construction	creating nursery bed	0.25ha	1,500/ha	375
	operation	whole of nursery work			10,000
	wages	salary for DA	2persons	600/m. m.	14,400
	building	office & storehouse	1	800	800
	subtotal				25,575
	total				42,775

Appendix Tab. 41　Numeration for family planting extension (per site)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1 (for 6 month)	equipment&tools				10,000
	subtotal				10,000
2 (for 1 year)	construction	creating nursery	0.2ha	1,500/ha	300
	operation	nursery work	60,000	0.2/seedling	12,000
	building	office	1	800/building	800
		potting house	1	300/building	300
		store house	1	1,000/building	1,000
	subtotal				14,400
	total				24,400

(90)

Appendix Tab. 42 (1)   Numeration for the cost of buffer zone planting

(Dedo Bogo)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1	draft programme-formulation cost research & explanatory meeting	meeting allowance	5persons*6times	100	3,000
		Processing fee (survey~mapping)	100days	50	5,000
		per diem	5persons*20days	50	5,000
		expendables			1,000
	subtotal				14,000
2	construction operation building	creating nursery by man power	0.5ha	1,500/ha	750
		nursery work	374,362	0.2/seedling	74,872
		office	1	800/building	800
		potting house	1	300/building	300
		guidehouse, storage house	1	1,000/building	1,000
	subtotal				77,722
	total				91,722

Note: When it will be provide construction and operation of nursery are provided through such work groups as Debo by communit/yr)esidents, cost of nursery construction and operation will be not necessary.

Appendix Tab. 42 (2)   Numeration for the cost of buffer zone planting

(Dusta, Gore Dako)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1	draft programme-formulation cost research & explanatory meeting	meeting allowance	5persons*6times	100	3,000
		processing fee (survey~mapping)	100days	50	5,000
		per diem	5persons*20days	50	5,000
		expendables			1,000
	subtotal				14,000
2	construction operation building	creating nursery by man power	0.4ha	1,500/ha	600
		nursery work	351,965	0.2/seedling	70,392
		office	1	800/building	800
		potting house	1	300/building	300
		guidehouse,rest & strage house	1	1,000/building	1,000
	subtotal				73,092
	total				87,092

Note: When it will be provide construction and operation of nursery are provided through such work groups as Debo by communit/yr)esidents, cost of nursery construction and operation will be not necessary.

Appendix Tab. 42 (3)   Numeration for the cost of buffer zone planting
(Elke Togobe)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1	draft programme-formulation cost research & explanatory meeting	meeting allowance	5persons*6times	100	3,000
		processing fee (survey~mapping)	100days	50	5,000
		per diem	5persons*20days	50	5,000
		expendables			1,000
	subtotal				14,000
2	construction operation building	creating nursery by man power	0.2ha	1,500/ha	300
		nursery work	95,990	0.2/seedling	19,198
		office	1	800/building	800
		Potting house	1	300/building	300
		guidehouse,rest & storage house	1	1,000/building	1,000
	subtotal				21,598
	total				35,598

Note: When construction and operation of nursery are provided through such work groups as Debo by communit(/yr)esidents, cost of nursery construction and operation will be not necessary.

Appendix Tab. 42 (4)   Numeration for the cost of buffer zone planting
(Komo Hari)

year	items of expenditure	progress detail	amount	unit cost (Birr)	sum of cost (Birr)
1	draft programme-formulation cost research & explanatory meeting	meeting allowance	5persons*6times	100	3,000
		Processing fee (survey~maping)	100days	50	5,000
		per diem	5persons*20days	50	5,000
		expendables			1,000
	subtotal				14,000
2	construction operation building	creating nursery by man power	0.1ha	1,500/ha	150
		nursery work	54,395	0.2/seedling	10,879
		office	1	800/building	800
		potting house	1	300/building	300
		guidehouse,rest&storage house	1	1,000/building	1,000
	subtotal				13,129
	total				27,129

Note: When construction and operation of nursery are provided through such work groups as Debo by communit(/yr)esidents, cost of nursery construction and operation will be not necessary.

Appendix Tab. 43 Numeration for the cost of traditional apiculture improvement

items of expenditure	detail	amount	unit cost (Birr)	sum of cost (Birr)
commitee cost	No. of place	3times	100	300
	allowance	5persons*3times	100	1,500
research &	per diem	5persons*60days	50	15,000
development	expendables			5,000
guidance &	per diem	5persons*60days	50	15,000
extension	publishing booklet	1,000copies	20	20,000
	expendables			5,000
total				61,800

Appendix Tab. 44 Grounds for cost estimation of felling & sales (natural forest)

1 Survey for trees to be felled
  - Number of upper story of F1 forest : 456/ha
  - Proportion of commercial species in the above number : 43.7%
  - Number of commercial species : 456×0.437≒199/ha
  - Number of felling tree : 199×0.2(felling rate)≒40/ha
  - Fellig volume per ha : 320.4×0.2=64.08㎥/ha
  - Survey area : 11,630÷64.08≒182ha
  - Efficiency of the survey : 40 trees/1 group,1 day→1 ha/1 group,1 day
    4(Birr/day)×2×182=1,456(Birr)

2 Measurement of felled trees
  - Efficiency of measurement : 20 trees/1 group,1 day→0.5 ha/1 group,1 day
    4(Birr/day)×2×182÷0.5=2,912(Birr)

Appendix Tab. 45   Cost estimation for felling in forest plantation

Felling Area (ha)

Tree species	Year	Work type	Harvest (m³)	Year 1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica	8	Thinning 1	48	72.3	9.2			69.4				160.0	192.0	502.9
	12	Thinning 2	54	50.6	88.7		40.7	39.8	54.2	7.5	18.3	28.5		328.3
Grevillea robusta, etc.	18	Thinning 3	88			53.6		12.5	30.8	102.3	74.4	37.8	89.2	400.6
	26	Main harvest	386				1.9				4.0	4.0	6.0	15.9
Eucalyptus spp.	4	Thinning 1	14					54.0	64.0	68.0	79.0	85.0	90.0	440.0
	6	Thinning 2	33	27.3	19.6		20.4			107.6	64.0	68.0	79.0	385.9
	9	Thinning 3	55	9.2	17.7		30.3		23.8				54.0	135.0
	13	Thinning 4	60			35.1	13.5	19.4	8.4					76.4
	18	Main harvest	212					7.3						7.3
Hagenia abyssinica		Thinning									1.0			1.0
Juniperus procera		Thinning					1.0							1.0
Mixed		Thinning						1.0						1.0

Felling Cost (Birr)

Tree species	Year	Work type	Unit price Birr/ha	Year 1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica	8	Thinning 1	160	11,568	1,472			11,104				25,600	30,720	80,464
	12	Thinning 2	180	9,108	15,966		7,326	7,164	9,756	1,350	3,294	5,130		59,094
Grevillea robusta, etc.	18	Thinning 3	290			15,544		3,625	8,932	29,667	21,576	10,962	25,868	116,174
	26	Main harvest	960				1,824				3,840	3,840	5,760	15,264
Eucalyptus spp.	4	Thinning 1	44					2,376	2,816	2,992	3,476	3,740	3,960	19,360
	6	Thinning 2	110	3,003	2,156		2,244			11,836	7,040	7,480	8,690	42,449
	9	Thinning 3	185	1,702	3,275		5,606		4,403				9,990	24,975
	13	Thinning 4	200			7,020	2,700	3,880	1,680					15,280
	18	Main harvest	710					5,183						5,183
Hagenia abyssinica		Thinning	180								180			180
Juniperus procera		Thinning	180				180							180
Mixed		Thinning	180					180						180
Total		Thinning		25,381	22,869	22,564	18,056	28,329	27,587	45,845	35,566	52,912	79,228	358,336
		Main harvest					1,824	5,183			3,840	3,840	5,760	20,447

1) Transmission pole/Timber
Species:Group 2, *Eucalyptus grandis/Eucalyptus saligna*
Plants/ha: 1,600
Site class: 24 m³/ha
Production model No: 7

Age	Tree height (m)	DBH (cm)	Operaton		Thinned/Removed				Unit price	
					Sawlogs	Trans. pole	poles	Fuel-wood		
				Unit price	125.4	102.0	77.8	46.8	Sub total	(Birr/ m³)
4.0	13.8	12.4	Thinning 1	m³			6.0	8.0	14.0	
				Birr			466.8	374.4	841.2	60.1
6.0	18.2	16.8	Thinning 2	m³	4.5		16.5	12.0	33.0	
				Birr	564.3		1,283.7	561.6	2,409.6	73.0
9.0	23.1	23.9	Thinning 3	m³	7.7		25.4	22.0	55.1	
				Birr	965.6		1,976.1	1,029.6	3,971.3	72.1
13.0	27.0	32.5	Thinning 4	m³	15.0	6.0	23.8	15.0	59.8	
				Birr	1,881.0	612.0	1,851.6	702.0	5,046.6	84.4
18.0	30.1	38.5	Final Felling	m³	74.0	74.0	32.5	41.5	222.0	
				Birr	9,279.6	7,548.0	2,528.6	1,942.2	21,298.3	95.9

2) Timber
Species:Group 3, *Cupressus lusitanica/Grevillea robusta/Pinus patula*
Plants/ha: 1,600
Site class: 24 m³/ha
Production model No. 9

Age	Tree height (m)	DBH (cm)	Operaton		Thinned/Removed				Unit price	
					Sawlogs	Trans. pole	poles	Fuel-wood		
				Unit price	193.8		77.8	14.8	Sub total	(Birr/ m³)
8.0	12.6	17.8	Thinning 1	m³	3.0		8.0	37.0	48.0	
				Birr	581.4		622.4	547.6	1,751.4	36.5
12.0	17.7	24.4	Thinning 2	m³	27.0		5.0	22.0	54.0	
				Birr	5,232.6		389.0	325.6	5,947.2	110.1
18.0	22.5	32.2	Thinning 3	m³	65.0		5.0	18.0	88.0	
				Birr	12,597.0		389.0	266.4	13,252.4	150.6
26.0	25.5	38.3	Final felling	m³	328.0		8.0	50.0	386.0	
				Birr	63,666.4		622.4	740.0	64,928.8	168.2

Source: The Orgut-Svedforest Consortium, Forest Products Pricing and Marketing Study Vol.2, Ministry of Agriculture,1990

Stumpage price (Source: FWCD(Oromia)) Birr/m

	Indigenous	Cyprus/ pine	Eucalyptus
Sawlog	292.1	193.8	125.4
Logging & Skidding	42.2	38.8	38.8
Fuelwood	54.8	14.8	46.8

Appendix Tab. 47 Revenue estimation from forest plantation products

Harvest (m³)

Tree species	Year	Work type	Year Harvest (m³)	1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica	8	Thinning 1	48	2,914	583			3,315				7,680	9,216	23,708
Pinus patula	12	Thinning 2	54	4,396	6,994		6,712	4,225	4,685	680	1,164	2,236		31,092
Grevillea robusta, etc.	18	Thinning 3	88			6,502		1,307	5,918	11,347	8,616	7,532	14,413	55,635
	26	Main harvest	386				1,553				5,063	3,423	4,011	14,050
Eucalyptus spp.	4	Thinning 1	14					756	896	952	1,106	1,190	1,260	6,160
	6	Thinning 2	33	3,366	1,711		1,067			6,616	2,112	2,244	2,607	19,723
	9	Thinning 3	55	518	2,106		2,203		2,901				2,970	10,698
	13	Thinning 4	60			3,638	2,261	3,461	993					10,353
	18	Main harvest	212					2,495						2,495
Hagenia abyssinica		Thinning					41							41
Juniperus procera		Thinning									191			191
Mixed		Thinning						58						58

Income (Birr)

Tree species	Year	Work type	Unit price Birr/m³	1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica	8	Thinning 1	36.5	106,361	21,280			120,998				280,320	336,384	865,343
Pinus patula	12	Thinning 2	110.1	484,000	770,039		738,991	465,173	515,819	74,868	128,156	246,184		3,423,230
Grevillea robusta, etc.	18	Thinning 3	150.6			979,201		196,834	891,251	1,708,858	1,297,570	1,134,319	2,170,598	8,378,631
	26	Main harvest	168.2				261,209				851,597	575,749	674,650	2,363,205
Eucalyptus spp.	4	Thinning 1	60.1					45,436	53,850	57,215	66,471	71,519	75,726	370,217
	6	Thinning 2	73.0	245,718	124,903		77,891			482,968	154,176	163,812	190,311	1,439,779
	9	Thinning 3	72.1	37,348	151,843		158,836		209,162				214,137	771,326
	13	Thinning 4	84.4			307,047	190,828	292,108	83,809					873,792
	18	Main harvest	95.5					238,273						238,273
Hagenia abyssinica		Thinning	54.8				2,247							2,247
Juniperus procera		Thinning	54.8								10,467			10,467
Mixed		Thinning	110.0					6,380						6,380
Total — Thinning				873,427	1,068,065	1,286,248	1,168,793	1,126,929	1,753,891	2,323,909	1,656,840	1,896,154	2,987,156	16,141,412
Total — Main harvest							261,209	238,273			851,597	575,749	674,650	2,601,478

Appendix Tab. 48 Cost estimation for tending work by year

Area of Tending Works

Tree species	Year	Work type	Unit	1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica / Pinus patula / Grevillea robusta, etc.		Planting, weeding, auxiliary planting	ha	160	192	205	235	255	269	254	252	263	246	2,331
	1	Weeding	ha		160	192	205	235	255	269	254	252	263	2,085
	2	Climber cutting, improvement felling	ha			160	192	205	235	255	269	254	252	1,822
	3	Access pruning	ha	49			160	192	205	235	255	269	254	1,619
	5	Access pruning	ha	126	14	49			160	192	205	235	255	1,236
	8	High pruning	ha	5	53	18	126	14	14			160	192	582
Eucalyptus spp.		Planting, weeding, auxiliary planting	ha	54	64	68	79	85	90	85	84	87	82	778
	1	Weeding	ha		54	64	68	79	85	90	85	84	87	696
	2	Climber-cutting, improvement felling	ha			54	64	68	79	85	90	85	84	609
	3	Climber-cutting, improvement felling	ha				54	64	68	79	85	90	85	525
Indigenous tree species		Planting, weeding, auxiliary planting	ha	54	64	68	79	85	90	85	84	87	82	778
	1	Weeding	ha		54	64	68	79	85	90	85	84	87	696
	2	Weeding	ha			54	64	68	79	85	90	85	84	609
	3	Weeding	ha				54	64	68	79	85	90	85	525
	4	Climber cutting	ha					54	64	68	79	85	90	440
	7	Pruning (climber cutting, improvement felling)	ha							54	64	68	79	265

Cost of Tending Works (Birr)

Tree species	Year	Work type	Unit	1	2	3	4	5	6	7	8	9	10	Total
Cupressus lusitanica / Pinus patula / Grevillea robusta, etc.		Planting, weeding, auxiliary planting	136	21,760	26,112	27,880	31,960	34,680	36,584	34,544	34,272	35,768	33,456	317,016
	1	Weeding	52		8,320	9,984	10,660	12,220	13,260	13,988	13,208	13,104	13,676	108,420
	2	Climber cutting, improvement felling	60			9,600	11,520	12,300	14,100	15,300	16,140	15,240	15,120	109,320
	3	Access pruning	100	4,900			16,000	19,200	20,500	23,500	25,500	26,900	25,400	161,900
	5	Access pruning	120	15,120	1,680	5,880			19,200	23,040	24,600	28,200	30,600	148,320
	8	High pruning	140	700	7,420	2,520	17,640	1,960	1,960			22,400	26,880	81,480
Eucalyptus spp.		Planting, weeding, auxiliary planting	136	7,344	8,704	9,248	10,744	11,560	12,240	11,560	11,424	11,832	11,152	105,808
	1	Weeding	52		2,808	3,328	3,536	4,108	4,420	4,680	4,420	4,368	4,524	36,192
	2	Climber cutting, improvement felling	60			3,240	3,840	4,080	4,740	5,100	5,400	5,100	5,040	36,540
	3	Climber cutting, improvement felling	60				3,240	3,840	4,080	4,740	5,100	5,400	5,100	31,500
Indigenous tree species		Planting, weeding, auxiliary planting	184	9,936	11,776	12,512	14,536	15,640	16,560	15,640	15,456	16,008	15,088	143,152
	1	Weeding	70		3,780	4,480	4,760	5,530	5,950	6,300	5,950	5,880	6,090	48,720
	2	Weeding	70			3,780	4,480	4,760	5,530	5,950	6,300	5,950	5,880	42,630
	3	Weeding	70				3,780	4,480	4,760	5,530	5,950	6,300	5,950	36,750
	4	Climber cutting	90					4,860	5,760	6,120	7,110	7,650	8,100	39,600
	7	Pruning (climber cutting, improvement felling)	90							4,860	5,760	6,120	7,110	23,850
Total				59,760	70,600	92,452	136,696	139,218	169,644	180,852	186,590	216,220	219,166	1,471,198

Extension of roads improvement : 47 km(5 Roads)
    Surface grading : 60% → 27.6 ″
    Graveling   : 20 ″ →   9.2 ″

1 Surface grading by bulldozer
    1km/4 hours(1 day)
    27.6km÷1km=27.6 days   4 hours×27.6 days=110.4 hours

    110.4 ×400(Birr/hour)=Birr 44,160

2 Graveling(3m in width×0.2m thickness of graveling)
    0.6㎥/m×9.2km×1,000=5,520㎥
    5,520㎥×3 ton/㎥=16,560 ton   16,560 ton÷6 ton=2,760(lorries)
    140(Birr/1 lorry)×2,760=Birr 386,400

3 Labourers
    20m/1 day(5 labourers/1 group)
    (27.6+9.2)km×1,000÷20=1,840 days
    1,840×4(Birr/day)×5(labourers)=Birr 36,800

4 Simple bridges(10m in length×3m in width,2 bridges)
    8 logs(8.72㎥)   8.72×364(Birr/㎥)≒Birr 3,200
    bulldozer   400(Birr/hour)×4 hour=Birr 1,600
    labourers   10(labourers)×3(days)×4(Birr/day)=Birr 120
    3,200+1,600+120=Birr 4,920   4,920×2=Birr 9,840

Total : 44,160+386,400+36,800+9,840=Birr 477,200

Appendix Tab. 50 Construction cost examples of DA house

Unit : Birr

Location		Helo Seboka	Kachama	Sedi Loya
Class		Standard	High	Standard
Const.year	G.C. year	1,997	1,993	1,996
Period of const.	month	4	4	9
Life of house	years	30	35	?
Total cost	Birr	13,420	19,659	14,092
Breakdown	Material cost	8,867	14,659	8,789
	poles	244	0	-
	iron roofing	2,584	2,584	-
	clay for wall	100	2,000	-
	brick	700	1,440	-
	cement	847	2,825	-
	paint	190	500	-
	others	4,202	5,310	-
	Laber cost	4,553	5,000	5,303

Expenditur

Appendix Tab. 51 Revenue and expenditure

(Unit: thousand Birr)

Project component	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eighth year	Ninth year	Tenth year	Total
Prevention of encroachment	30	30	30	30	10	10	10	10	10	10	180
Felling and sales	39	35	32	32	53	45	71	61	88	125	581
Reforestation and protection	504	454	485	603	637	681	666	671	726	709	6,136
Social forestry	103	118	61	112	61	53	62	52	37	25	684
Facilities improvement	465	347	337	171	16		4			3	1,343
Others	1,430	829	675	421	287	1,347	1,077	757	237	437	7,497
Subtotal	2,571	1,813	1,620	1,369	1,064	2,136	1,890	1,551	1,098	1,309	16,421
Staff salaries	406	504	504	504	504	504	504	504	504	504	4,996
Total (a)	3,031	2,317	2,124	1,873	1,568	2,640	2,394	2,055	1,602	1,813	21,417

Revenue

Project component	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh year	Eighth year	Ninth year	Tenth year	Total
Natural forests	876	1,168	1,461	1,753	2,045	2,045	2,045	2,045	2,045	2,045	17,528
Forest plantations	873	1,068	1,286	1,430	1,365	1,754	2,324	2,509	2,472	3,662	18,743
Thinning	873	1,068	1,286	1,169	1,127	1,754	2,324	1,657	1,896	2,987	16,141
Main harvest				261	238			852	576	675	2,602
Total (b)	1,749	2,236	2,747	3,183	3,410	3,799	4,369	4,554	4,517	5,707	36,271
Deduction (b-a)	△1,282	△81	623	1,310	1,842	1,159	1,975	2,499	2,915	3,894	14,854
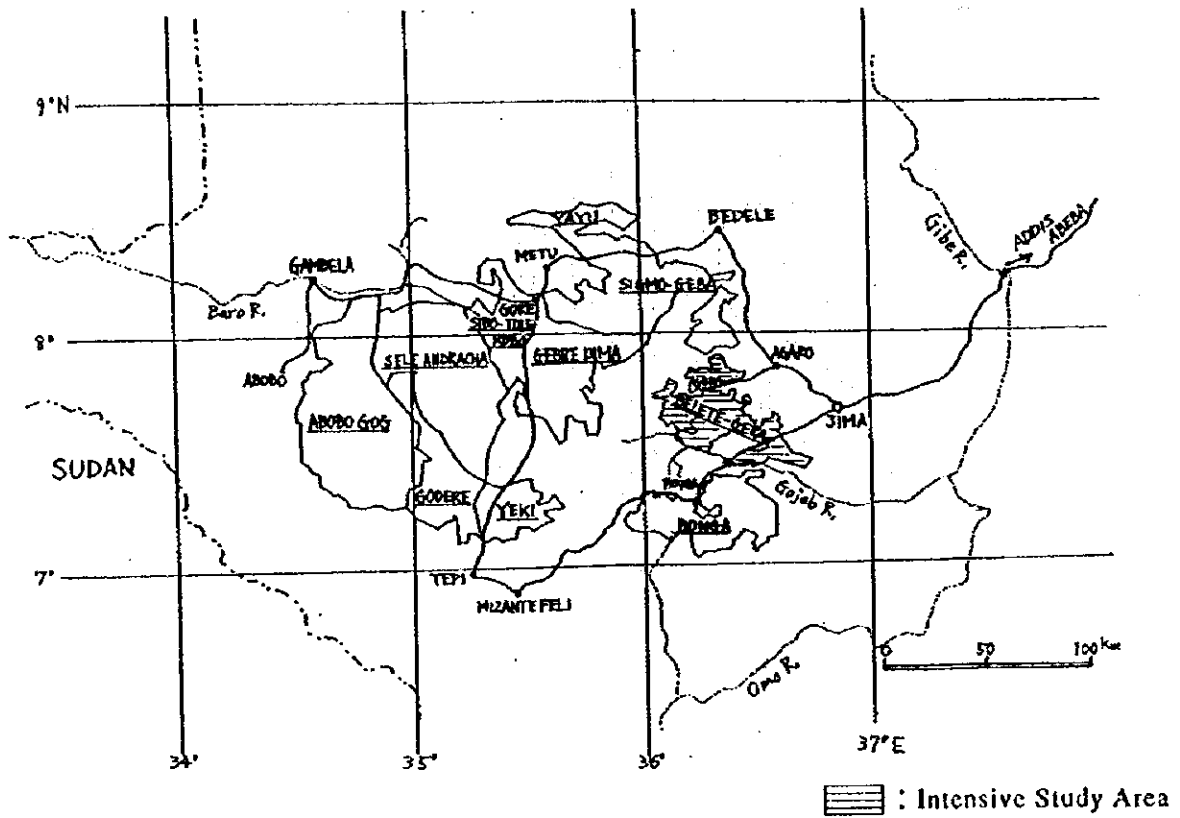
Appendix Fig. 1 The map of Study Area (10 NFPAs)

Rain Most of the Year (GORE)
3years, avr. ; 2138mm, 18.4°C

Rain Most of the Year (METU)
17years, aver. ; 1799mm, 19.2°C

Summer Rain(Addis Ababa)
32years, aver. ; 1236mm, 16.3°C

Summer Rain(GAMBELA)
aver. ; 1269mm, 27.6°C

Rain Most of the Year (BONGA)
aver. ; 1633mm, 20.2°C

Rain Most of the Year(JIMMA)
20years, aver. ; 1151mm, 19.2°C
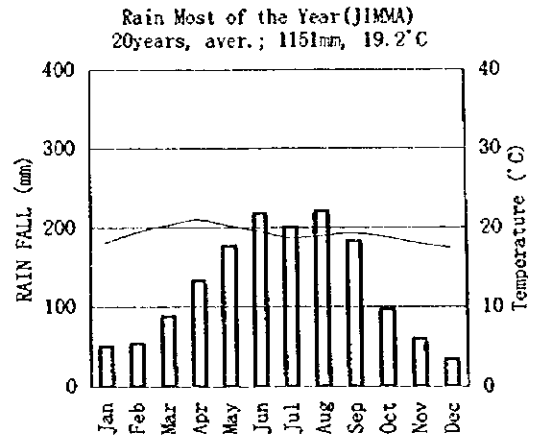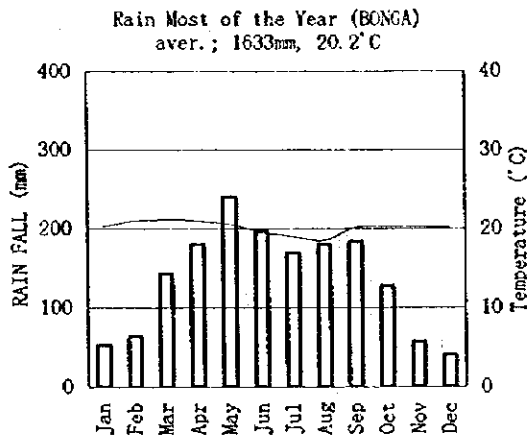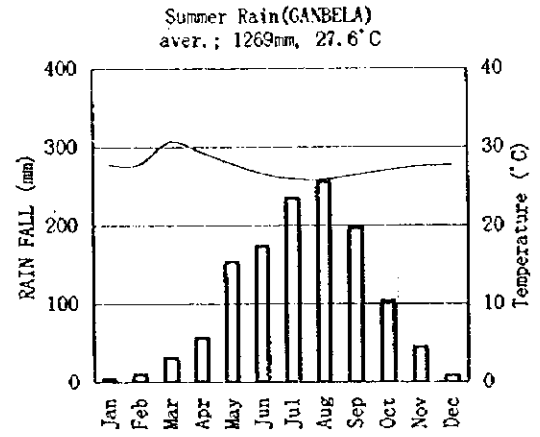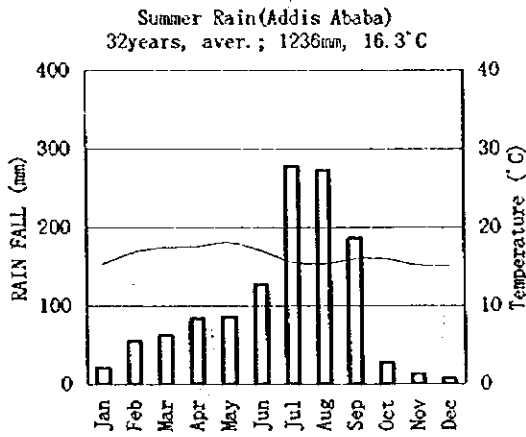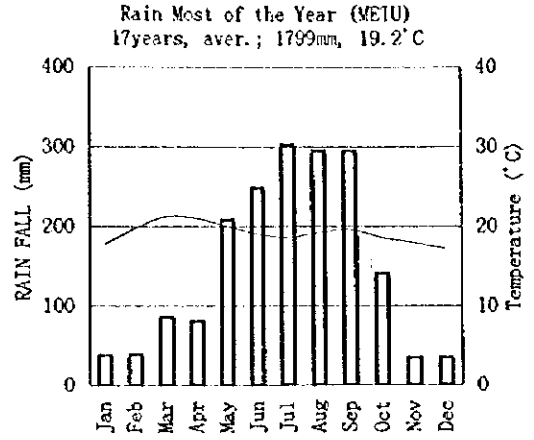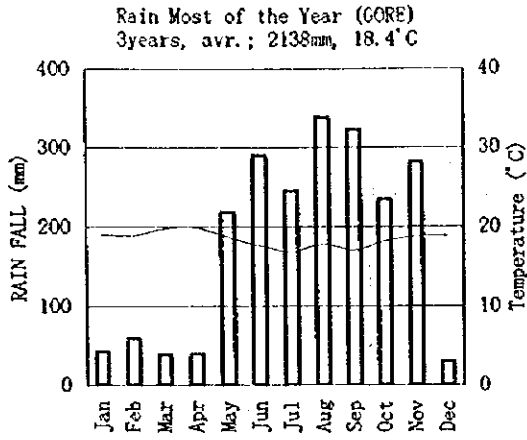
Appendix Fig. 2   Average monthly precipitation and temperature
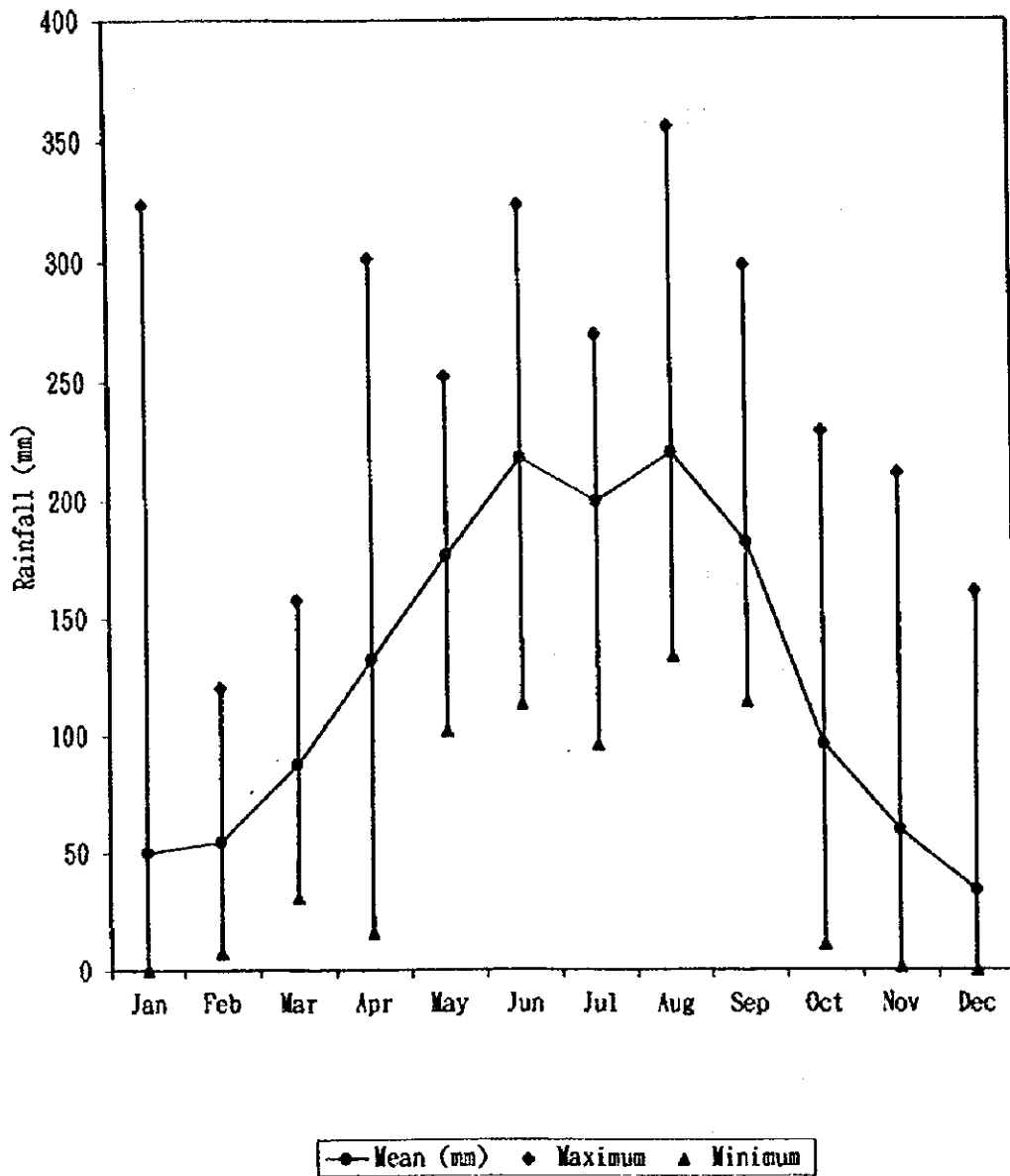
Appendix Fig. 3 Monthly total precipitation in Jimma, from 1976 to 1995

LEGEND

1	Quaternary Sediments
2	Basaltic flows and related Spatter Cones
3	Basaltic Intermediate and felsic Volanics
4	Alkaline granite and Syenite
5	Magdala Group
6	Trap Series
7	Amba Aradam Formation
8	Analo group
9	Adigrat Sandstone
10	Hamanlei Series, Uarandab Series,
11	Gabrodare Series, Main Gypsum
12	Dibigna and Genale Doria Formation
13	Upper Palaeozoic Triassic Sandstone, Shale, Glacial deposits
14	Post-tectonic granitoids
15	Syntectonic granitoids (Upper Complex)
16	Upper Complex
17	Middle Complex
Lower Complex
Lake

QUATERNARY VOLCANICS

TERTIARY VOLCANICS

CENTRAL PLATEAU SEDIMENTS

EASTERN & WESTERN OGADEN SEDIMENTS

SOUTHERN SIDAMO SEDIMENTS

CENOZOIC

MESOZOIC

PRECAMBRIAN

Appendix Fig. 4   Geology Map of southwest Ethiopia

Legend (Soil Map)
(FAO/UNESCO)

Symbol	Soil Unit
Ne	Eutric Nitosols
Be	Eutric Cambisols
Bh	Humic Cambisols
Bd	Dystric Cambisols
Vc	Chromic Vertisols
Re	Eutric Regosols
Jc	Calcaric Fluvisols
Je	Eutric Fluvisols
To	Ochric Andosols
Qc	Orthic Acrisols
Qc	Cambic Arenosols
Yh	Haplic Yermosols
Xh	Haplic Xerosols

Texture 1 coarse
2 medium
3 fine

Slope a flat
b undulating
c steeply

Appendix Fig. 5 Soil Map of southwest Ethiopia

Legend (Soil Map)
(FAO/UNESCO)

Symbol	Soil Unit
Ne	Eutric Nitosols
Be	Eutric Cambisols
Bh	Humic Cambisols
Bd	Dystric Cambisols
Vc	Chromic Vertisols
Re	Eutric Regosols
Jc	Calcaric Fluvisols
Je	Eutric Fluvisols
To	Ochric Andosols
Ao	Orthic Acrisols
Qc	Cambic Arenosols
Yh	Haplic Yermosols
Xh	Haplic Xerosols

Texture 1 coarse
2 medium
3 fine

Slope a flat
b undulating
c steeply

Appendix Fig. 5 Soil Map of southwest Ethiopia

Appendix Fig. 6 Drainage and river basin (Southwest Ethiopia)

Appendix Fig. 7 Locations of 32 villages surveyed

Belete Block

10 villages: 70 households

Gera Block

22   villages: 130 households

LEGEND
Regional Boundary
District Boundary
Village Boundary
Forest
District Capital
Roads

Jimma

MANNA

DEDO

SEKA

Elke Tonoba

Afro Sufe

Afro Edes

Sombo Daru

Komo Hari

Gudo Dake

Yanga Deo

Afrsana Bapo

Shebe Mola

Sebeka Debela

Kishe

GO

Sadi Loya

(Kottasalaja+Selaje+Kobokocho)
Yobe Selaje

Muja Kecho Andaracha
(Andaracha)

Chira
(Challa)

Gura Afalo
(Gura+Afalo)

Wafa

Duga

Kuso Dako
(Gurekeso)

Naso Gera
(Gera+Naso)

Gamina Dacho
(Gamina+Dacholeki)

Oba Toli
(Oba)

Kombolcha

Kela Kecho
(Relaharere)

(Gada Kenmatri+Gubakorto+Gumej)
Gute Gada

SOUTH ETHIOPIA

SOUTH ETHIOPIA

GERA

OMO

Agaro

10km

(108)

Soil Profile

Profile No.		Location		Date	Weather	Surveyor
Land form				Elevation	Slope	
Parent Material		Drainage			Land use or Vegetation	
				Moisture Condition	Groundwater table (m)	

		I	II	III	IV	V	VI
1. Horizon symbol							
2. Depth of top and bottom of horizon		-	-	-	-	-	-
3. Boundary of horizon		a c g d	a c g d	a c g d	a c g d	a c g d	a c g d
4. Form of boundary		s w i b	s w i b	s w i b	s w i b	s w i b	s w i b
5. Colour	- wet						
	- dry						
6. Mottling	- abundance	f c m	f c m	f c m	f c m	f c m	f c m
	- size	f m c	f m c	f m c	f m c	f m c	f m c
	- contrast	f d p	f d p	f d p	f d p	f d p	f d p
	- colour						
7. Texture	- fine earth	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C
		S L Si C	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C
	- large particle - Size (cm)						
	- %						
8. Structure	- grade	l w m s	l w m s	l w m s	l w m s	l w m s	l w m s
	- type	p c b s p g v	p c b s p g v	p c b s p g v	p c b s p g v	p c b s p g v	p c b s p g v
	- size	f m c	f m c	f m c	f m c	f m c	f m c
9. Consistence	- wet : stickness	nS sS S vS	nS sS S vS	nS sS S vS	nS sS S vS	nS sS S vS	nS sS S vS
	: plasticity	nP sP P vP	nP sP P vP	nP sP P vP	nP sP P vP	nP sP P vP	nP sP P vP
	- moist	lo, vf, fr, Fi, vF, eF	lo, vf, fr, Fi, vF, eF	lo, vf, fr, Fi, vF, eF	lo, vf, fr, Fi, vF, eF	lo, vf, fr, Fi, vF, eF	lo, vf, fr, Fi, vF, eF
	- dry	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH
10. Others (Cutans, Cementation, pores pans, Efflorescence, pH., Roots, Humus Dip, Ben. Hardness (mm), etc.)							

Appendix Fig. 8 (1) Soil profile chart

(109)

Location
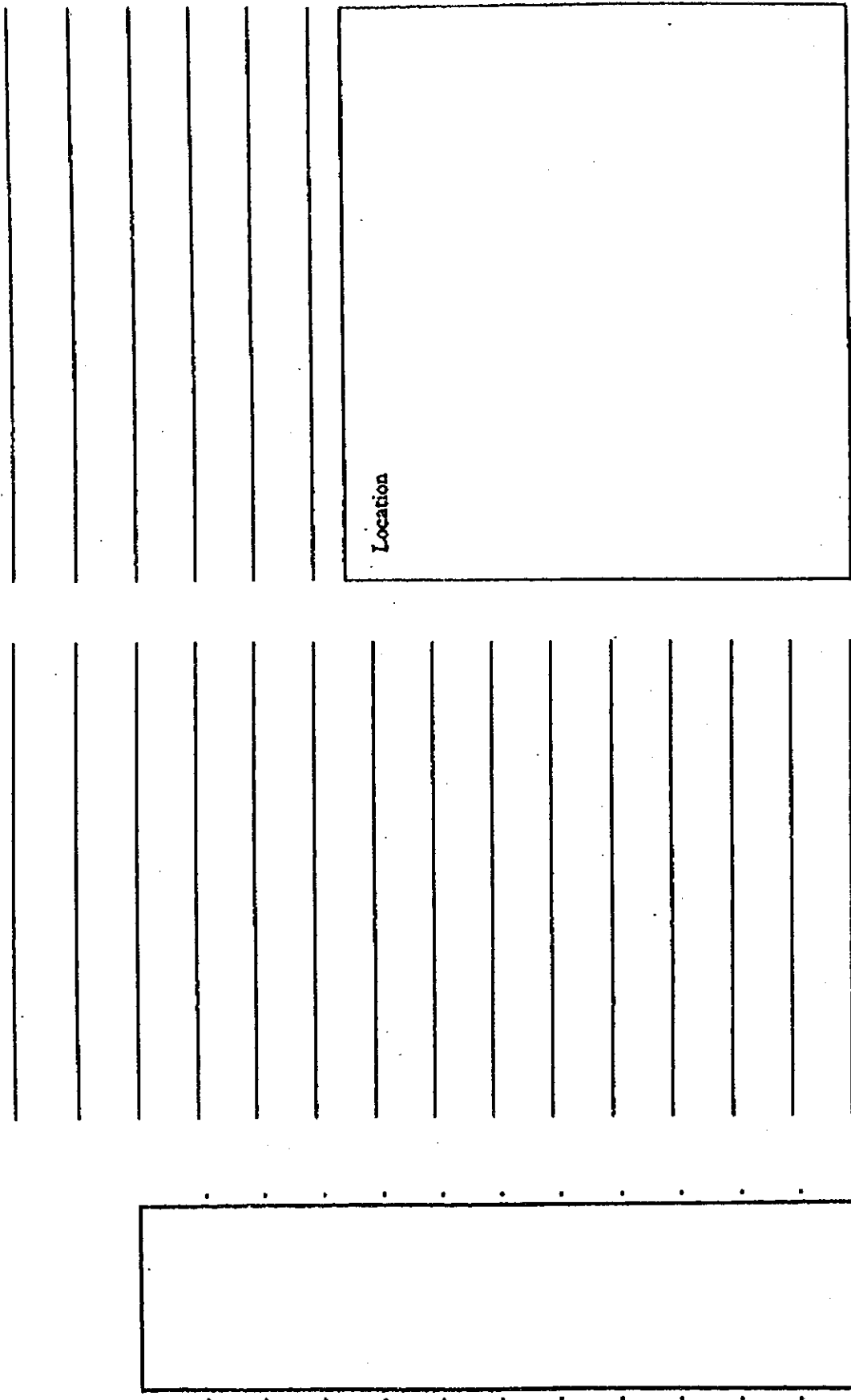
Appendix Fig. 8 (2) Soil profile chart

Soil Profile

Profile No. 27	Location Belete / Tuga Milki	Date Jan.11-97	Weather Fine	Surveyor Hiroshi TAKATOH, TESFAYE MULUGETA

Land form	Steepy	Elevation 2365m	Slope 15~30°	Land use or Vegetation Natural forest

Parent Material	Basalt	Drainage	Well	Moisture Condition	Wet	Groundwater table (m)	—

		I A₁	II A₂	III Bt₁	IV Bt₂	V Bt₃	VI C
1.	Horizon symbol	I A₁	II A₂	III Bt₁	IV Bt₂	V Bt₃	VI C
2.	Depth of top and bottom of horizon	0 - 3	3 - 15	15 - 40	40 - 70	70 - 100	100 ~
3.	Boundary of horizon	a c (Ⓖ) d	a c Ⓖ d	a c Ⓖ d	a c Ⓖ d	a c Ⓖ d	a c Ⓖ d
4.	Form of boundary	Ⓢ w i b	s Ⓦ i b	s Ⓦ i b	s Ⓦ i b	s Ⓦ i b	s Ⓦ i b
5. Colour	· wet	5YR 3/2	5YR 4/2	2.5YR 4/3	2.5YR 3/3	2.5YR 3/4	
	· dry						2.5YR 4/6, 2.5R 3/4
6. Mottling	· abundance	f c m	f c m	f c m	f c m	f c m	f c m
	· size	f m c	f m c	f m c	f m c	f m c	f m c
	· contrast	f d p	f d p	f d p	f d p	f d p	f d p
	· colour						
7. Texture	· fine earth	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C
		S L Si C	S L Si C	S L Si C	S L Si C	S L Si C	S L Si C
	· large particle - Size (cm)	CL	CL~LiC	LiC	LiC	LiC	LiC
	- %						
8. Structure	· grade	1 w Ⓜ s	1 w Ⓜ s	1 w Ⓜ s	1 w Ⓜ s	1 w Ⓜ s	1 w Ⓜ s
	· type	p c Ⓖ pⓑ y	p c Ⓖ p b v	p c Ⓖ p b v	p c Ⓖ p b v	p c Ⓖ p b v	p c Ⓖ p b v
	· size	Ⓕ m c	Ⓕ m c	Ⓕ m c	Ⓕ m c	Ⓕ m c	f Ⓜ c
9. Consistence	· wet - stickiness	nS Ⓢ S vS	nS Ⓢ S vS	nS Ⓢ S vS	nS Ⓢ S vS	nS Ⓢ S vS	nS Ⓢ S vS
	- plasticity	Ⓝⓟ aP P vP	nP aP Ⓟ vP	nP aP Ⓟ vP	nP aP Ⓟ vP	nP aP Ⓟ vP	nP aP Ⓟ vP
	· moist	lo, vf, fr, Fi, vFi, eF	lo, vf, fr, Fi, vFi, eF	lo, vf, fr, Fi, vFi, eF	lo, vf, fr, Fi, vFi, eF	lo, vf, fr, Fi, vFi, eF	lo, vf, fr, Fi, vFi, eF
	· dry	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH	lo, S, sH, H, vH, eH
10. Others (Cutans, Cementation, pores pans, Efflorescent, pH, Roots, Humus Dia, Ben. Hardness (mm), etc)		Root—a Ⓕ Hardness 4mm	Root—c (m c) Hardness 6mm	Root—c (m c) Hardness 10mm	Root—few Ⓕ 25×30mm nite hole Hardness 16mm	Root—very few Ⓕ nite hole Hardness 19mm	Root—very few weathering rock Ⓒ Hardness 21mm
pH		pH 5.05	pH 4.87	pH 4.67	pH 4.76	pH 4.97	pH 4.64

Appendix Fig. 9 (1) Soil profile

(111)

Location

Milk Mt.

Munbunta River

Sembo →

Plantation

Belete
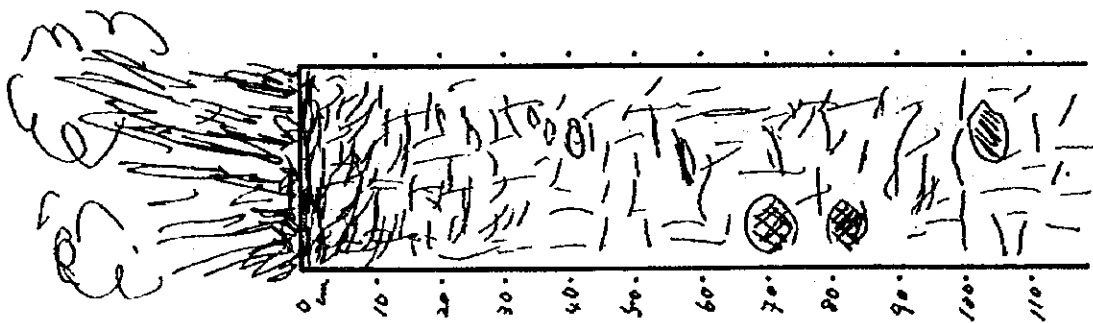
1. Maytenus undata
2. Ficus sur
3. Schefflera abyssinica
4. Syzygium guineense
5. Pygeum africanum
6. Hagenia abyssinica
7. Ekebergia capensis
8. Octea kenyensis
9. Polyscias ferruginea
10. Millettia ferruginea
11. Vepris dainellii
12. Measa lanceolata
13. Croton macrostachyus
14. Podocarpus gracillior
15. Albizia gummifera
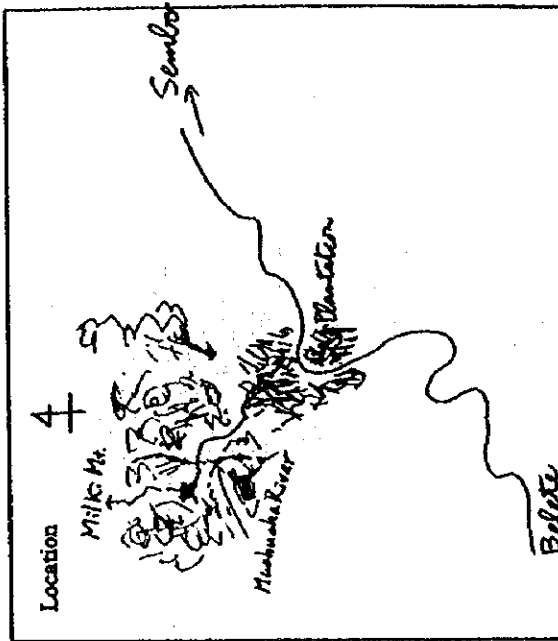
Appendix Fig. 9 (2)   Soil profile
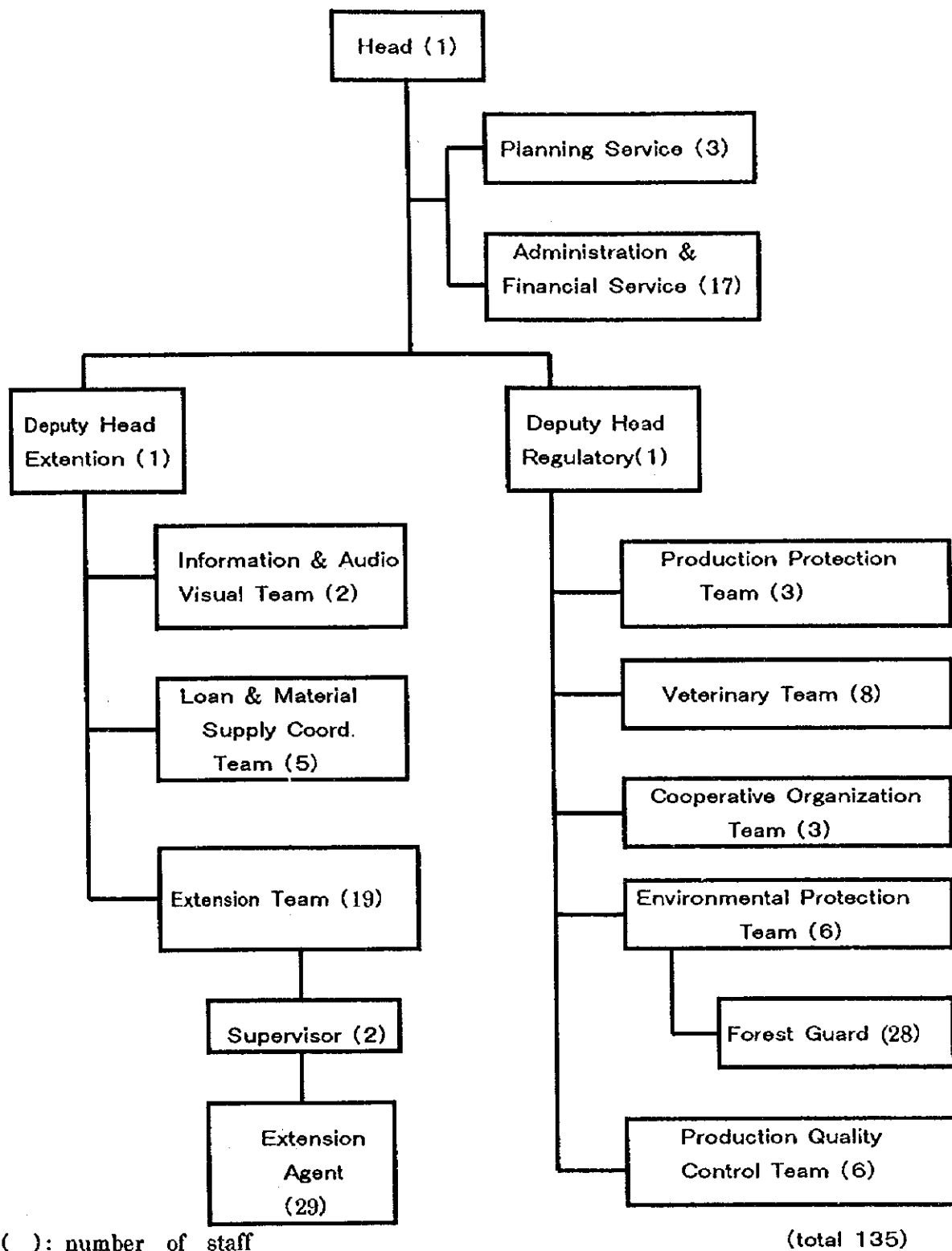
Appendix Fig. 10   Organization chart of Seka Chekorsa district agriculture
development office (June 1997)

Head (3)

- Planning Service (4)
- Administration & Finance Service (18)

Deputy Head Extention (5)

- Information & Audio Visual Team (5)
- Loan & Material Supply Coord. Team (5)
- Extension Team (33)
  - Supervisor (2)
    - Extension Agent (30)

Deputy Head Regulatory(4)

- Production Protection Team (6)
- Veterinary Team (18)
- Cooperative Organization Team (5)
- Environmental Protection Team (17)
  - Forest Guard (8)
- Production Quality Control Team (7)
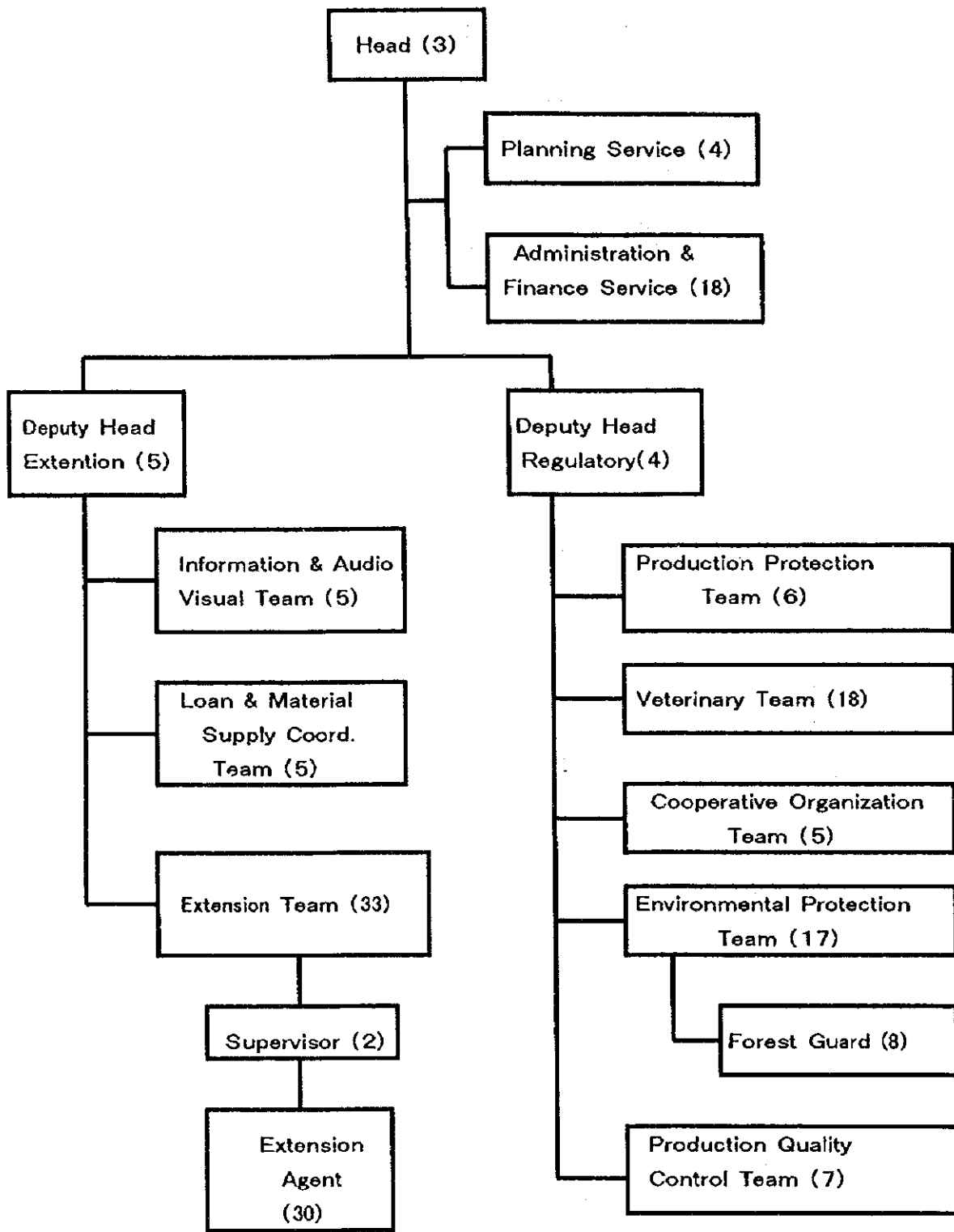
( ): number of staff

(Total number 170)

Appendix Fig. 11 Organization chart of Gera district agriculture
development office (June 1997 plan)

(114)
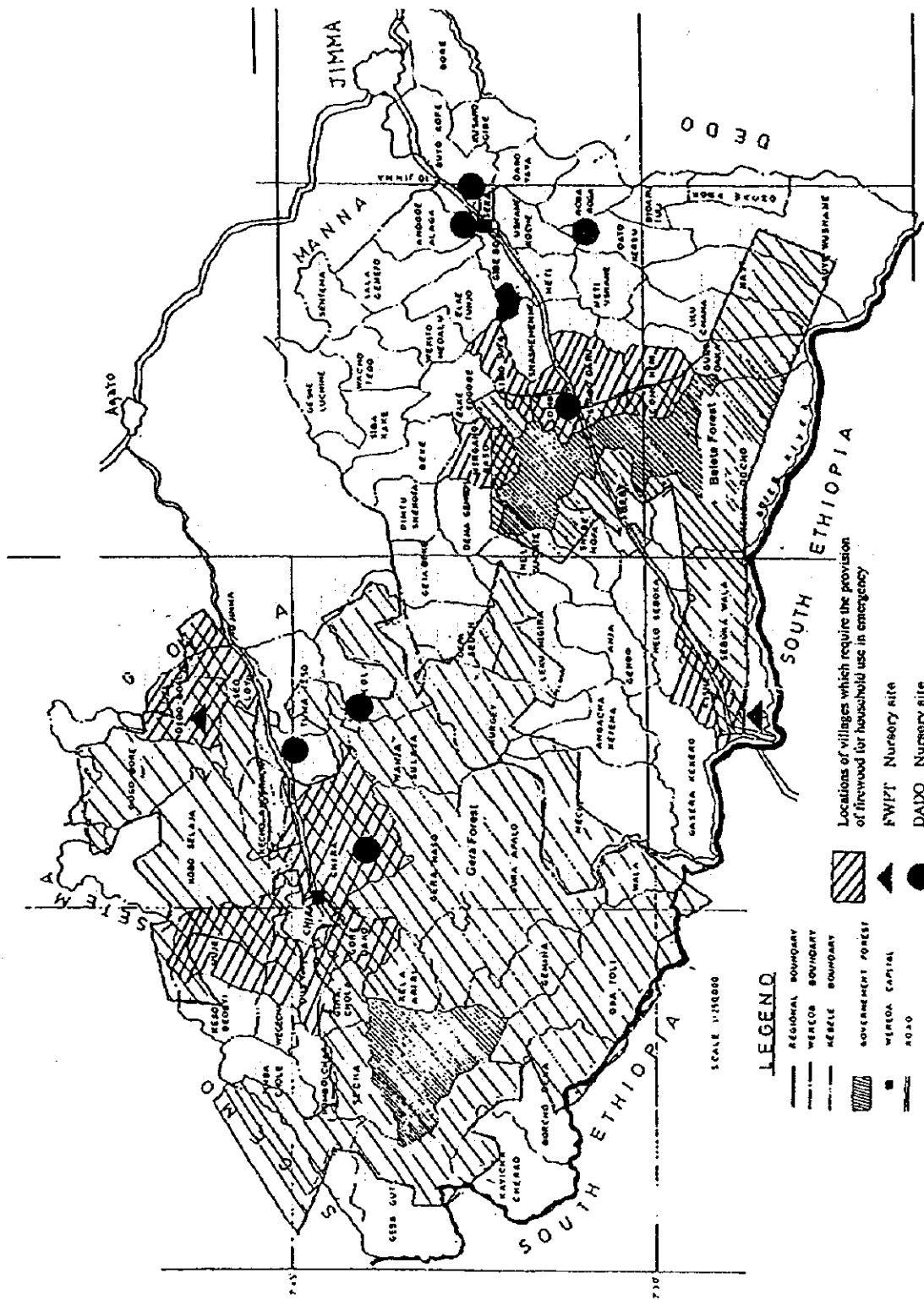
Appendix Fig. 12 Villages with urgent need to secure firewood for household consumption and locations of existing nursery Sites

(115)
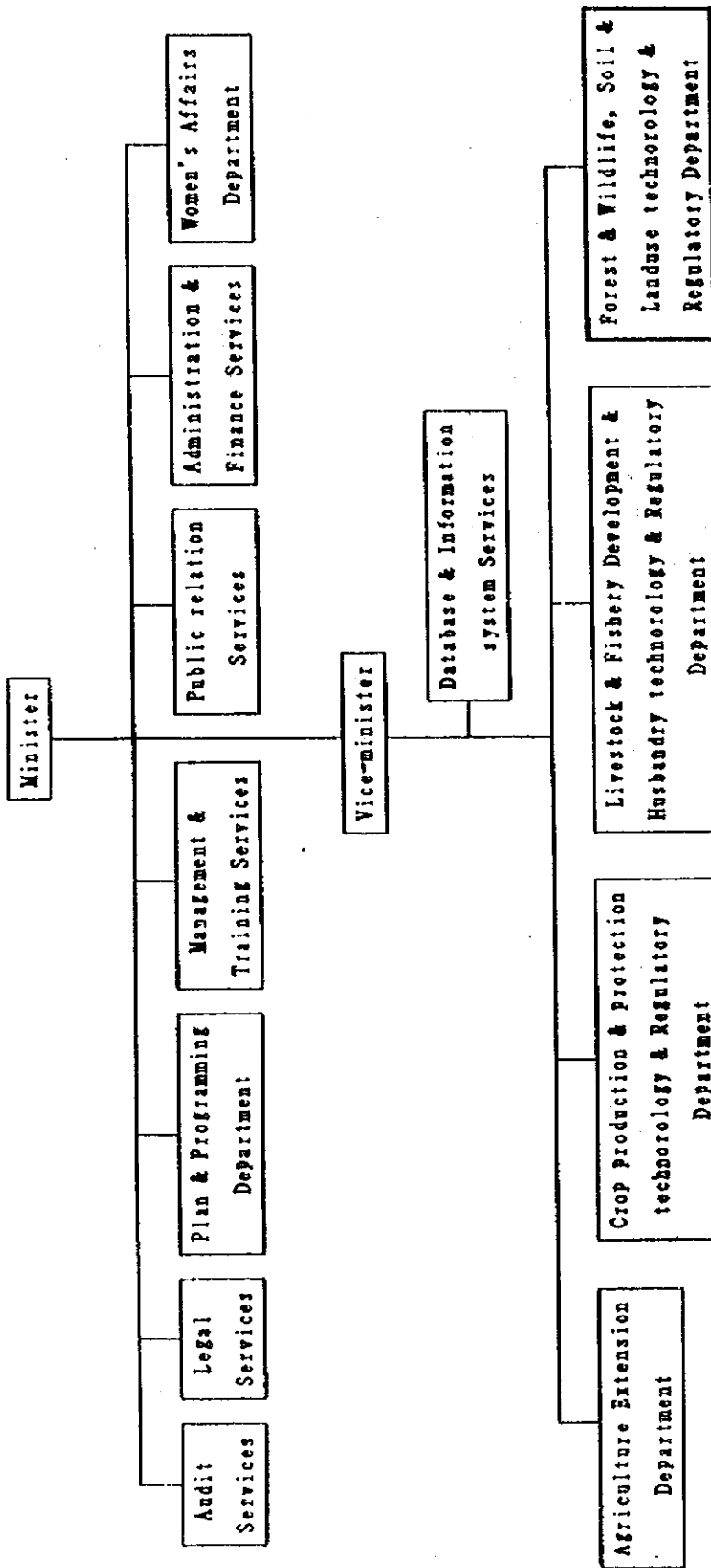
Appendix Fig. 13 Organizational structure of MoA

Oromia Regional Council

Office of Oromia Regional State President

Vice-President

Bureau of Agriculture Development

Bureau of Audit & Inspection

Bureau of Finance

Bureau of Plnning & Economic Development

Bureau of Justice

Bureau of Personnel Affairs

Bureau of Labour & Social Affairs

Bureau of Industry, Trade & Tourism

Bureau of Water, Mines & Energy Resources Development

Bureau of Education

Bureau of Health

Bureau of Trasport & Communication

Bureau of Construction & Urban Development

Bureau of Culture & Information

Investment Office of Oromia

Rural Road Authority

Disaster Prevention & PrePredness Council

Sports & Physical Fitness Commission

Appendix Fig. 14 Administrative structure of Oromia Region

(117)
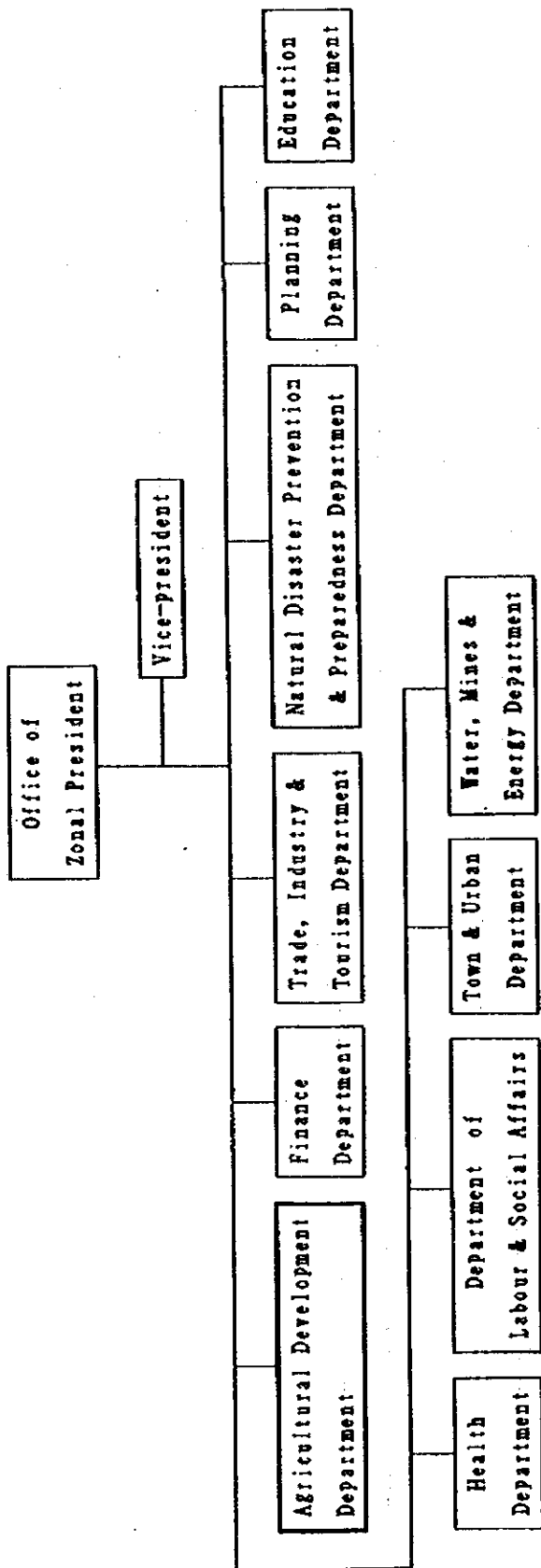
Appendix Fig. 15 Administrative structure of the zones within the Oromia Region
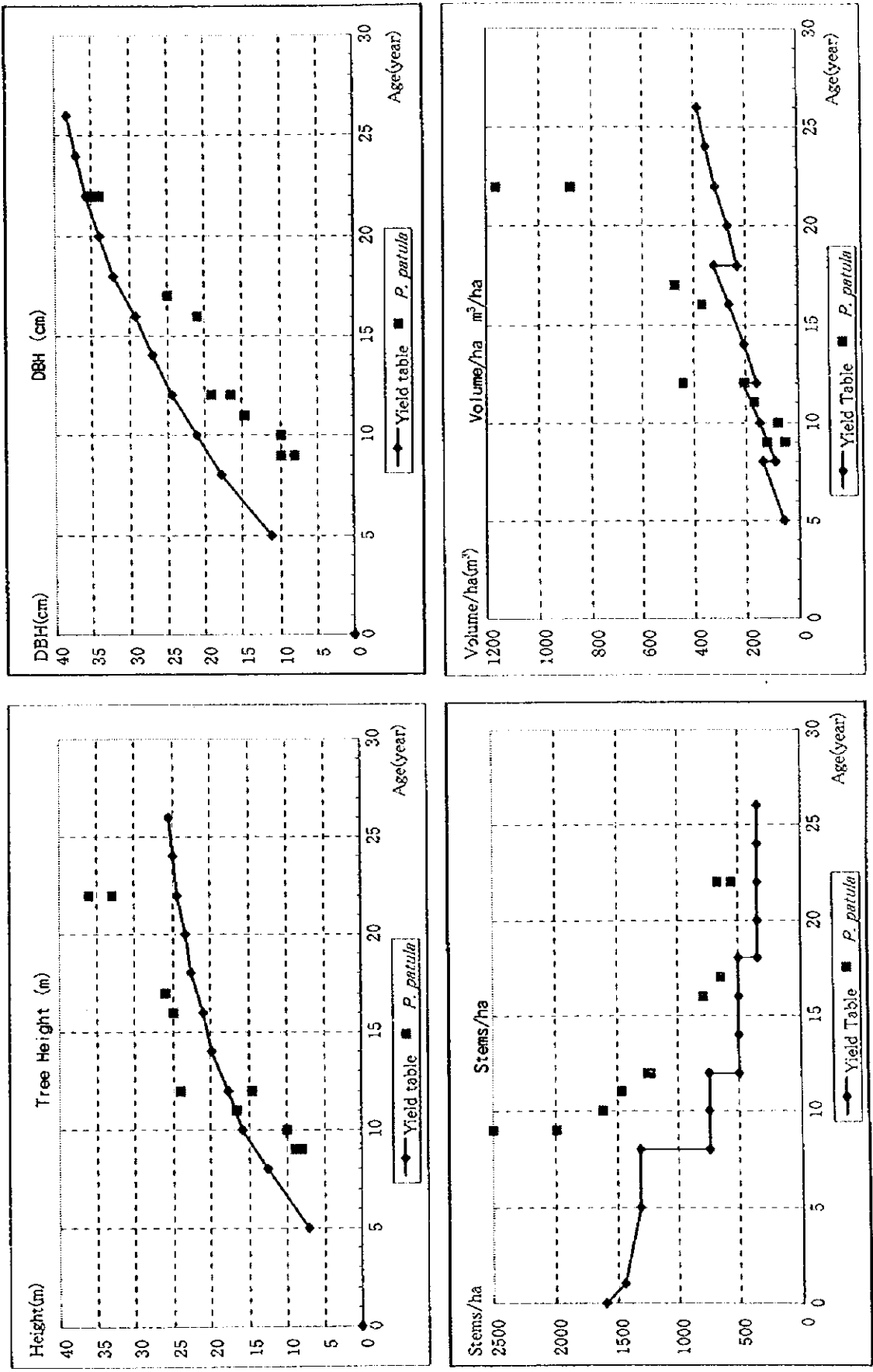
Appendix Fig. 16 Results of standard plot survey in forest plantation and existing yield table (*Pinus patula*)
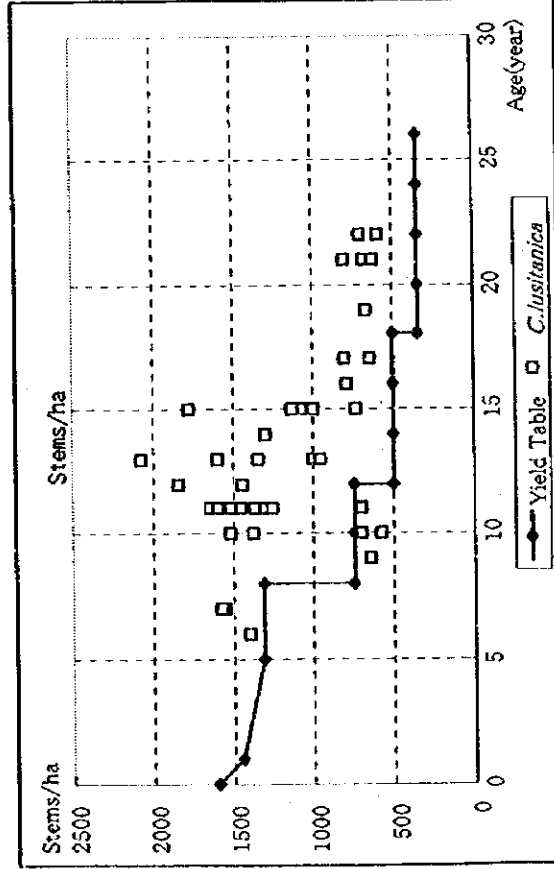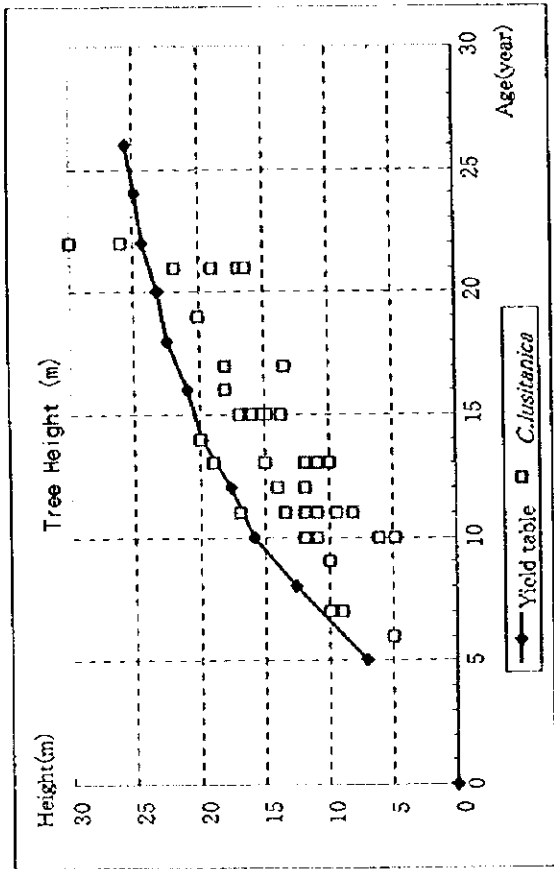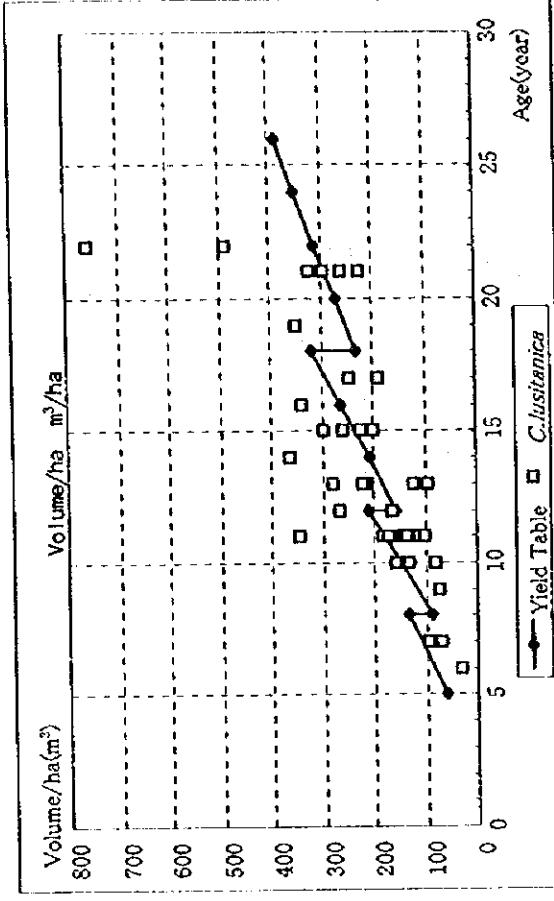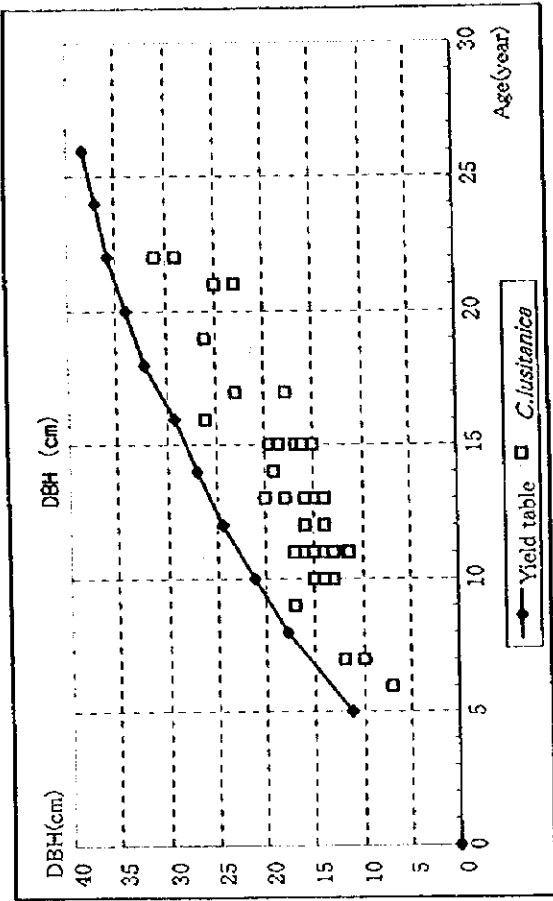
Appendix Fig. 17 Results of standard plot survey in forest plantation and existing yield table (*Cupressus lusitanica*)
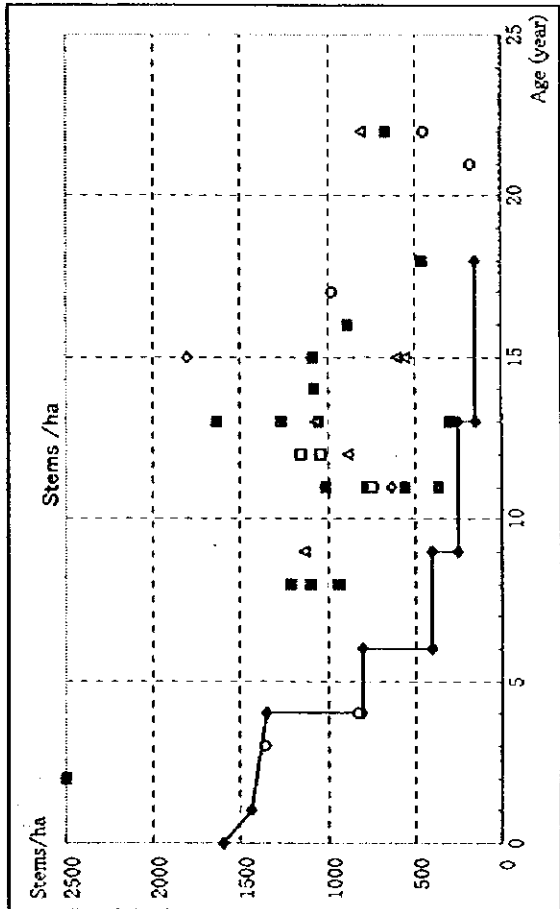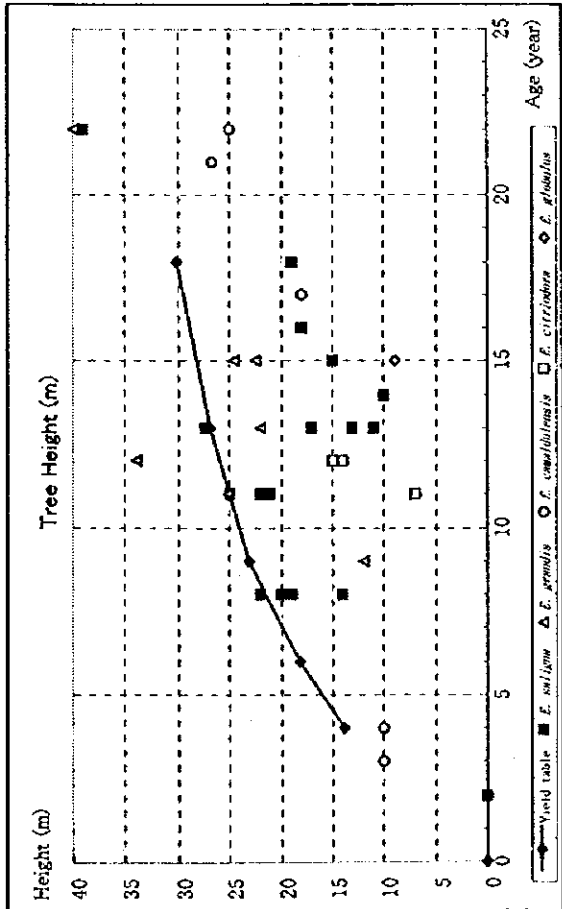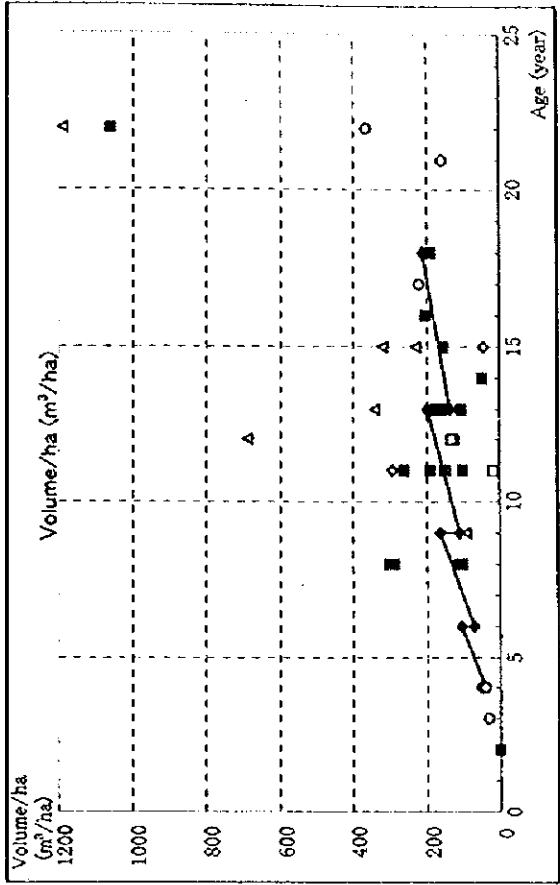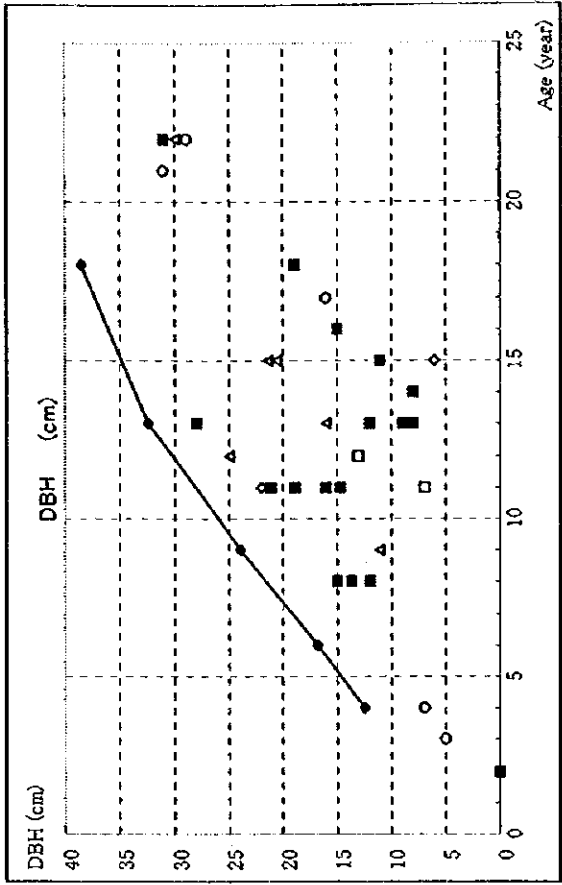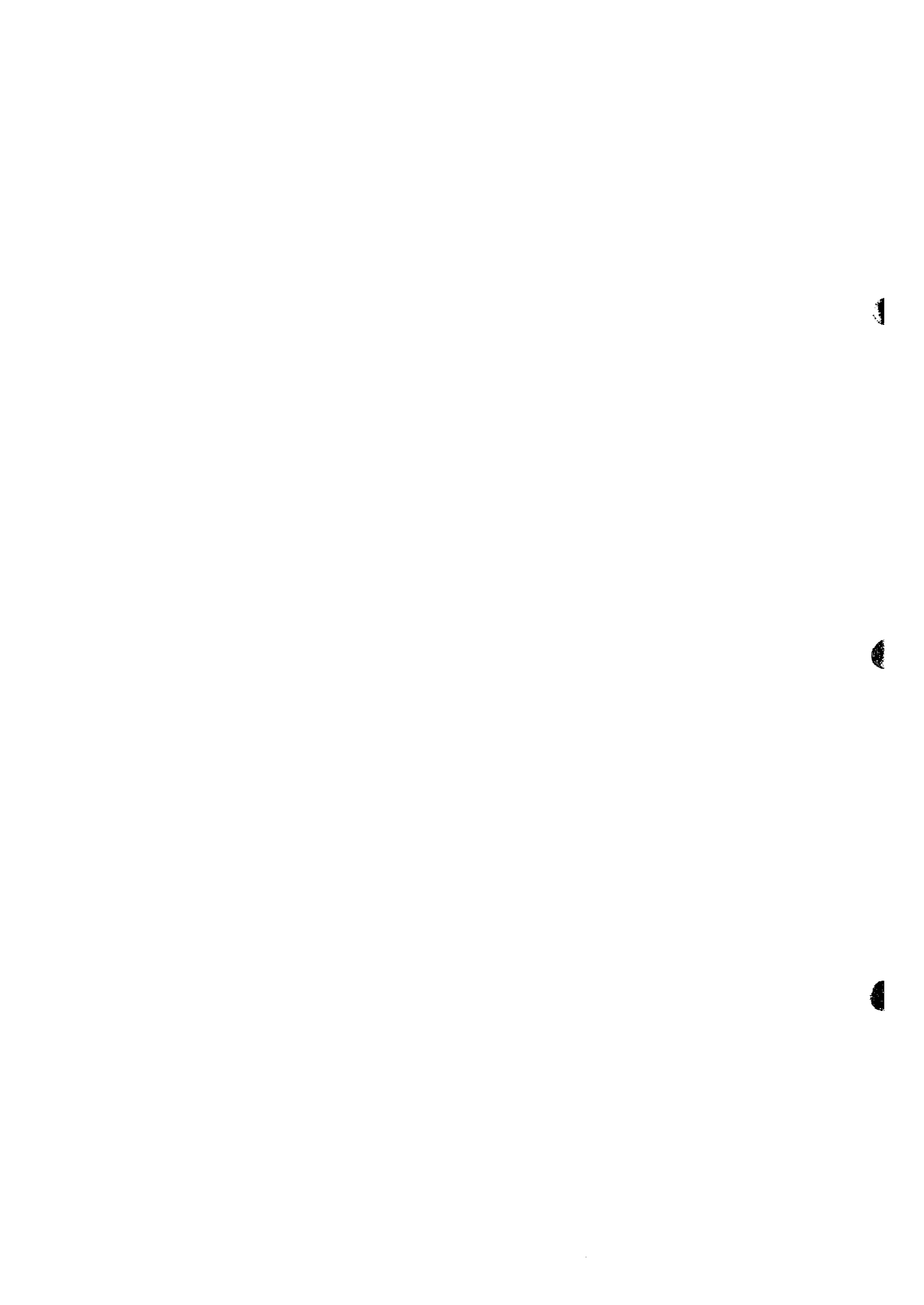
Appendix Fig. 18 Results of standard plot survey in forest plantation and existing yield table (*Eucalyptus spp.*)
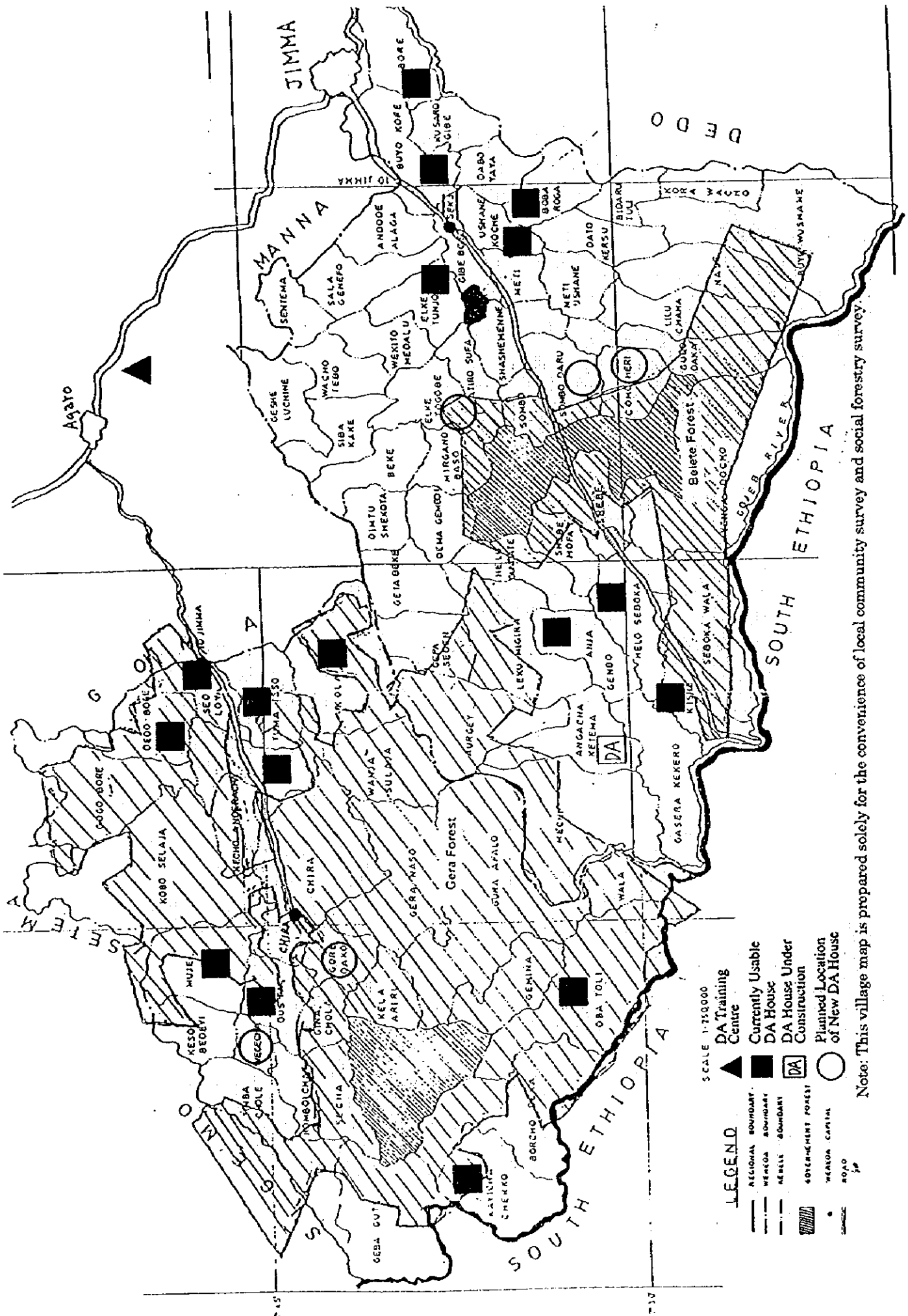
Appendix Fig. 19 Locations of existing DA houses and proposed construction sites

(122)

JICA