

12. Results of the Forest Survey by Plot in the Reserve



Result of the Forest Survey by Plot in the Nkhotakota Wildlife Reserve (Per 0.25 ha)

PLOT NO. 1 (Miombo Forest)	SPECIES	Forest Type : M, L		
		NO. of Trees	Volume (m ³)	Ratio (%)
	<i>Annona senegalensis</i>	1	0.009	0.15
	<i>Brachystegia boehmii</i>	16	2.159	35.90
	<i>Brachystegia spiciformis</i>	8	0.744	12.37
	<i>Burkea africana</i>	2	0.018	0.30
	<i>Dalbergia nitidula, Senna petersiana</i>	1	0.049	0.81
	<i>Diplorhynchus condylocarpon</i>	7	0.093	1.54
	<i>Julbernardia globiflora</i>	4	0.070	1.16
	<i>Julbernardia paniculata</i>	1	0.064	1.06
	<i>Parinari curatellifolia</i>	4	0.226	3.75
	<i>Pericopsis angolensis</i>	1	0.121	2.01
	<i>Pseudolachnostylis maprouneifolia</i>	5	0.313	5.21
	<i>Pterocarpus angolensis</i>	2	0.109	1.81
	<i>Randia sp., Xeromphis obovata</i>	2	0.025	0.41
	<i>Terminalia stenostachya</i>	1	0.009	0.15
	<i>Uapaca kirkiana</i>	5	0.375	6.24
	<i>Uapaca nitida</i>	18	1.613	26.82
	Mlima	1	0.009	0.15
	OT	1	0.009	0.15
	Dead tree	(6)	—	—
	TOTAL	86	6.013	100.00

PLOT NO. 2 (Miombo Forest)	SPECIES	Forest Type : L, L		
		NO. of Trees	Volume (m ³)	Ratio (%)
	<i>Annona senegalensis</i>	1	0.008	0.24
	<i>Bosqueia phoberos, Strophanthus nicholsonii</i>	1	0.022	0.68
	<i>Brachystegia boehmii</i>	10	1.643	49.69
	<i>Brachystegia spiciformis</i>	15	0.169	5.11
	<i>Combretum zeyheri</i>	6	0.049	1.47
	<i>Dalbergiella nyasae, Bauhinia petersiana</i>	2	0.040	1.22
	<i>Dichrostachys cinerea</i>	1	0.008	0.24
	<i>Diplorhynchus condylocarpon</i>	9	0.271	8.19
	<i>Flacourtia indica</i>	1	0.008	0.24
	<i>Julbernardia globiflora</i>	10	0.196	5.93
	<i>Julbernardia paniculata</i>	1	0.022	0.68
	<i>Monotes africanus, Swartzia madagascariensis</i>	5	0.121	3.67
	<i>Piliostigma thonningii</i>	1	0.008	0.24
	<i>Pseudolachnostylis maprouneifolia</i>	11	0.286	8.65
	<i>Terminalia stenostachya</i>	14	0.440	13.30
	<i>Uapaca nitida</i>	1	0.014	0.44
	Dead tree	(2)	—	—
	TOTAL	91	3.307	100.00

PLOT NO. 3 (Miombo Forest)

Forest Type : H, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	29	4.844	44.20
<i>Dalbergia nitidula</i>	1	0.015	0.13
<i>Dalbergia nitidula, Senna petersiana</i>	1	0.008	0.07
<i>Diplorhynchus condylocarpon</i>	9	0.346	3.15
<i>Julbernardia globiflora</i>	15	2.245	20.48
<i>Julbernardia paniculata</i>	4	0.115	1.05
<i>Lannea schimperi</i>	2	0.082	0.74
<i>Lonchocarpus capassa</i>	3	0.037	0.34
<i>Parinari curatellifolia</i>	1	0.131	1.19
<i>Pericopsis angolensis</i>	3	0.704	6.42
<i>Pseudolachnostylis maprouneifolia</i>	11	0.479	4.37
<i>Pterocarpus angolensis</i>	1	0.058	0.53
<i>Randia sp., Xeromphis obovata</i>	2	0.053	0.48
<i>Terminalia stenostachya</i>	8	0.225	2.05
<i>Trichilia emetica</i>	1	0.058	0.53
<i>Uapaca kirkiana</i>	2	0.164	1.50
<i>Uapaca nitida</i>	17	1.397	12.75
Dead tree	(2)	—	—
TOTAL	112	10.959	100.00

PLOT NO. 4 (Miombo Forest)

Forest Type : M, D

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	16	0.442	5.79
<i>Burkea africana</i>	10	0.597	7.81
<i>Combretum zeyheri</i>	1	0.123	1.60
<i>Dalbergia nitidula</i>	1	0.009	0.12
<i>Dalbergia nitidula, Senna petersiana</i>	1	0.009	0.12
<i>Dalbergiella nyasae, Bauhinia petersiana</i>	1	0.016	0.21
<i>Diplorhynchus condylocarpon</i>	20	0.846	11.07
<i>Julbernardia globiflora</i>	19	1.443	18.87
<i>Julbernardia paniculata</i>	5	0.086	1.13
<i>Pericopsis angolensis</i>	2	0.081	1.06
<i>Pseudolachnostylis maprouneifolia</i>	22	0.735	9.61
<i>Pterocarpus angolensis</i>	1	0.009	0.12
<i>Randia sp., Xeromphis obovata</i>	1	0.009	0.12
<i>Terminalia stenostachya</i>	5	0.100	1.31
<i>Uapaca nitida</i>	23	1.803	23.58
<i>Vangueria infausta</i>	2	0.018	0.24
<i>Vitex doniana</i>	3	0.168	2.20
Kanamzuro	2	0.018	0.24
Mkunhumala	1	0.009	0.12
Nalanje? (Mlanje)	4	1.007	13.17
Tsimbwi	1	0.082	1.07
OT	2	0.034	0.45
Dead tree	(1)	—	—
TOTAL	144	7.647	100.00

PLOT NO. 5 (Miombo Forest)	Forest Type : L, D		
	SPECIES	NO. of Trees	Volume (m ³)
<i>Amaranthus spinosus</i>	3	0.115	3.40
<i>Brachystegia boehmii</i>	31	1.129	33.51
<i>Diospyros sp., Psorospermum febrifugum,</i> <i>Rhus longipes</i>	4	0.112	3.32
<i>Diplorhynchus condylocarpon</i>	3	0.032	0.95
<i>Flacourtia indica</i>	3	0.051	1.51
<i>Julbernardia globiflora</i>	39	0.784	23.28
<i>Lannea schimperi</i>	1	0.008	0.25
<i>Newtonia buchananii</i>	2	0.017	0.50
<i>Pericopsis angolensis</i>	5	0.094	2.79
<i>Pseudolachnostylis maprouneifolia</i>	20	0.388	11.51
<i>Syzygium sp.</i>	5	0.093	2.76
<i>Tephrosia vogelii</i>	3	0.025	0.75
<i>Terminalia stenostachya</i>	2	0.057	1.70
<i>Uapaca nitida</i>	11	0.250	7.42
<i>Vangueria sp.</i>	2	0.159	4.71
Mlengwe	5	0.055	1.64
Dead tree	(1)	—	—
TOTAL	140	3.368	100.00

PLOT NO. 6 (Miombo Forest)	Forest Type : M, M		
	SPECIES	NO. of Trees	Volume (m ³)
<i>Annona senegalensis</i>	2	0.070	1.14
<i>Bosqueia phoberos, Strophanthus nicholsonii</i>	2	0.126	2.05
<i>Brachystegia boehmii</i>	29	2.052	33.35
<i>Burkea africana</i>	2	0.159	2.59
<i>Diospyros sp., Psorospermum febrifugum,</i> <i>Rhus longipes</i>	14	0.653	10.62
<i>Diplorhynchus condylocarpon</i>	8	0.259	4.20
<i>Flacourtia indica</i>	18	0.474	7.71
<i>Julbernardia globiflora</i>	13	0.944	15.34
<i>Lannea schimperi</i>	6	0.147	2.39
<i>Monotes africanus, Swartzia madagascariensis</i>	2	0.024	0.39
<i>Newtonia buchananii</i>	1	0.024	0.39
<i>Protea sp., Faurea sp.</i>	1	0.016	0.25
<i>Pseudolachnostylis maprouneifolia</i>	7	0.477	7.76
<i>Randia sp., Xeromphis obovata</i>	3	0.033	0.54
<i>Stereospermum kunthianum</i>	1	0.079	1.28
<i>Syzygium sp.</i>	6	0.228	3.71
<i>Treculia africana</i>	1	0.079	1.28
<i>Uapaca nitida</i>	4	0.129	2.10
Katele	2	0.059	0.96
M'ngona	4	0.042	0.68
Mlengwe	2	0.078	1.26
TOTAL	128	6.152	100.00

PLOT NO. 7 (Miombo Forest)

Forest Type : L, L

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	26	0.787	41.26
<i>Combretum zeyheri</i>	1	0.007	0.39
<i>Flacourtia indica</i>	31	0.644	33.76
<i>Julbernardia globiflora</i>	4	0.043	2.24
<i>Pseudolachnostylis maprouneifolia</i>	13	0.189	9.91
<i>Terminalia stenostachya</i>	19	0.238	12.45
TOTAL	94	1.909	100.00

PLOT NO. 8 (Miombo Forest)

Forest Type : H, D

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Azelia quanzensis</i>	6	0.931	7.29
<i>Brachystegia boehmii</i>	41	3.662	28.66
<i>Diplorhynchus condylocarpon</i>	14	0.172	1.34
<i>Julbernardia paniculata</i>	33	3.758	29.41
<i>Monotes africanus, Swartzia madagascariensis</i>	7	0.389	3.04
<i>Pericopsis angolensis</i>	7	1.952	15.27
<i>Pseudolachnostylis maprouneifolia</i>	25	0.987	7.72
<i>Terminalia stenostachya</i>	2	0.027	0.21
<i>Uapaca kirkiana</i>	6	0.902	7.06
TOTAL	141	12.780	100.00

PLOT NO. 9 (Miombo Forest)

Forest Type : H, L

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Annona senegalensis</i>	1	0.031	0.37
<i>Brachystegia boehmii</i>	11	0.968	11.68
<i>Burkea africana</i>	3	0.466	5.63
<i>Dalbergiella nyasae, Bauhinia petersiana</i>	2	0.031	0.37
<i>Dichrostachys cinerea</i>	1	0.044	0.53
<i>Diplorhynchus condylocarpon</i>	5	0.114	1.37
<i>Flacourtia indica</i>	5	0.064	0.77
<i>Julbernardia globiflora</i>	24	3.046	36.78
<i>Julbernardia paniculata</i>	9	0.891	10.75
<i>Lannea schimperi</i>	4	0.159	1.92
<i>Pericopsis angolensis</i>	2	0.192	2.32
<i>Piliostigma thonningii</i>	8	1.505	18.17
<i>Pseudolachnostylis maprouneifolia</i>	4	0.445	5.38
<i>Randia sp., Xeromphis obovata</i>	1	0.044	0.53
<i>Terminalia stenostachya</i>	1	0.011	0.13
<i>Uapaca kirkiana</i>	5	0.176	2.13
<i>Uapaca nitida</i>	2	0.055	0.66
Kapilapila	3	0.042	0.50
Dead tree	(1)	--	--
TOTAL	92	8.283	100.00

PLOT NO. 10 (Miombo Forest)

Forest Type : L, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	29	1.402	35.76
<i>Combretum zeyheri</i>	2	0.061	1.57
<i>Dichrostachys cinerea</i>	2	0.021	0.54
<i>Diplorhynchus condylocarpon</i>	10	0.212	5.40
<i>Halleria elliptica</i>	4	0.078	1.99
<i>Julbernardia globiflora</i>	21	0.689	17.58
<i>Julbernardia paniculata</i>	6	0.414	10.55
<i>Lannea schimperi</i>	1	0.076	1.93
<i>Parinari curatellifolia</i>	1	0.019	0.48
<i>Protea sp., Faurea sp.</i>	3	0.032	0.81
<i>Pseudolachnostylis maprouneifolia</i>	11	0.501	12.78
<i>Randia sp., Xeromphis obovata</i>	2	0.030	0.75
<i>Terminalia stenostachya</i>	2	0.030	0.75
<i>Uapaca kirkiana</i>	5	0.108	2.74
<i>Uapaca nitida</i>	13	0.249	6.36
Dead tree	(3)	—	—
TOTAL	115	3.920	100.00

PLOT NO. 11 (Miombo Forest)

Forest Type : H, L

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	15	1.551	22.47
<i>Combretum zeyheri</i>	1	0.038	0.55
<i>Dalbergia nitidula, Senna petersiana</i>	1	0.012	0.18
<i>Diplorhynchus condylocarpon</i>	2	0.051	0.73
<i>Entada abyssinica</i>	1	0.012	0.18
<i>Flacourtia indica</i>	7	1.592	23.05
<i>Julbernardia globiflora</i>	14	2.147	31.10
<i>Lannea schimperi</i>	1	0.012	0.18
<i>Monotes africanus, Swartzia madagascariensis</i>	7	0.633	9.17
<i>Parinari curatellifolia</i>	3	0.270	3.92
<i>Pericopsis angolensis</i>	1	0.094	1.37
<i>Pseudolachnostylis maprouneifolia</i>	10	0.327	4.74
<i>Terminalia stenostachya</i>	12	0.163	2.36
Dead tree	(1)	—	—
TOTAL	76	6.904	100.00

PLOT NO.12 (Miombo Forest)

Forest Type : M, L

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	2	0.295	4.91
<i>Combretum zeyheri</i>	1	0.021	0.35
<i>Dalbergia nitidula, Senna petersiana</i>	6	0.163	2.70
<i>Dalbergiella nyasae, Bauhinia petersiana</i>	3	0.045	0.74
<i>Diplorhynchus condylocarpon</i>	18	0.362	6.02
<i>Entada abyssinica</i>	1	0.047	0.79
<i>Flacourtia indica</i>	24	2.768	46.06
<i>Julbernardia globiflora</i>	8	0.467	7.76
<i>Lannea schimperi</i>	2	0.131	2.18
<i>Monotes africanus, Swartzia madagascariensis</i>	5	0.223	3.71
<i>Pericopsis angolensis</i>	4	0.516	8.59
<i>Pseudolachnostylis maprouneifolia</i>	11	0.625	10.40
<i>Pterocarpus angolensis</i>	2	0.094	1.57
<i>Terminalia stenostachya</i>	1	0.021	0.35
<i>Uapaca nitida</i>	1	0.084	1.40
<i>Vangueria infausta</i>	1	0.012	0.20
Chiwowo (Chiwowa)	2	0.024	0.39
Njere, Mjere	3	0.113	1.88
TOTAL	95	6.009	100.00

PLOT NO. 13 (Miombo Forest)

Forest Type : M, L

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	18	2.270	43.11
<i>Combretum zeyheri</i>	12	0.234	4.44
<i>Diplorhynchus condylocarpon</i>	10	0.193	3.67
<i>Flacourtia indica</i>	6	0.831	15.79
<i>Julbernardia paniculata</i>	1	0.240	4.56
<i>Monotes africanus, Swartzia madagascariensis</i>	2	0.197	3.75
<i>Parinari curatellifolia</i>	1	0.129	2.45
<i>Pseudolachnostylis maprouneifolia</i>	13	0.820	15.57
<i>Terminalia stenostachya</i>	8	0.334	6.34
Kalama wa ukazi	1	0.017	0.32
Dead tree	(1)	—	—
TOTAL	73	5.266	100.00

PLOT NO. 14 (Miombo Forest)

Forest Type : H, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia spiciformis</i>	6	2.061	14.95
<i>Combretum zeyheri</i>	18	0.231	1.68
<i>Dalbergia nitidula, Senna petersiana</i>	1	0.008	0.06
<i>Diplorhynchus condylocarpon</i>	11	0.104	0.75
<i>Julbernardia paniculata</i>	25	5.776	41.91
<i>Lannea schimperi</i>	1	0.008	0.06
<i>Pericopsis angolensis</i>	20	5.197	37.71
<i>Protea sp., Faurea sp.</i>	5	0.139	1.01
<i>Pseudolachnostylis maprouneifolia</i>	6	0.210	1.52
<i>Uapaca kirkiana</i>	3	0.025	0.18
<i>Vangueria infausta</i>	2	0.023	0.17
Dead tree	(2)	—	—
TOTAL	100	13.782	100.00

PLOT NO. 15 (Miombo Forest)		Forest Type : M, D		
SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)	
<i>Brachystegia boehmii</i>	3	0.325	3.44	
<i>Dalbergia nitidula</i>	1	0.018	0.19	
<i>Diplorhynchus condylocarpon</i>	11	0.145	1.53	
<i>Julbernardia paniculata</i>	28	3.059	32.39	
<i>Parinari curatellifolia</i>	5	0.075	0.80	
<i>Pericopsis angolensis</i>	5	0.937	9.92	
<i>Protea sp., Faurea sp.</i>	19	0.693	7.34	
<i>Pseudolachnostylis maprouneifolia</i>	14	0.638	6.76	
<i>Terminalia stenostachya</i>	3	0.129	1.37	
<i>Uapaca kirkiana</i>	124	3.168	33.54	
<i>Uapaca nitida</i>	8	0.257	2.72	
TOTAL	221	9.445	100.00	

PLOT NO. 16 (Miombo Forest)		Forest Type : M, M		
SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)	
<i>Brachystegia boehmii</i>	3	0.331	6.15	
<i>Combretum zeyheri</i>	1	0.008	0.15	
<i>Diplorhynchus condylocarpon</i>	23	0.225	4.18	
<i>Julbernardia globiflora</i>	4	0.533	9.90	
<i>Julbernardia paniculata</i>	14	2.479	46.08	
<i>Monotes africanus, Swartzia madagascariensis</i>	4	0.083	1.55	
<i>Parinari curatellifolia</i>	2	0.023	0.42	
<i>Pericopsis angolensis</i>	7	0.480	8.92	
<i>Protea sp., Faurea sp.</i>	9	0.199	3.70	
<i>Pseudolachnostylis maprouneifolia</i>	7	0.158	2.94	
<i>Terminalia stenostachya</i>	1	0.008	0.15	
<i>Uapaca kirkiana</i>	40	0.813	15.12	
<i>Uapaca nitida</i>	4	0.039	0.73	
Dead tree	(1)	—	—	
TOTAL	120	5.379	100.00	

PLOT NO. 17 (Evergreen Forest)				
SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)	
<i>Albizia adianthifolia</i>	1	3.706	2.17	
<i>Bequaertiodendron magalismontanum</i>	1	44.156	25.88	
<i>Chamaete cristata</i>	20	27.221	15.95	
<i>Craibia brevicaudata</i>	82	37.280	21.85	
<i>Croton macrostachys</i>	1	3.706	2.17	
<i>Rauvolfia caffra</i>	2	8.678	5.09	
<i>Teclea nobilis</i>	3	0.471	0.28	
<i>Trichilia emetica</i>	2	45.406	26.61	
Dead tree	(13)	—	—	
TOTAL	125	170.624	100.00	

PLOT NO. 18 (Evergreen Forest)

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Albizia adianthifolia</i>	5	18.672	6.97
<i>Apodytes dimidiata</i>	14	16.652	6.22
<i>Bequaertiodendron magalismontanum</i>	6	120.486	44.99
<i>Bersama abyssinica</i>	1	0.097	0.04
<i>Chamaete cristata</i>	3	5.209	1.94
<i>Chionanthus battiscambei</i>	1	0.656	0.25
<i>Craibia brevicaudata</i>	41	15.701	5.86
<i>Ficus natalensis</i>	2	72.020	26.89
<i>Kigelia africana</i>	1	0.035	0.01
<i>Oxyanthus speciosus</i>	1	0.097	0.04
<i>Teclea nobilis</i>	28	6.460	2.41
<i>Trichilia emetica</i>	1	0.097	0.04
<i>Trilepsium madagascariensis</i>	4	11.645	4.35
TOTAL	108	267.828	100.00

PLOT NO. 19 (Semi-evergreen Forest)

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Albizia adianthifolia</i>	2	12.206	32.48
<i>Apodytes dimidiata</i>	2	1.907	5.07
<i>Bersama abyssinica</i>	12	2.190	5.83
<i>Bridelia micrantha</i>	5	2.628	6.99
<i>Chionanthus battiscambei</i>	4	0.452	1.20
<i>Combretum molle</i>	9	2.112	5.62
<i>Dombeya rotundifolia</i>	1	0.050	0.13
<i>Dracaena laxissima</i>	72	5.410	14.39
<i>Erythroxylum emarginatum</i>	5	0.183	0.49
<i>Euclea schimperi</i>	5	0.414	1.10
<i>Harungana madagascariensis</i>	1	0.243	0.65
<i>Markhamia obtusifolia</i>	10	1.107	2.95
<i>Maytenus senegalensis</i>	3	0.163	0.43
<i>Ozoroa reticulata</i>	3	0.746	1.98
<i>Polysphaeria lanceolata</i>	12	0.299	0.80
<i>Psychotria mahoni</i>	2	0.104	0.28
<i>Rauvolfia caffra</i>	6	5.663	15.07
<i>Stenoleps lanceolata</i>	1	0.032	0.09
<i>Syzygium cordatum</i>	1	0.340	0.90
<i>Syzygium guineense</i>	1	0.018	0.05
<i>Teclea nobilis</i>	1	0.050	0.13
<i>Trichilia emetica</i>	4	0.993	2.64
<i>Turraea floribunda</i>	2	0.050	0.13
<i>Uangueria infanctas</i>	6	0.221	0.59
Dead tree	(6)	—	—
TOTAL	176	37.581	100.00

PLOT NO. 20 (Miombo Forest)

Forest Type : L, D

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Anisophyllea pomifera</i>	3	0.131	1.19
<i>Brachystegia boehmii</i>	25	0.931	8.47
<i>Brachystegia floribunda</i>	69	2.426	22.08
<i>Brachystegia longifolia</i>	13	0.377	3.43
<i>Brachystegia utilis</i>	23	0.773	7.03
<i>Ekebergia benguelensis</i>	1	0.012	0.11
<i>Garcinia huillensis</i>	1	0.033	0.30
<i>Julbernardia globiflora</i>	1	0.047	0.43
<i>Julbernardia paniculata</i>	127	3.580	32.58
<i>Lannea schimperi</i>	1	0.021	0.19
<i>Ochna schweinfurthiana</i>	1	0.012	0.11
<i>Parinari curatellifolia</i>	7	0.311	2.83
<i>Uapaca kirkiana</i>	55	1.452	13.21
<i>Uapaca nitida</i>	7	0.360	3.28
<i>Vitex doniana</i>	3	0.523	4.76
Dead tree	(3)	—	—
TOTAL	340	10.989	100.00

PLOT NO. 21 (Miombo Forest)

Forest Type : L, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	51	2.472	41.99
<i>Brachystegia floribunda</i>	12	0.675	11.46
<i>Brachystegia utilis</i>	4	0.158	2.68
<i>Dalbergia nitidula</i>	1	0.009	0.16
<i>Julbernardia paniculata</i>	21	0.626	10.63
<i>Parinari curatellifolia</i>	2	0.026	0.44
<i>Protea sp., Faurea sp.</i>	19	0.356	6.04
<i>Pseudolachnostylis maprouneifolia</i>	1	0.009	0.16
<i>Uapaca kirkiana</i>	55	1.429	24.28
<i>Uapaca nitida</i>	5	0.091	1.55
Chiwowo (Chiwowa)	2	0.019	0.32
Tsimbwi	1	0.017	0.28
Dead tree	(1)	—	—
TOTAL	175	5.887	100.00

PLOT NO. 22 (Miombo Forest)		Forest Type : H, L	
SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	15	1.860	14.53
<i>Brachystegia bussei</i>	18	6.862	53.62
<i>Combretum zeyheri</i>	1	0.044	0.35
<i>Diplorhynchus condylocarpon</i>	5	0.215	1.68
<i>Julbernardia paniculata</i>	13	1.377	10.76
<i>Lannea discolor</i>	3	0.073	0.57
<i>Pericopsis angolensis</i>	9	1.222	9.55
<i>Protea sp., Faurea sp.</i>	5	0.117	0.92
<i>Pseudolachnostylis maprouneifolia</i>	4	0.282	2.21
<i>Terminalia stenostachya</i>	7	0.300	2.35
<i>Uapaca kirkiana</i>	7	0.226	1.76
<i>Uapaca nitida</i>	2	0.130	1.01
Chiwowo (Chiwowa)	2	0.073	0.57
Tsimbwi	1	0.016	0.12
TOTAL	92	12.796	100.00

PLOT NO. 23 (Miombo Forest)		Forest Type : L, L	
SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Acacia nilotica</i>	6	0.080	2.92
<i>Annona senegalensis</i>	10	0.246	8.98
<i>Brachystegia boehmii</i>	3	0.201	7.35
<i>Brachystegia bussei</i>	5	0.208	7.62
<i>Brachystegia longifolia</i>	12	0.479	17.51
<i>Combretum zeyheri</i>	19	0.417	15.23
<i>Dalbergia nitidula</i>	1	0.009	0.34
<i>Dichrostachys cinerea</i>	1	0.009	0.34
<i>Flacourtia indica</i>	4	0.068	2.50
<i>Julbernardia paniculata</i>	1	0.009	0.34
<i>Lannea schimperi</i>	2	0.104	3.79
<i>Pericopsis angolensis</i>	3	0.086	3.15
<i>Piliostigma thonningii</i>	6	0.080	2.92
<i>Protea sp., Faurea sp.</i>	15	0.258	9.44
<i>Pseudolachnostylis maprouneifolia</i>	4	0.196	7.16
<i>Terminalia stenostachya</i>	1	0.026	0.95
<i>Uapaca kirkiana</i>	2	0.019	0.68
<i>Vitex doniana</i>	8	0.241	8.79
Dead tree	(1)	—	—
TOTAL	104	2.737	100.00

PLOT NO. 24 (Miombo Forest)

Forest Type : M, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Bosqueia phoberos, Strophanthus nicholsonii</i>	4	0.053	0.75
<i>Brachystegia bussei</i>	8	2.475	34.78
<i>Brachystegia floribunda</i>	1	0.038	0.54
<i>Brachystegia longifolia</i>	4	0.499	7.01
<i>Brachystegia spiciformis</i>	1	0.087	1.22
<i>Combretum zeyheri</i>	4	0.092	1.29
<i>Cordia abyssinica</i>	1	0.017	0.24
<i>Diplorhynchus condylocarpon</i>	13	0.473	6.65
<i>Julbernardia paniculata</i>	44	1.820	25.57
<i>Lannea schimperi</i>	1	0.010	0.14
<i>Pericopsis angolensis</i>	2	0.356	5.00
<i>Protea sp., Faurea sp.</i>	14	0.220	3.09
<i>Pseudolachnostylis maprouneifolia</i>	4	0.130	1.83
<i>Uapaca kirkiana</i>	16	0.801	11.26
Kamilalumba	2	0.044	0.62
TOTAL	119	7.115	100.00

PLOT NO. 25 (Miombo Forest)

Forest Type : M, D

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	103	5.617	42.47
<i>Brachystegia floribunda</i>	23	1.134	8.57
<i>Brachystegia spiciformis</i>	4	0.075	0.56
<i>Brachystegia utilis</i>	29	1.998	15.11
<i>Cordia abyssinica</i>	1	0.033	0.25
<i>Julbernardia globiflora</i>	10	0.386	2.92
<i>Julbernardia paniculata</i>	25	0.924	6.99
<i>Lannea schimperi</i>	2	0.059	0.45
<i>Ochna pulchra</i>	3	0.126	0.95
<i>Protea sp., Faurea sp.</i>	10	0.330	2.49
<i>Pseudolachnostylis maprouneifolia</i>	3	0.080	0.60
<i>Sesamum angolense</i>	1	0.033	0.25
<i>Terminalia stenostachya</i>	1	0.033	0.25
<i>Uapaca kirkiana</i>	60	2.242	16.95
Chiwowo (Chiwowa)	1	0.012	0.09
Kamilalumba	1	0.021	0.16
Tsimbwi	3	0.126	0.95
Dead tree	(4)	--	--
TOTAL	284	13.227	100.00

PLOT NO. 26 (Miombo Forest)

Forest Type : L, D

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia floribunda</i>	12	0.539	6.05
<i>Brachystegia longifolia</i>	15	0.626	7.04
<i>Brachystegia spiciformis</i>	2	0.200	2.25
<i>Brachystegia stipulata</i>	1	0.045	0.51
<i>Brachystegia utilis</i>	2	0.242	2.72
<i>Julbernardia globiflora</i>	2	0.157	1.76
<i>Julbernardia paniculata</i>	11	0.501	5.63
<i>Ochna pulchra</i>	12	0.222	2.49
<i>Parinari curatellifolia</i>	6	0.333	3.74
<i>Protea sp., Faurea sp.</i>	10	0.362	4.07
<i>Uapaca kirkiana</i>	160	5.581	62.71
<i>Uapaca nitida</i>	2	0.091	1.03
Dead tree	(2)	—	—
TOTAL	237	8.900	100.00

PLOT NO. 27 (Miombo Forest)

Forest Type : L, M

SPECIES	NO. of Trees	Volume (m ³)	Ratio (%)
<i>Brachystegia boehmii</i>	56	1.298	25.48
<i>Brachystegia longifolia</i>	2	0.090	1.77
<i>Brachystegia utilis</i>	63	1.056	20.73
<i>Combretum zeyheri</i>	1	0.008	0.16
<i>Ekebergia benguelensis</i>	2	0.023	0.46
<i>Julbernardia globiflora</i>	70	1.320	25.92
<i>Julbernardia paniculata</i>	35	0.523	10.27
<i>Lannea schimperi</i>	5	0.114	2.23
<i>Parinari curatellifolia</i>	1	0.008	0.16
<i>Piliostigma thonningii</i>	1	0.008	0.16
<i>Protea sp., Faurea sp.</i>	8	0.108	2.12
<i>Pseudolachnostylis maprouneifolia</i>	5	0.080	1.57
<i>Strychnos spinosa</i>	2	0.017	0.33
<i>Terminalia stenostachya</i>	1	0.008	0.16
<i>Uapaca kirkiana</i>	10	0.312	6.12
Chiwowo (Chiwowa)	2	0.017	0.33
Tsimbwi	3	0.102	2.01
TOTAL	267	5.093	100.00

REMARKS : Forest Type

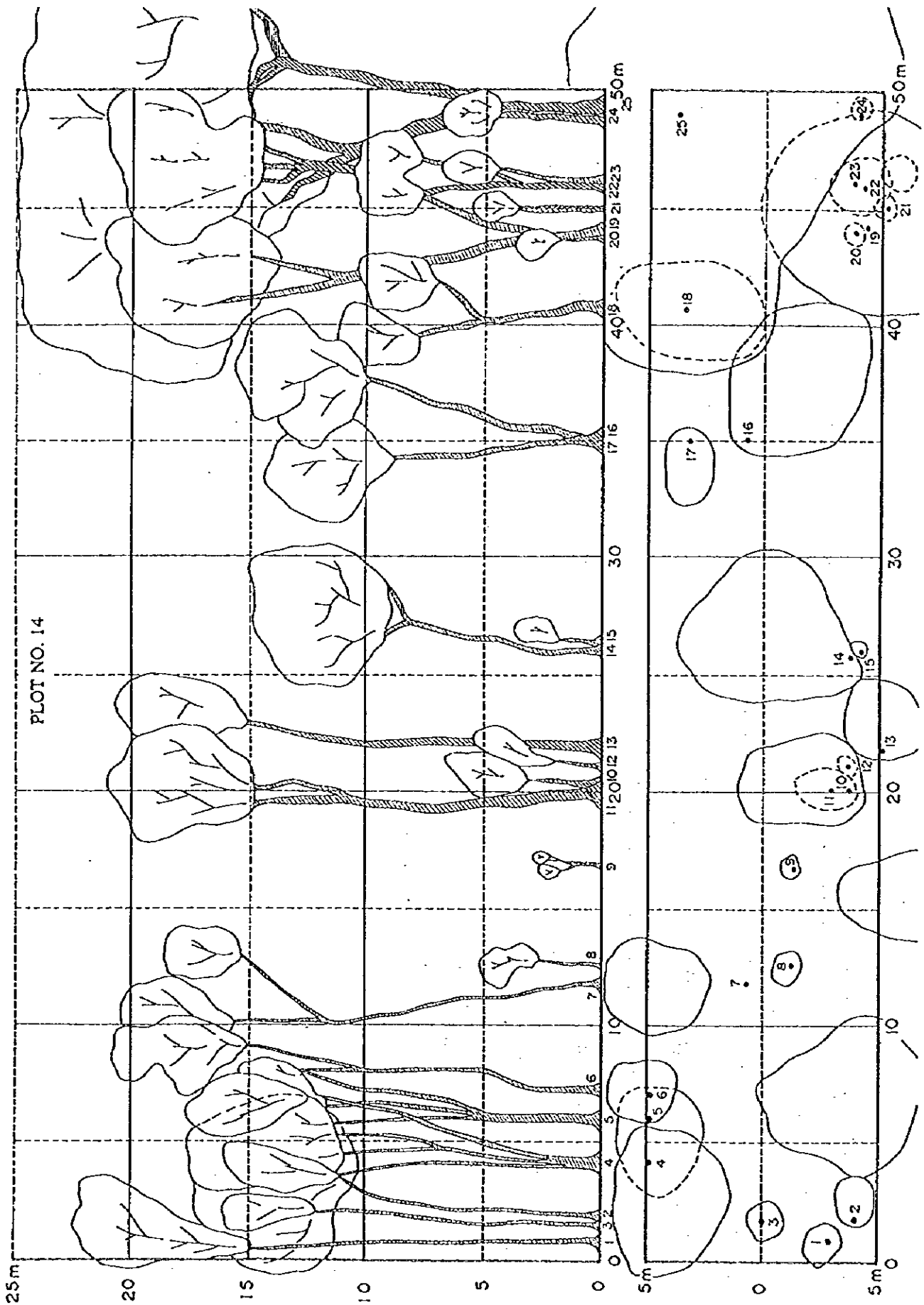
Code	Tree Height	Density
H, D	High	Dense
H, M	High	Medium
H, L	High	Low
M, D	Medium	Dense
M, M	Medium	Medium
M, L	Medium	Low
L, D	Low	Dense
L, M	Low	Medium
L, L	Low	Low

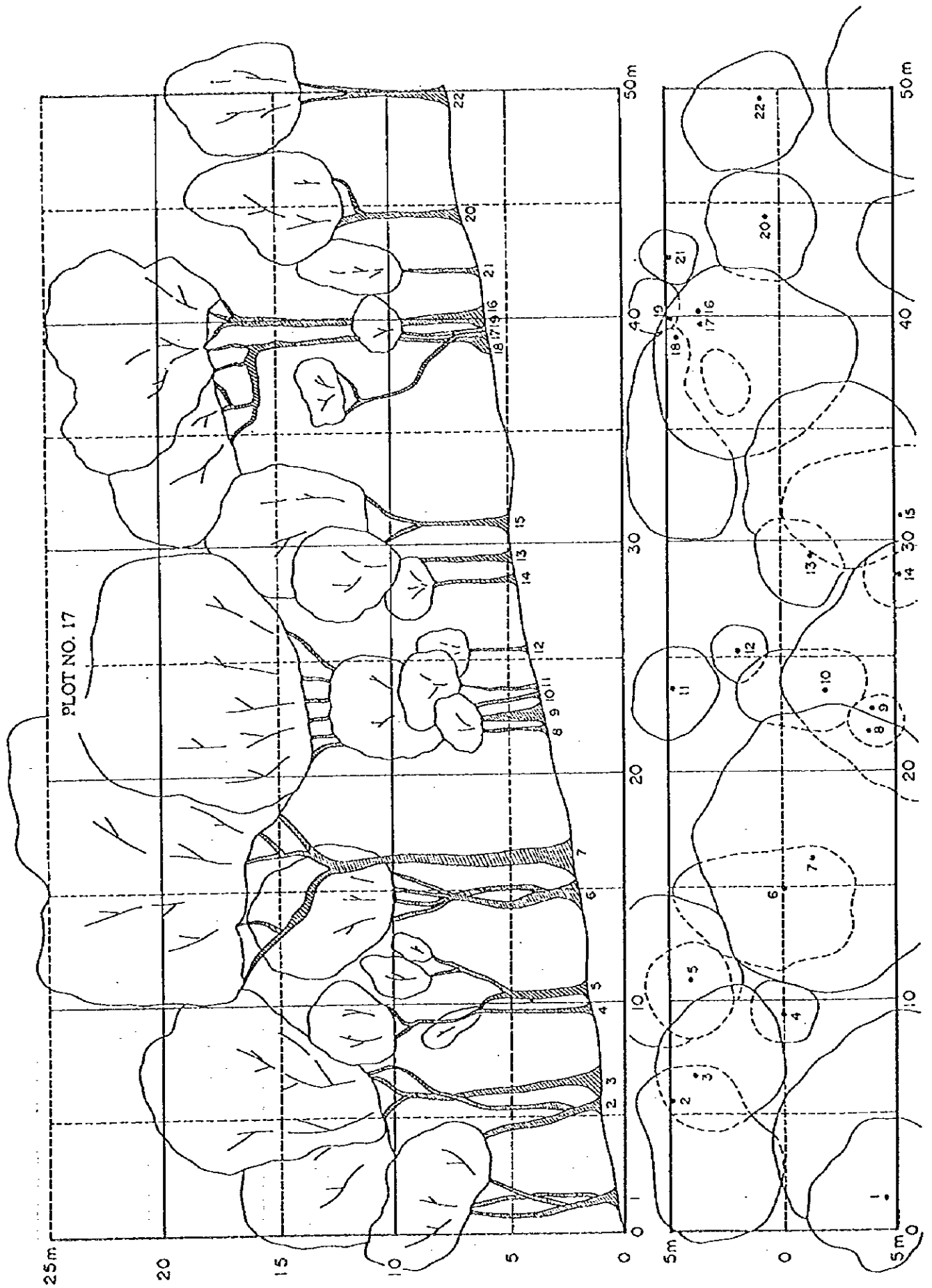
13. Sectional Profile and Crown Projection Diagram of Forest Survey Plots

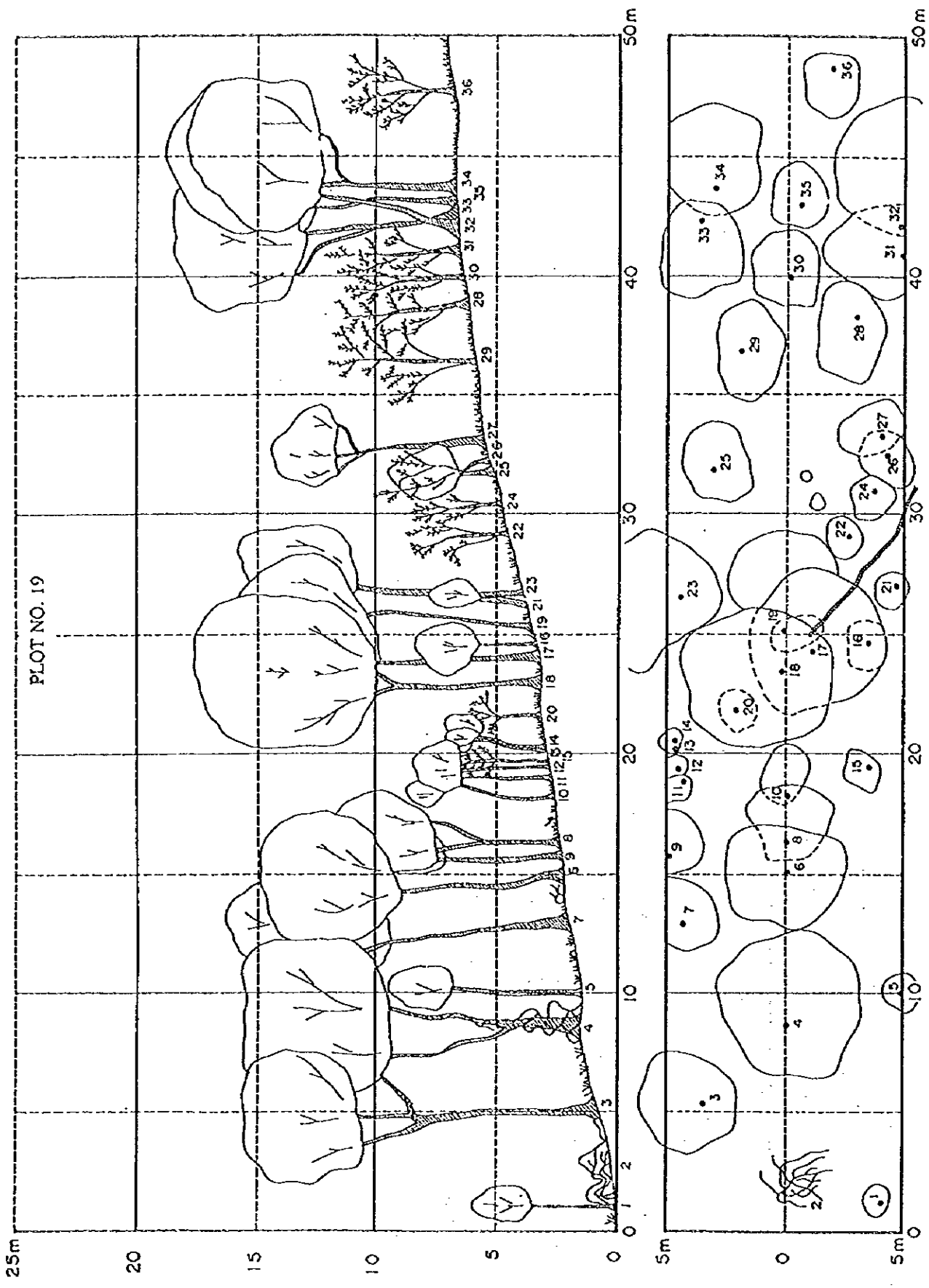


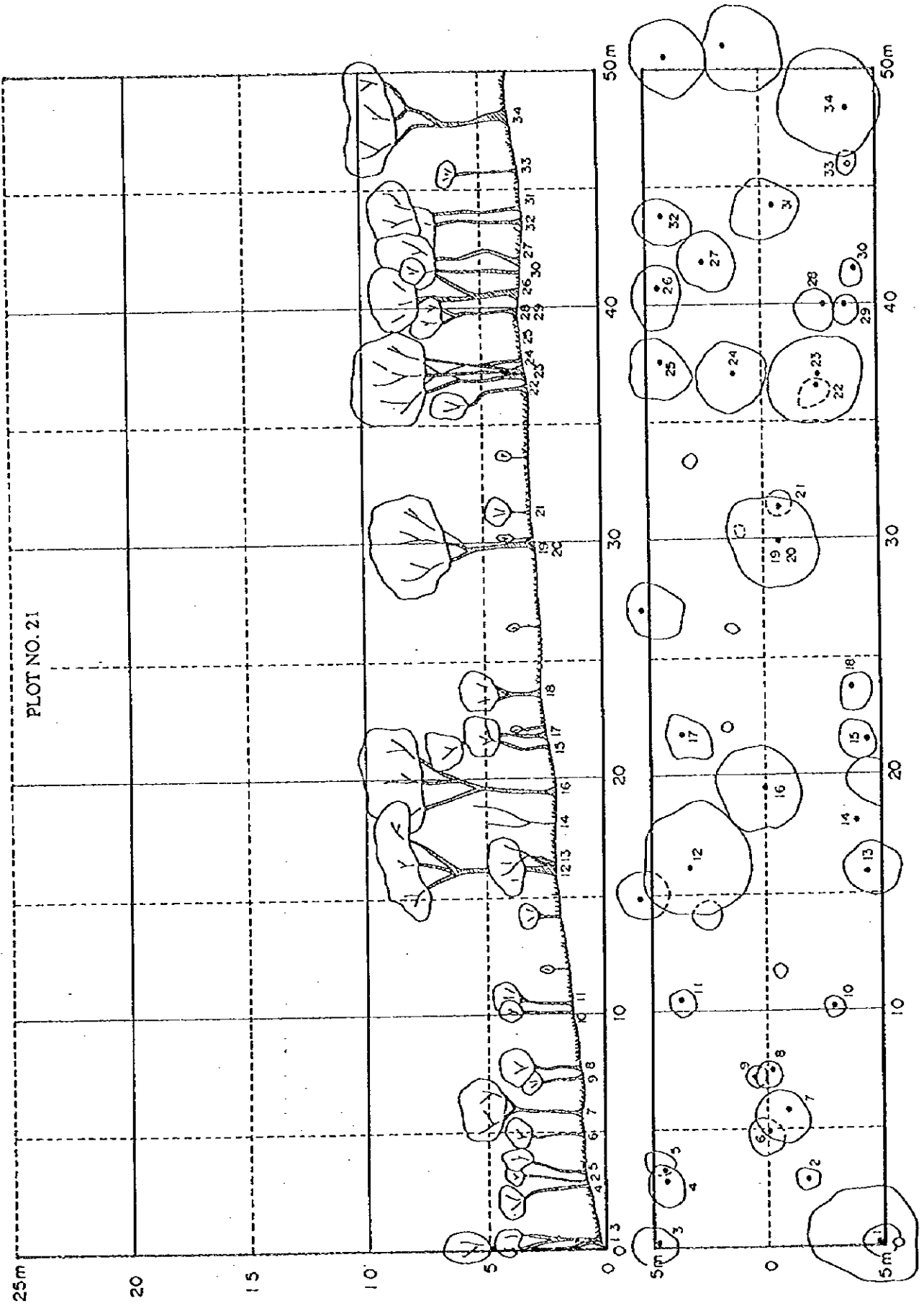
Longitudinal Section and Crown Projection Diagram by the Plots of Forest Survey
List of Tree Species

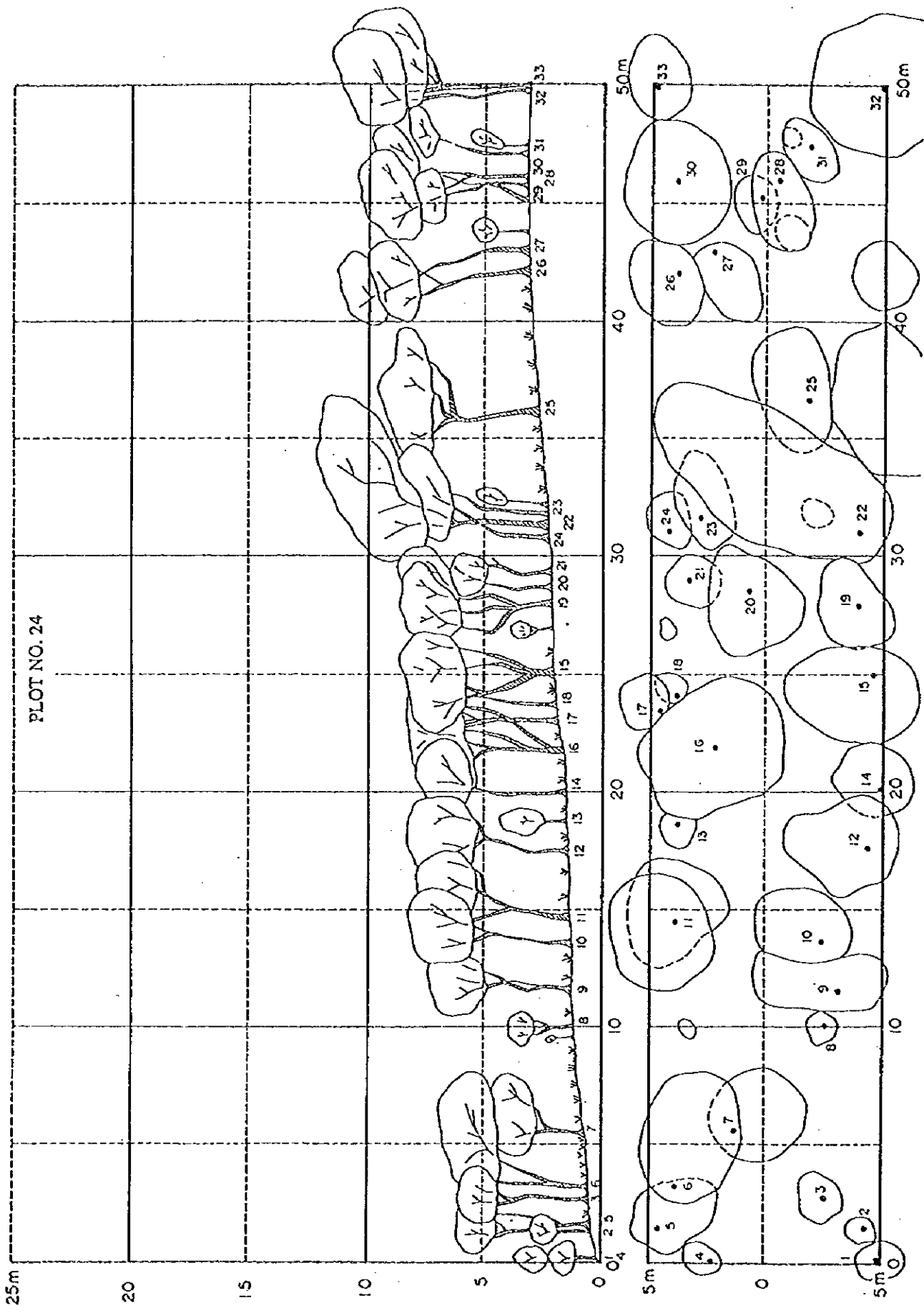
PLOT NO. 14		PLOT NO. 17		PLOT NO. 19		PLOT NO. 21		PLOT NO. 24		Riverside Forest	
1	<i>Jubernardia paniculata</i>	1	<i>Craibia brevicaudata</i>	1	<i>Psychotria nana</i>	1	<i>Uapaca nitida</i>	1	<i>Jubernardia paniculata</i>	1	<i>Breonadia microcephala</i>
2	<i>Brachystegia spiciformis</i>	2	<i>Craibia brevicaudata</i>	2	<i>Anpelycisus africana</i>	2	<i>Brachystegia boehmi</i>	2	<i>Protea sp., Faurea sp.</i>	2	<i>Syzygium guineense</i>
3	<i>Jubernardia paniculata</i>	3	<i>Chamaete cristata</i>	3	<i>Bridelia micrantha</i>	3	<i>Brachystegia boehmi</i>	3	<i>Jubernardia paniculata</i>	3	<i>Syzygium guineense</i>
4	<i>Pericopsis angolensis</i>	4	<i>Craibia brevicaudata</i>	4	<i>Miconia capensis</i>	4	<i>Uapaca kirikiana</i>	4	<i>Protea sp., Faurea sp.</i>	4	<i>Flacourtia indica</i>
5	<i>Pericopsis angolensis</i>	5	<i>Craibia brevicaudata</i>	5	<i>Polyphaeria lanceolata</i>	5	<i>Uapaca kirikiana</i>	5	<i>Jubernardia paniculata</i>	5	<i>Syzygium guineense</i>
6	<i>Jubernardia paniculata</i>	6	<i>Craibia brevicaudata</i>	6	<i>Trichilia emetica</i>	6	<i>Uapaca kirikiana</i>	6	<i>Jubernardia paniculata</i>	6	<i>Syzygium guineense</i>
7	<i>Jubernardia paniculata</i>	7	<i>Rauwolfia caffra</i>	7	<i>Bersama abyssinica</i>	7	<i>Uapaca kirikiana</i>	7	<i>Protea sp., Faurea sp.</i>	7	<i>Garcinia huillensis</i>
8	<i>Combretum zeyheri</i>	8	<i>Craibia brevicaudata</i>	8	<i>Trichilia emetica</i>	8	<i>Uapaca kirikiana</i>	8	<i>Pseudolachnostylis maprouneifolia</i>	8	<i>Diospyros zombensis</i>
9	<i>Protea sp., Faurea sp.</i>	9	<i>Craibia brevicaudata</i>	9	<i>Marhamia obtusifolia</i>	9	<i>Drachystegia boehmi</i>	9	<i>Diplorhynchus comolocarpon</i>	9	<i>Fluggea virosa</i>
10	<i>Jubernardia paniculata</i>	10	<i>Craibia brevicaudata</i>	10	<i>Trichilia emetica</i>	10	<i>Protea sp., Faurea sp.</i>	10	<i>Jubernardia paniculata</i>	10	<i>Breonadia microcephala</i>
11	<i>Pseudolachnostylis maprouneifolia</i>	11	<i>Telea nobilis</i>	11	<i>Dracaena laxissima</i>	11	<i>Brachystegia boehmi</i>	11	<i>Jubernardia paniculata</i>	11	<i>Garcinia huillensis</i>
12	<i>Protea sp., Faurea sp.</i>	12	<i>Craibia brevicaudata</i>	12	<i>Dracaena laxissima</i>	12	<i>Brachystegia floribunda</i>	12	<i>Jubernardia paniculata</i>	12	<i>Syzygium guineense</i>
13	<i>Jubernardia paniculata</i>	13	<i>Craibia brevicaudata</i>	13	<i>Polyphaeria lanceolata</i>	13	<i>Protea sp., Faurea sp.</i>	13	<i>Jubernardia paniculata</i>	13	<i>Diospyros zombensis</i>
14	<i>Jubernardia paniculata</i>	14	<i>Craibia brevicaudata</i>	14	<i>Polyphaeria lanceolata</i>	14	<i>Dead tree</i>	14	<i>Brachystegia longifolia</i>	14	<i>Bersama abyssinica</i>
15	<i>Combretum zeyheri</i>	15	<i>Craibia brevicaudata</i>	15	<i>Erythroxylum emarginatum</i>	15	<i>Jubernardia paniculata</i>	15	<i>Uapaca kirikiana</i>	15	<i>Syzygium guineense</i>
16	<i>Jubernardia paniculata</i>	16	<i>Craibia brevicaudata</i>	16	<i>Erythroxylum emarginatum</i>	16	<i>Jubernardia paniculata</i>	16	<i>Uapaca kirikiana</i>	16	<i>Garcinia huillensis</i>
17	<i>Combretum zeyheri</i>	17	<i>Trichilia emetica</i>	17	<i>Rauwolfia caffra</i>	17	<i>Jubernardia paniculata</i>	17	<i>Jubernardia paniculata</i>	17	<i>Jubernardia paniculata</i>
18	<i>Pericopsis angolensis</i>	18	<i>Chamaete cristata</i>	18	<i>Rauwolfia caffra</i>	18	<i>Drachystegia boehmi</i>	18	<i>Jubernardia paniculata</i>	18	<i>Breonadia microcephala</i>
19	<i>Drachystegia spiciformis</i>	19	<i>Craibia brevicaudata</i>	19	<i>Rauwolfia caffra</i>	19	<i>Uapaca kirikiana</i>	19	<i>Uapaca kirikiana</i>	19	<i>Diospyros zombensis</i>
20	<i>Lannea schimperii</i>	20	<i>Craibia brevicaudata</i>	20	<i>Dracaena laxissima</i>	20	<i>Uapaca kirikiana</i>	20	<i>Uapaca kirikiana</i>	20	<i>Syzygium guineense</i>
21	<i>Vangueria infausta</i>	21	<i>Chamaete cristata</i>	21	<i>Erythroxylum emarginatum</i>	21	<i>Brachystegia boehmi</i>	21	<i>Protea sp., Faurea sp.</i>	21	<i>Diospyros zombensis</i>
22	<i>Pseudolachnostylis maprouneifolia</i>	22	<i>Craibia brevicaudata</i>	22	<i>Dracaena laxissima</i>	22	<i>Uapaca kirikiana</i>	22	<i>Brachystegia bussei</i>	22	<i>Bersama abyssinica</i>
23	<i>Vangueria infausta</i>			23	<i>Albizia adianthifolia</i>	23	<i>Uapaca kirikiana</i>	23	<i>Jubernardia paniculata</i>	23	<i>Syzygium guineense</i>
24	<i>Dead tree</i>			24	<i>Dracaena laxissima</i>	24	<i>Uapaca kirikiana</i>	24	<i>Jubernardia paniculata</i>	24	<i>Garcinia huillensis</i>
25	<i>Jubernardia paniculata</i>			25	<i>Dracaena laxissima</i>	25	<i>Brachystegia boehmi</i>	25	<i>Jubernardia paniculata</i>	25	<i>Syzygium guineense</i>
				26	<i>Psychotria nana</i>	26	<i>Uapaca kirikiana</i>	26	<i>Jubernardia paniculata</i>	26	<i>Syzygium guineense</i>
				27	<i>Bersama abyssinica</i>	27	<i>Uapaca kirikiana</i>	27	<i>Jubernardia paniculata</i>	27	<i>Breonadia microcephala</i>
				28	<i>Dracaena laxissima</i>	28	<i>Uapaca kirikiana</i>	28	<i>Jubernardia paniculata</i>	28	<i>Syzygium guineense</i>
				29	<i>Dracaena laxissima</i>	29	<i>Uapaca kirikiana</i>	29	<i>Jubernardia paniculata</i>	29	<i>Syzygium guineense</i>
				30	<i>Dracaena laxissima</i>	30	<i>Uapaca kirikiana</i>	30	<i>Jubernardia paniculata</i>	30	<i>Combretum molle</i>
				31	<i>Dracaena laxissima</i>	31	<i>Uapaca kirikiana</i>	31	<i>Jubernardia paniculata</i>	31	<i>Syzygium guineense</i>
				32	<i>Bridelia micrantha</i>	32	<i>Protea sp., Faurea sp.</i>	32	<i>Uapaca kirikiana</i>	32	<i>Flacourtia indica</i>
				33	<i>Albizia adianthifolia</i>	33	<i>Protea sp., Faurea sp.</i>	33	<i>Jubernardia paniculata</i>	33	<i>Syzygium guineense</i>
				34	<i>Chionanthus battiscombei</i>	34	<i>Brachystegia boehmi</i>			34	<i>Diospyros zombensis</i>
				35	<i>Erythroxylum emarginatum</i>					35	<i>Garcinia huillensis</i>
				36	<i>Dracaena laxissima</i>					36	<i>Garcinia huillensis</i>
										37	<i>Breonadia microcephala</i>
										38	<i>Diospyros zombensis</i>
										39	<i>Syzygium guineense</i>
										40	<i>Vitex doniana</i>
										41	<i>Hydnocarpus orientalis</i>

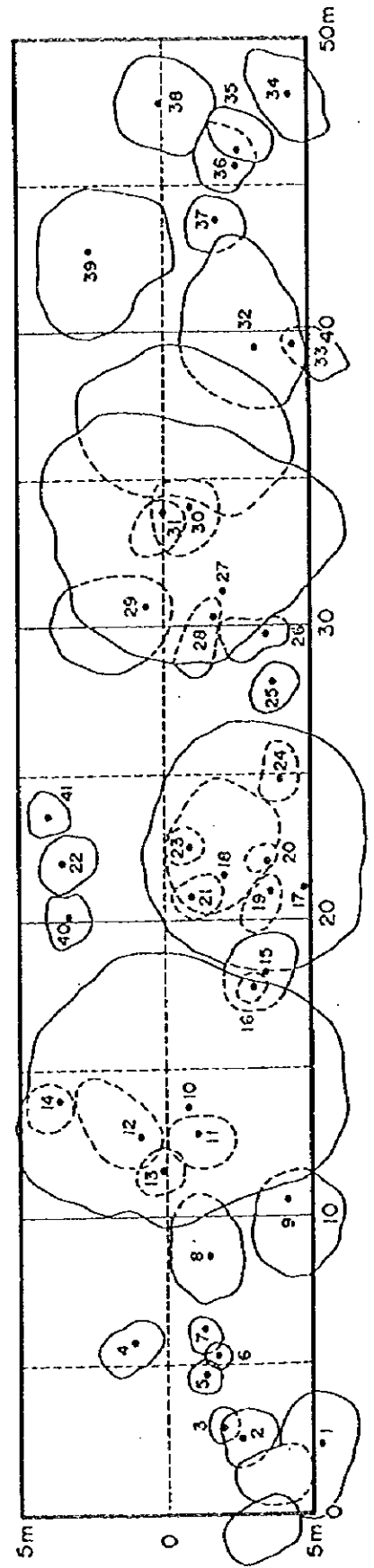
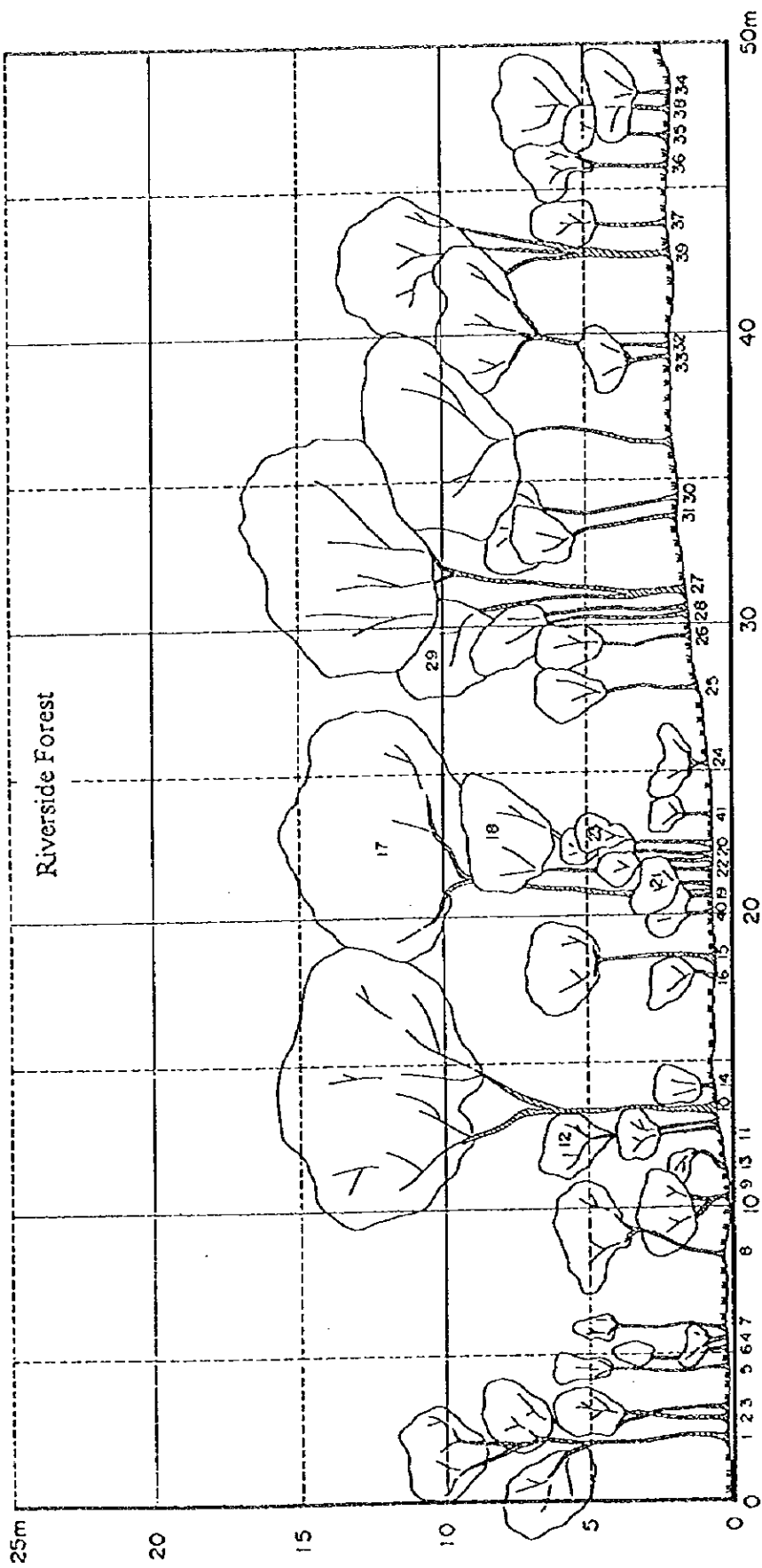














14. List of Understory Plants in the Reserve



List of Understory Plants in the Reserve

Family	Species	Class	Animal
Dayalliaceae	<i>Nephrolepis</i> sp.	Hb	
Aspleniaceae	<i>Asplenium</i> sp.	Hb	
Annonaceae	<i>Annona senegalensis</i>	Tr	
Ranunculaceae	<i>Clematopsis scabiosifolia</i>	Hb/Sh	none
Ochnaceae	<i>Brackenridgea</i> sp.	Tr/Sh	
	<i>Ochna holstii</i>	Tr	
	<i>Ochna leptoclada</i>	?	
	<i>Ochna stolzii</i>	?	
Dipterocarpaceae	<i>Monotes africanus</i>	Tr	
Tiliaceae	<i>Corchorus trilocularis</i>	Hb	
	<i>Grewia</i> sp.	Hb	
Malvaceae	<i>Hibiscus cannabinus</i>	Hb	
	<i>Hibiscus</i> sp.	Hb	
Capparidaceae	<i>Cleome monophylla</i>	Hb	
Flacourtiaceae	<i>Flacourtia indica</i>	Tr	
Cucurbitaceae	<i>Cucumis</i> sp.	Cl/Hb?	
Ebenaceae	<i>Diospyros kirkii</i>	Tr	
Leguminosae	<i>Abrus precatorius</i>	Sh/Cl	
	<i>Abrus</i> sp.	?	common
	<i>Acacia</i> sp.	Tr	
	<i>Aeschynomene</i> sp.	Sh?	
	<i>Brachystegia boehmii</i>	Tr	
	<i>Brachystegia longifolia</i>	Tr	common
	<i>Brachystegia manga</i>	Tr	
	<i>Crotalaria</i> sp.	Hb	
	<i>Dalbergia fischeri</i>	Cl	
	<i>Desmodium creeper</i>	Hb	
	<i>Desmodium repandum</i>	Hb	
	<i>Dolichos kilimandscharicus</i>	Hb	
	<i>Droogmansia pteropus</i>	Hb	
	<i>Eriosema affine</i>	Sh	
	<i>Eriosema ellipticum</i>	Sh	
	<i>Eriosema</i> sp.	Hb	common
	<i>Flemingia gradam</i>	Sh	
	<i>Julbernardia globiflora</i>	Tr	
	<i>Julbernardia paniculata</i>	Tr	elephant
	<i>Mucuna stans</i>	Cl	
	<i>Piliostigma thonningii</i>	Tr	
	<i>Sesbania sesban</i>	Sh	
	<i>Tephrosia</i> sp.	Sh	
Thymelaeaceae	<i>Gnidia</i> sp.	?	none
Combretaceae	<i>Combretum canum</i>	?	
Myrtaceae	<i>Syzygium cordatum</i>	Tr	
Melastomaceae	<i>Dissotis princeps</i>	Sh	
Meliaceae	<i>Turraea nilotica</i>	Sh	
Anacardiaceae	<i>Lannea edulis</i>	Sh	
	<i>Ozoroa veticitus</i>	?	
Sapindaceae	<i>Zanha golungensis</i>	Tr	

Family	Species	Class	Animal
Polygalaceae	<i>Polygala</i> sp.	?	
Rhamnaceae	<i>Ziziphus mucronata</i>	Tr	
Vitaceae	<i>Cissus gummifera</i>	Cl	
	<i>Cissus integrifolia</i>	Cl	
	<i>Cissus petiola</i>	?	
	<i>Cissus rubiginosa</i>	Cl	common
	<i>Cissus</i> sp.	?	
	<i>Cyphostemma</i> sp.	?	
	<i>Cyphostemma zombense</i>	Sh	
Euphorbiaceae	<i>Acalypha villicaulis</i>	?	none
	<i>Antidesma venosum</i>	Tr	
	<i>Bridelia cathartica</i>	Tr	
	<i>Euphorbia nummifolia</i>	?	
	<i>Euphorbia</i> sp.	?	common
	<i>Phyllanthus nummunifolia</i>	?	none
	<i>Phyllanthus</i> sp.	?	eland
	<i>Pseudolachnostylis maprouneifolia</i>	Tr	
	<i>Uapaca kirkiana</i>	Tr	
	<i>Uapaca nitida</i>	Tr	
Araliaceae	<i>Cussonia abyssinica</i>	Tr?	
Umbelliferae	<i>Lefebvrea umbellifera</i>	Hb?	
Moraceae	<i>Ficus cycomorus</i>	?	
Proteaceae	<i>Faurea saligna</i>	Tr	none
	<i>Faurea speciosa</i>	Tr	
	<i>Protea welwitschii</i>	Sh	
Oleaceae	<i>Jasminum</i> sp.	Hb	none
Loganiaceae	<i>Strychnos innocua</i>	Tr	
Gentianaceae	<i>Swertia</i> sp.	Hb	
Apocynaceae	<i>Diplorhynchus condylocarpon</i>	Tr	
Asclepiadaceae	<i>Cryptolepis nigritana</i>	Sh	
	<i>Ectadiopsis oblongifolia</i>	Sh	
Convolvulaceae	<i>Ipomoea tenuirostris</i>	Hb	
Bignoniaceae	<i>Stereospermum kunthianum</i>	Tr	
Solanaceae	<i>Solanum nigrum</i>	Hb?	
Pedaliaceae	<i>Sesamum angolense</i>	Hb	none
Acanthaceae	<i>Blepharis</i> sp.	Hb	common
	<i>Thunbergia lanceolata</i>	Hb	bushbuck, bushpig
Verbenaceae	<i>Clerodendrum myricoides</i>	Sh	
	<i>Lippia javanica</i>	Sh	
	<i>Vitex doniana</i>	Tr	
Labiatae	<i>Becium obovatum</i>	Hb	none
	<i>Hoslundia opposita</i>	Hb	
	<i>Leonotis mollissima</i>	?	
	<i>Plectranthus shirensis</i>	Hb	
Rubiaceae	<i>Fadogia andongonsis</i>	?	
	<i>Fadogia</i> sp.	?	common
	<i>Galium chloroionanthum</i>	Hb	worthog, bushpig
	<i>Galium</i> sp.	?	
	<i>Gardenia</i> sp.	Hb	
	<i>Psychotria kirkii</i>	?	common

Family	Species	Class	Animal
Rubiaceae	<i>Spermacoce umbricata</i>	?	
	<i>Temnocalyx obovatus</i>	Hb	
	<i>Xeromphis obovata</i>	Sh	
Compositae	<i>Anisopappus</i> sp.	Hb	
	<i>Aspilia kotschyi</i>	Hb	none
	<i>Aspilia mossambicensis</i>	?	
	<i>Bidens pilosa</i>	Hb	
	<i>Bidens pinnapatens</i>	?	
	<i>Bidens</i> sp.	?	
	<i>Dicoma sessifolia</i>	?	
	<i>Elephantopus</i> sp.	Hb	none
	<i>Erythrocephalum</i> sp.	Hb	
	<i>Eupatorium</i> sp.	Hb	duiker, monkey, bushpig
	<i>Helichrysum kirkii</i>	Hb	
	<i>Helichrysum</i> sp.	Hb?	none
	<i>Inula glomerata</i>	Hb	
	<i>Melanthera</i> sp.	Hb	
	<i>Nidorella auriculata</i>	Hb	
	<i>Nidorella</i> sp.	Hb?	
	<i>Senecio latifolius</i>	Hb	none
<i>Sonchus</i> sp.	Hb?		
<i>Vernonia glabra</i>	Hb		
Commelinaceae	<i>Aneilema aequilum</i>	Hb	
	<i>Aneilema africanus</i>	Hb	none
	<i>Aneilema</i> sp.	Hb	
	<i>Commelina africana</i>	Hb	none
	<i>Commelina benghalensis</i>	Hb	none
	<i>Floscopa</i> sp.	Hb	none
	<i>Floscopa triclestela</i>	Hb	
Zingiberaceae	<i>Aframomum angustifolium</i>	Hb	
Liliaceae	<i>Albuca</i> sp.	Hb	
	<i>Asparagus africanus</i>	Hb/Cl	
	<i>Gloriosa simplex</i>	Hb?	
Smilacaceae	<i>Smilax kraussiana</i>	Cl	
Amaryllidaceae	<i>Crinum whitei</i>	?	
Iridaceae	<i>Gladiolus denal</i>	Hb	none
Hypoxidaceae	<i>Hypoxis nyassica</i>	Hb	common
Taccaceae	<i>Tacca leontopetaloides</i>	Hb	common
	<i>Tacca</i> sp.	?	
Cyperaceae	<i>Carex racemosa</i>	Hb	none
	<i>Carex</i> sp.	Hb	none
	<i>Cyperus alternifolius</i>	Hb	
	<i>Cyperus</i> sp.	Hb	none
	<i>Kyllinga</i> sp.	Hb	none
Gramineae	<i>Digitaria gazensis</i>	Hb	common
	<i>Digitaria</i> sp.	Hb	common
	<i>Echinocloa</i> sp.	Hb	common
	<i>Eragrostis phyllamites</i>	Hb	
	<i>Eragrostis</i> sp.	Hb	common
	<i>Heteropogon contortus</i>	Hb	

Family	Species	Class	Animal
Gramineae	<i>Hyparrhenia filipendula</i>	Hb	
	<i>Hyparrhenia gazensis</i>	Hb	common
	<i>Hyparrhenia nyassae</i>	Hb	common
	<i>Hyparrhenia rufa</i>	Hb	common
	<i>Hyparrhenia</i> sp.	Hb	
	<i>Imperata cylindrica</i>	Hb	common
	<i>Leersia hexandra</i>	Hb	common
	<i>Melinis repens</i>	Hb	
	<i>Oryza</i> sp.	Hb	common
	<i>Panicum gazensis</i>	Hb	
	<i>Phragmites mauritianus</i>	Hb	
	<i>Pogonarthria squarrosa</i>	Hb	
	<i>Pogonarthria unisela</i>	Hb	common
	<i>Rottboellia exaltata</i>	Hb	common
	<i>Rottboellia</i> sp.	Hb	
	<i>Setaria pumila</i>	Hb	
	<i>Setaria purpurea</i>	Hb	
	<i>Setaria sphacelata</i>	Hb	common
	<i>Sporobolus pyramidalis</i>	Hb	
	<i>Sporobolus</i> sp.	Hb	
<i>Themeda triandra</i>	Hb	common	
?	<i>Actinolepis asclepi</i>	?	
?	<i>Albostylis</i> sp.	?	common
?	<i>Ampelocissus</i> sp.	?	
?	<i>Fern thylepteris</i>	?	
?	<i>Floerens needeg</i>	?	common
?	<i>Multidentia crassum</i>	?	common
?	<i>Senna singuena</i>	?	
?	<i>Thypteris</i> sp.	?	none
?	<i>Triclecceras longepedunita</i>	?	

Remarks Tr : Tree, Sh : Shrub, Hb : Herb, Cl : Climber

15. Results of the Understory Vegetation by Quadrat



Results of the Understory Vegetation Survey (Rainy Season) per 4m²

Remarks : Sub-total (1) : Fodder plants
 Sub-total (2) : Non-fodder plants
 W (R) (g) : Raw weight
 W (D) (g) : Dry weight

Quadrat No. 1 (Miombo Forest)		Forest Type : H, L		
Species		W (R) (g)	W (D) (g)	Height (cm)
1 <i>Eragrostis</i> sp.	Hb	320	94.1	51
2 <i>Digitaria gazensis</i>	Hb	69	20.3	40
3 <i>Eriosema</i> sp.	Hb	2	0.6	12
Sub-total (1)		389	115.0	—
4 <i>Cyperus</i> sp.	Hb	70	20.6	42
5 <i>Floscopa</i> sp.	Hb	110	32.3	33
6 <i>Floscopa</i> sp.	Hb	52	15.3	30
7 <i>Elephantopus</i> sp.	Hb	26	7.6	5
8 <i>Becium obovatum</i>	Hb	4	1.2	23
9 <i>Aspilia kotschyi</i>	Hb	15	4.4	20
10 <i>Commelina africana</i>	Hb	5	1.5	28
11 <i>Kyllinga</i> sp.	Hb	2	0.6	15
Sub-total (2)		284	83.5	—
TOTAL		673	198.5	—

Quadrat No. 2 (Dry Grassland)		W (F) (g)	W (D) (g)	Height (cm)
Species				
1 <i>Eragrostis</i> sp.	Hb	360	105.8	60
2 <i>Themeda triandra</i>	Hb	89	26.2	37
3 <i>Pogonarthria unisela</i>	Hb	68	20.0	66
4 <i>Floerens needeg</i>	?	9	2.6	36
Sub-total (1)		526	154.6	—
5 <i>Becium obovatum</i>	Hb	160	47.0	22
6 <i>Carex</i> sp.	Hb	9	2.6	35
Sub-total (2)		169	49.7	—
TOTAL		695	204.3	—

Quadrat No. 3 (Miombo Forest)		Forest Type : H, D		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Digitaria gazensis</i>	Hb	590	173.5	50
2 <i>Albostylis</i> sp.	?	22	6.5	43
3 <i>Abrus</i> sp.	?	46	13.5	40
4 <i>Euphorbia</i> sp.	?	10	2.9	16
5 <i>Brachystegia longifolia</i>	Tr	690	202.9	27
Sub-total (1)		1,358	399.3	—
6 <i>Cyperus</i> sp.	Hb	150	44.1	55
7 <i>Becium obovatum</i>	Hb	19	5.6	16
Sub-total (2)		169	49.7	—
TOTAL		1,527	448.9	—

Quadrat No. 4 (Seasonally Wet Grassland)

Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Setaria sphacelata</i>	Hb	2,280	670.3	120
2 <i>Echinochloa</i> sp.	Hb	7,000	2,058.0	105
3 <i>Imperata cylindrica</i>	Hb	520	152.9	110
Sub-total (1)		9,800	2,881.2	--
TOTAL		9,800	2,881.2	--

Quadrat No. 5 (Seasonally Wet Grassland)

Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Setaria sphacelata</i>	Hb	720	211.7	110
2 <i>Echinochloa</i> sp.	Hb	6,000	1,764.0	130
3 <i>Hyparrhenia rufa</i>	Hb	4,600	1,352.4	100
Sub-total (1)		11,320	3,328.1	--
TOTAL		11,320	3,328.1	--

Quadrat No. 6 (Miombo Forest)

Forest Type : M, L

Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Digitaria gazensis</i>	Hb	500	147.0	43
2 <i>Brachystegia longifolia</i>	Tr	240	70.6	22
Sub-total (1)		740	217.6	--
3 <i>Cyperus</i> sp.	Hb	68	20.0	15
Sub-total (2)		68	20.0	--
TOTAL		808	237.6	--

Quadrat No. 7 (Miombo Forest)

Forest Type : M, D

Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Hyparrhenia rufa</i>	Hb	320	94.1	80
2 <i>Hyparrhenia nyassae</i>	Hb	240	70.6	75
3 <i>Digitaria gazensis</i>	Hb	120	35.3	38
4 <i>Blepharis</i> sp.	Hb	160	47.0	40
Sub-total (1)		840	247.0	--
5 <i>Gladiolus denal</i>	Hb	52	15.3	55
6 <i>Cyperus</i> sp.	Hb	42	12.3	60
7 <i>Acalypha villicaulis</i>	?	110	32.3	36
Sub-total (2)		204	60.0	--
TOTAL		1,044	306.9	--

Quadrat No. 8 (Miombo Forest)		Forest Type : L, L		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Digitaria gazensis</i>	Hb	680	199.9	50
2 <i>Oryza sp.</i>	Hb	320	94.1	42
3 <i>Hyparrhenia gazensis</i>	Hb	130	38.2	45
4 <i>Albostylis sp.</i>	?	65	19.1	10
5 <i>Hypoxis nyassica</i>	Hb	6	1.8	25
Sub-total (1)		1,201	353.1	--
6 <i>Carex racemosa</i>	Hb	85	25.0	42
7 <i>Becium obovatum</i>	Hb	35	10.3	15
Sub-total (2)		120	35.3	--
TOTAL		1,321	388.4	--

Quadrat No. 9 (Miombo Forest)		Forest Type : L, D		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Digitaria gazensis</i>	Hb	97	28.5	38
2 <i>Brachystegia longifolia</i>	Tr	101	29.7	18
3 <i>Eriosema ellipticum</i>	Sh	24	7.1	35
4 <i>Eragrostis phyllamites</i>	Hb	51	15.0	56
5 <i>Thunbergia lanceolata</i>	?	44	12.9	17
6 <i>Abrus precatorius</i>	Sh/Cl	6	1.8	10
Sub-total (1)		323	95.0	--
7 <i>Carex racemosa</i>	Hb	137	40.3	42
8 <i>Becium obovatum</i>	Hb	48	14.0	9
9 <i>Ochna leptoclada</i>	?	8	2.4	17
10 <i>Cyperus sp.</i>	Hb	4	1.2	46
11 <i>Aspilia kotschyi</i>	Hb	12	3.5	38
Sub-total (2)		209	61.3	--
TOTAL		532	156.3	--

Quadrat No. 10 (Miombo Forest)		Forest Type : L, D		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Eupatorium</i> sp.	Hb	110	32.3	55
2 <i>Ectadiopsis oblongifolia</i>	Sh	15	4.4	32
3 <i>Psychotria kirkii</i>	?	20	5.9	6
4 <i>Hyparrhenia filipendula</i>	Hb	480	141.1	55
5 <i>Thunbergia lanceolata</i>	Hb	21	6.2	27
6 <i>Cissus rubiginosa</i>	Cl	33	9.7	33
7 <i>Fadogia</i> sp.	?	43	12.6	46
8 <i>Multidentia crassum</i>	?	25	7.4	25
9 <i>Tacca leontopetaloides</i>	Hb	26	7.6	36
Sub-total (1)		773	227.3	—
10 <i>Senecio</i> sp.	Hb	18	5.3	8
11 <i>Jasminum</i> sp.	Hb	3	0.9	27
12 <i>Clematopsis scabiosifolia</i>	Hb/Sh	24	7.1	68
13 <i>Acalypha villicaulis</i>	?	9	2.6	22
14 <i>Commelina benghalensis</i>	Hb	3	0.9	18
15 <i>Aspilia kotschyi</i>	Hb	5	1.5	24
16 <i>Carex racemosa</i>	Hb	70	20.6	48
17 <i>Helichrysum</i> sp.	Hb?	7	2.1	56
Sub-total (2)		139	40.9	—
TOTAL		912	268.1	—

Quadrat No. 11 (Miombo Forest)		Forest Type : M, M		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Thunbergia lanceolata</i>	Hb	47	13.8	30
2 <i>Brachystegia longifolia</i>	Tr	520	152.9	25
3 <i>Digitaria gazensis</i>	Hb	140	41.2	49
4 <i>Eragrostis</i> sp.	Hb	8	2.4	62
5 <i>Echinochloa</i> sp.	Hb	81	23.8	50
6 <i>Phyllanthus</i> sp.	?	4	1.2	15
7 <i>Euphorbia</i> sp.	?	10	2.9	12
Sub-total (1)		810	238.1	—
8 <i>Becium obovatum</i>	Hb	90	26.5	38
9 <i>Faurea saligna</i>	Tr	37	10.9	30
10 <i>Thypteris</i> sp.	?	94	27.6	22
11 <i>Aneilema africanus</i>	Hb	20	5.9	30
12 <i>Cyperus</i> sp.	Hb	14	4.1	65
13 <i>Aspilia kotschyi</i>	Hb	17	5.0	36
14 <i>Carex racemosa</i>	Hb	74	21.8	52
Sub-total (2)		346	101.7	—
TOTAL		1,156	339.9	—

Quadrat No. 12 (Miombo Forest)		Forest Type : H, M		
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Julbernardia paniculata</i>	Tr	120	35.3	45
2 <i>Brachystegia longifolia</i>	Tr	460	135.2	32
3 <i>Digitaria gazensis</i>	Hb	140	41.2	43
4 <i>Echinochloa</i> sp.	Hb	400	117.6	47
Sub-total (1)		1,120	329.3	--
5 <i>Cyperus</i> sp.	Hb	160	47.0	70
6 <i>Becium obovatum</i>	Hb	80	23.5	28
7 <i>Carex racemosa</i>	Hb	69	20.3	43
8 <i>Gnidia</i> sp.	?	55	16.2	30
Sub-total (2)		364	107.0	--
TOTAL		1,484	436.3	--

Quadrat No. 13 (Seasonally Wet Grassland)				
Species		W (F) (g)	W (D) (g)	Height (cm)
1 <i>Leersia hexandra</i>	Hb	1,860	546.8	75
2 <i>Rottboellia exaltata</i>	Hb	2,440	717.4	120
Sub-total (1)		4,300	1,264.2	--
3 <i>Phyllanthus nummunrifolia</i>	?	110	32.3	43
4 <i>Sesamum angolense</i>	Hb	680	199.9	76
Sub-total (2)		790	232.3	--
TOTAL		5,090	1,496.5	--

REMARKS : Forest Type

Code	Tree Height	Density
H, D	High	Dense
H, M	High	Medium
H, L	High	Low
M, D	Medium	Dense
M, M	Medium	Medium
M, L	Medium	Low
L, D	Low	Dense
L, M	Low	Medium
L, L	Low	Low



16. Medicinal Plants and Their Use in Malawi

Medical Plants and Their Use in Malawi

Family	Plant Name		Use
	Scientific	Local	
Moraceae	<i>Ficus capensis</i>	Nbundu, Mvundu	roots : stomachache
	<i>Ficus</i> spp.	Kachere	roots : balm
Proteaceae	<i>Protea</i> spp., <i>Fourea</i> spp.	Chiwe	roots : stomachache
Annonaceae	<i>Annona senegalensis</i>	Mpoza	leaf tips & stem bark : colds, stomach ache / bark : dress women's hair
Ranunculaceae	<i>Clematis simensis</i>	Liundumula, Chisacha mabvu	roots : asthma
	<i>Clematopsis scabiosifolia</i>	Chanzi	tuber : syphilis, headaches, mental disease / flowers : colds
Menispermaceae	<i>Cocculu hirsutus</i>	Namagoeka	leaves : massage polio affected limbs, vegetable
Dipterocarpaceae	<i>Monotes africanus</i>	Mkalakate	stem bark : toothache
Guriferae	<i>Pterospermum febrifugum</i>	Msiloti, Mdima	leaves : scabies, skin diseases / roots : heartburn, high blood pressure
Cruciferae	<i>Brassica campestris</i> , <i>B. chinensis</i>	Kabizi, Kabidzi	stem bark : bleeding in monthly period
Rosaceae	<i>Parinari curatellifolia</i>	Muula	roots : stomachache
Ceanaraceae	<i>Byrsocarpus orientalis</i>	Msiloti (Kavundula)	roots : abortion
Leguminosae	<i>Acacia abida</i>	Nsangu	stem bark : diarrhoea, tumers, internal cancer
	<i>Aeschynomene ryanana</i>	Kanyata	root : oedeme
	<i>Azela quanzensis</i>	Msantamfumu	stem bark : body care
	<i>Bauhinia thonningii</i>	Chitseketeke	roots : stomachache
	<i>Brachystegia floribunda</i>	Tsamba	leaves : cataract, trachoma
	<i>Cajanus cajan</i>	Nandolo	leaves : irrigate eyes after a snake spits / roots : urinary diseases
	<i>Cassia petersiana</i>	Mpsa-chokolo	roots : coughs, colds, syphilis, stomach ache, anthelmintic / leaves : dysentery
	<i>Dalbergia nitidula</i>	Mkalasinga	leaves : eyeache
	<i>Dalbergia nitidula</i>	Mkhalasinga	roots : cough, bilharzia / leaves : abscess
	<i>Dalbergiella ryanae</i> , <i>Bauhinia petersiana</i>	Mvundu, Mvundu	fruits : snakebite
	<i>Dichrostachys cinerea</i>	Mpangala	leaves : reduce pains when pregnant
	<i>Elephantorrhiza goetzei</i>	Chiteta	tuber : disease of women after child-birth, laxative, venereal diseases, promote fertility in women
	<i>Eriada pursceitha</i> , <i>Tylosema fassoglensis</i>	Mkulumu	roots : body care
	<i>Jubernardia paniculata</i>	Mtoodo	roots : diarrhoea
	<i>Mucuna stans</i> , <i>Stizolobium aterrimum</i>	Chitedze (Mukhalasonga)	roots : bilharzia, stop monthly period
	<i>Piliostigma thonningii</i>	Msekese (Chitumbe)	roots : toothache
	<i>Pterocarpus angolensis</i>	Mlombwa	stem bark : diarrhoea
<i>Pterocarpus</i> sp.	Mkulu	roots : stomachache	
<i>Vigna unguiculata</i>	Khobwe	roots : bookworm, asthma	
Euphorbiaceae	<i>Acalypha senensis</i>	Chigaga	root : massage for oedema, diarrhoea, intestinal worms, renal diseases
	<i>Bridelia ferruginea</i> , <i>B. micrantha</i>	Mpsa	roots : stomachache
	<i>Euphorbia tirucalli</i>	Nkhadzi, -ze	roots : mental derangement
	<i>Phyllanthus guineensis</i>	Mtanthanyerere	leaves : irrigate sore eyes, cataract / roots : rheumatism
	<i>Pseudolachnostylis macrouneifolia</i>	Msololo	roots & stem bark : tumors / leaves : diarrhoea, earache, massage polio affected limbs / roots : diarrhoea, desentery
	<i>Uopoca kirkiana</i>	Msuku	roots : tuberculosis / leaves : diarrhoea
Euphorbiaceae / Rosaceae	<i>Uopoca nitida</i>	Kasokorowe	leaves : stomachache (baby)
	<i>Artidesma venosum</i> / <i>Hirtella zanzibarica</i>	Mpungulira	leaves : tonic for pregnant women
Rutaceae	<i>Fagara</i> sp.	Mlunguchulu	roots : snake-bite
Simaroubaceae	<i>Harrisonia abyssinica</i>	Msalalasya	root bark : quicken delivery in overdue pregnancy cases
Meliaceae	<i>Ekebergia benguelensis</i>	Miyasefu (Msefu)	stem bark : skin diseases
	<i>Trichilia emetica</i>	Msikidzi, -tsi	stem bark : body care
Meliaceae / Sterculiaceae	<i>Khaya myrsica</i> / <i>Waltheria indica</i>	M'bawa	stem bark : body care
Polygalaceae	<i>Securidaca longepedunculata</i>	Bvazi	roots & leaves : bathe the head of a mental patient, headache / roots : aphrodisiac, chest complains, toothache / stem : cause abortion, contraceptive
Anacardiaceae	<i>Lannea schimperii</i> , <i>L. discolor</i>	Kaumba	stem bark : any diseases

Family	Plant Name		Use
	Scientific	Local	
Anacardiaceae	<i>Mangifera indica</i>	Yembe	roots : balm
	<i>Sclerocarya caffra</i>	Mfula, Msebe,	roots : body wash
Rhamnaceae	<i>Ziziphus mucronata</i>	Kankhade	stem bark : chest complains / leaves : boils, carbuncles / roots : dysentery, headache
Vitaceae	<i>Ampelocissus obtusata</i>	Mlelesya	? : stomachache, headache, menstruation pains
	<i>Cissus burchanaii</i>	Nomwalicheche	tuber : rheumatism, allied complaints, menstruation pains, barrenness in women, venereal diseases, cancer
	<i>Cissus cornifolia</i>	Mpelesya	rhizome : menstruation pains
	<i>Cissus integrifolia</i>	Mtambe	roots : rheumatism, febrifuge for malaria, influenza, colds, urinary diseases
	<i>Cissus jatrophioides</i>	Mwinimunda	tuber : rheumatism, allied complaints, menstruation pains, barrenness in women, venereal diseases, cancer
	<i>Cissus zombense</i>	Chiwanastika	tuber : rheumatism, allied complaints, menstruation pains, barrenness in women, venereal diseases, cancer
	<i>Cyphostema burchanaii</i> <i>Rhoicissus erythroides</i>	? Mpesa, Mpelesya	? tuber : barrenness in women, impotence in men, uterine cancer
Malvaceae	<i>Azanza garckeana</i>	Mtowo	roots : contraceptive
Sterculiaceae	<i>Sterculia africana</i>	Mgoza	stem bark : body wash
Flacourtiaceae	<i>Flacourtia india</i>	Mrudza	roots : baby care
Passifloraceae	<i>Adenia cissampeloides</i>	Mlozi	tuber : quicken delivery, ease pains / roots : prevent snakes / leaf : vegetable
Caricaceae	<i>Carica papaya</i>	Mpapaya	roots : gonorrhoea, syphilis, urinary diseases, tuberculosis / roots&stem bark : yellow fever / latex : antiseptic, astringent
Myrtaceae	<i>Eucalyptus</i> spp.	Mbuluganu	stem bark : cough
Combretaceae	<i>Combretum zeyheri</i>	Kalama	roots : stomachache
	<i>Terminalia sericea</i>	Naphini, Nyalisi	roots : tuberculosis, stomach ailments, internal cancer / stem bark : eye problem
Umbelliferae	<i>Sieganoniaenia araliacea</i>	Mpotoni, Mpandanjobvu	leaves : irrigate sore eyes, protect against wild animals
Ebenaceae	<i>Euclea crispa</i>	Mpukuso	roots : toothache
Loganiaceae	<i>Strychnos spinosa</i>	Mteme, Mateme, M'mwaje	roots&stem bark : colic, hepatitis / root bark : venereal diseases, stomach ache / leaves : cataract / roots : quicken delivery, increase spermatogenesis / leaves : bathe pelio affected limbs
Apocynaceae	<i>Carissa edulis</i>	Mpambulu	leaves : febrifuge, laxative / roots : kidney disorder, blood disorder / flower : jaundice / berry : anthelmintic in cattle and man
	<i>Conopharyngia elegans</i>	Kakope	?
	<i>Holarthra pubescens</i>	Nthombozi chipeta	roots : venereal diseases (gonorrhoea, syphilis)
	<i>Tabernaemontana elegans</i>	Kakope	latex : skin diseases
Rubiaceae	<i>Breonadia microcephala</i>	Mun'gona	roots : body wash
	<i>Ternstroemia obovatus</i>	Maso ya n'gombe	roots : stomachache
	<i>Poederia bojerana</i>	Mutuvetuve	roots : headache
	<i>Vangueria infausta</i>	Mvilu	roots : gonorrhoea, syphilis
	<i>Xeromphis obovata</i>	Chipembere, Msoadoka	roots : bilharzia, stomach ache, venereal diseases / leaves : irrigate infected eyes
	Boraginaceae	<i>Cordia abyssinica</i>	M'bwabwa
Verbenaceae	<i>Clerodendron uncinatum</i>	Likhodza	roots : bilharzia, bathe the head of a mental patient, bactericide for open sores
	<i>Vitex doniana</i>	Mphopya	stem bark : stomachache (pregnant)
Labiatae	<i>Ocimum canum</i>	Kaphavumba	leaves : cataract
Solanaceae	<i>Capsicum</i> spp.	Tsobola	roots : balm
	<i>Solanum panduriforme</i>	Nihulula	roots : snake-bite
Scrophulariaceae	<i>Halleria elliptica</i>	Mpulupulu	roots : snake-bite
Bignoniaceae	<i>Kigelia africana</i>	Mbvunguti	roots&leaves : syphilis, venereal diseases / stem bark&fruit : balm for sores and ulcers / fruit : bathe the head of a megaloccephalous child, enlarge the male genitalia when eaten
	<i>Stereospermum kunthianum</i>	Kafupa, Kavyunguti	roots : hiccup / stem bark : lint dress ulcers
	<i>Stereospermum</i> sp.	Mlakanjobvu	roots : body care for prevention
Pedaliaceae	<i>Sesuvium angolense</i>	Chewe, Chitowe, Mkuyu	leaves : smallpox / roots : hasten delivery / stem bark : increase milk for baby
Compositae	<i>Dicoma kurii</i>	Pabnjekanthu	roots : stomachache
	<i>Vernonia adoensis</i>	Futsa wa onwaruna, Futsa thengo	leaves : lumbago, rheumatism, constipation, backache, headache, sprains, swellings, tumours / roots : venereal diseases (gonorrhoea, syphilis)
Liliaceae	<i>Aloe</i> sp.	Khooje	whole plant : urinary diseases, increase prowess in the male genitalia, massage for elephantiasis

Family	Plant Name		Use
	Scientific	Local	
Liliaceae	<i>Asparagus africana</i>	Katsisi mzkwa	leaves & roots : bathe the head of a mental patient, headache, warts, calluses, skin lesions
	<i>Dracaena fragrans</i>	Mchemani	roots : aphrodisiac
	<i>Smilax kassiana</i>	Kwakwazi	leaves : earache, bactericide (eye infection)
Hypoxidaceae	<i>Hypoxis nyasica</i>	Kamba	tuber : barrenness in women, impotence in men, urinary diseases, internal cancer
Palmae	<i>Raphia farinifera</i>	Chiwale	leaflets & corn : skin diseases, warts
Musaceae	<i>Musa paradisiaca</i>	Ntochi	fruits : diarrhoea
?	?	Bwadzichefu	roots : mental derangement
?	?	Chababa	leaves : snake-bite
?	?	Chebe	leaves : balm
?	?	Chibwabwa	roots : any diseases
?	?	Chikwankwa	roots : body building (baby)
?	?	Chinthembwe khonjethengo	leaves : gonorrhoea, syphilis
?	?	Chisimbwe	leaves : diarrhoea
?	?	Chiwowa	roots : cough
?	?	Chizgutu	fruits : skin lesions
?	?	Kabezi	roots : gonorrhoea
?	?	Kabingazimu	roots : stomachache
?	?	Kakhoce	roots : ?
?	?	Kamoba	leaves : stomachache
?	?	Kamwazi	stem bark : diarrhoea
?	?	Kanjuro	roots : antidote (stomach)
?	?	Kenje	leaves : stomachache
?	?	Khomole	roots : tonic for men
?	?	Lamba	roots : body care
?	?	Lukwakwazi	leaves & roots : stomachache
?	?	Malaza	roots : gonorrhoea
?	?	Malimawo	roots : diarrhoea, gonorrhoea, syphilis
?	?	Mfuwu	leaves : eyeache
?	?	Mjabwani	roots : unknown pains (ointment)
?	?	Mlungalunga	roots : leg swelling
?	?	Mpandanjobvu	stem bark & roots : stomachache (baby)
?	?	Mpondo	roots : body building (baby)
?	?	Msisi	roots : snake-bite
?	?	Msinikazguka	leaves : ?
?	?	Mtombodwa	roots : body wash
?	?	Mtunda	roots : mental derangement
?	?	Mubabani	stem bark : gonorrhoea, syphilis
?	?	Mudjatsa	roots : stomachache (baby)
?	?	Muvwala nkhooda	roots : diarrhoea
?	?	Muzooa	roots : mental derangement
?	?	Mzakaka	roots : headache
?	?	Nthubwakafulu	roots : snake-bite
?	?	Sigatoni	roots : diarrhoea, gonorrhoea
?	?	Somphole	roots : body pain, cough
?	?	Isakanj	roots : mental derangement

Source : 1. Msoothi J. D., *Traditional Medicine Research in Malawi*, Journal of Social Science Volume 10.

University of Malawi

2. Kokwaro J.O., *Medicinal Plants of East Africa*

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4. Williamson J., *Useful plants of Malawi*, University of Malawi, 1975



17. Data on Subcontracted Social Analysis Survey



Table 1 Traditional Authorities (TA/STA), Group Villages (GV), and the Number of Villages

No.	District	No.	TA/STA	No.	GV	No. of villages		
1	Nkhotakota (East side of the Reserve)	1	Kanyenda TA	1	Gayikaludwe	6		
				2	Aaron	7		
				3	Chia	12		
				4	Katimbira	7		
				5	Chinthumbuka	8		
		2	Malenga Chanzi TA (combined with Mphonde STA)	2	Malenga Chanzi TA (combined with Mphonde STA)	6	Nkhongo	9
						7	Namakwati	6
						8	Pwetekere	5
						9	Ungwe	6
						10	Chanika	3
						11	Sesani	8
		3	Mphonde STA	3	Mphonde STA	12	Katongole	6
						13	Mphonde	7
		4	Mwansambo STA*	4	Mwansambo STA*	14	Chitsulo	12
						15	Kalizangwe	5
2	Ntchisi (South side)	5	Nthondo STA	16	Nthondo	13		
				17	Ndinda	11		
				18	Matalala	11		
		6	Chilooko TA	6	Chilooko TA	19	Bumpula	8
						20	Kabvwenje	10
3	Kasungu (West side)	7	Kapelula TA	21	Chakutola	24		
				22	Chikang'ombe	7		
				23	Kapichira	7		
				24	Kapelula	14		
		8	Wimbe TA	8	Wimbe TA	25	Kasiya	4
						26	Kapyanga	9
		9	Simlemba STA	9	Simlemba STA	27	Manjondo	4
		4	Mzimba (North side)	10	Mabulabo TA	28	Viri M'nthumbo	18
						29	Chitetesaka	13
30	Lunkhwawa					4		
	Kamanga							
Total				30	GV	264		

Note: TA refers to as Traditional Authority
 STA refers to as Sub-traditional Authority
 * Partially included in Mwadzawa TA

Table 2 Population and its Density of the Study Area (1987)

District	TA/STA	Population	Density (person/km ²)	Annual increase rate (%)
Nkhotakota	Mphonde STA	12,571	89	3.9
	Malenga Chanzi TA	31,841	78	5.1
	Kanyenda TA	47,841	79	7.9
	Mwansambo STA	13,129	101	6.3
	Subtotal	(158,044)	(37)	(5.2)
Ntchisi	Nthondo STA	11,061	51	4.0
	Chilooko TA	34,878	71	4.2
	Subtotal	(120,860)	(73)	(3.3)
Kasungu	Kapelula TA	14,096	42	7.1
	Wimbe TA	52,883	59	8.7
	Simlemba STA	15,597	62	6.8
	Subtotal	(323,453)	(41)	(5.1)
Mzimba	Mabulabo TA	32,808	45	3.9
	Subtotal	(433,696)	(42)	(3.7)
	Total	266,705	63	

Source: Statistics from the National Population Census, 1987

Table 3 Breakdown of Tribes in the Study Area

Tribe	Reply	Percentage
Chewa	17	57
Yao	1	3
Tonga	5	17
Tumbuka	3	10
Mixed	4	13
	30	100

Table 4 Group Villages Cultivating Major Crops

District	TA/STA	No. of GVs	Maize	Tobacco	Peanut	Cassava	Red pepper
Nkhotakota	Kenyenda	5	5	2	0	5	3
	Mphonde	2	2	0	0	2	1
	Malenga Chanzi	6	6	1	0	6	2
	Mwasambo	2	2	1	0	2	1
Kasungu	Wimbe	2	2	2	2	0	0
	Simlemba	1	1	1	1	0	0
	Kapelula	4	4	4	4		0
Ntchisi	Chilooko	2	2	2	2	0	0
	Nthondo	3	2	3	3	0	0
Mzimba	Mabulabo	3	3	1	0	0	0
Total		30	29	17	12	15	7

Table 5 Availability of Customary Forests

District	TA/STA	No. of GVs surveyed	Yes	No
Nkhotakota	Kanyenda	5	3	2
	Mphonde	2	2	-
	Malenga Chanzi	6	3	3
	Mwasambo	2	1	1
Kasungu	Wimbe	2	2	-
	Simlemba	1	1	-
	Kapelula	4	3	1
Ntchisi	Chilooko	2	2	-
	Nthondo	3	2	1
Mzimba	Mabulabo	3	2	1
Total		30	21	9

Table 6 Fuelwood Resources

District	TA/STA	No. of GVs surveyed	Sufficient	Lacking
Nkhotakota	Kanyenda	5	1	4
	Mphonde	2	-	2
	Malenga Chanzi	6	3	3
	Mwasambo	2	2	-
Kasungu	Wimbe	2	-	2
	Simlemba	1	1	-
	Kapelula	4	2	2
Ntchisi	Chilooko	2	2	-
	Nthondo	3	1	2
Mzimba	Mabulabo	3	3	-
Total		30	15	15

Table 7 Group Villages Using Customary Forests

(plural responses)

District	TA/STA	No. of GVs surveyed	Available/ Unavailable		Use					
			A	U	Grazing	Fuelwood	Medicinal herbs	Agricultural timber	Building timber	Shipbuilding
Nkhotakota	Kanyenda	5	3	2	-	1	1	1	-	1
	Mphonde	2	2	-	1	2	1	1	2	-
	Malenga Chanzi	6	3	3	2	1	1	1	-	-
	Mwasambo	2	1	1	1	1	-	-	-	-
Kasungu	Wimbe	2	2	-	2	1	1	-	-	-
	Simlemba	1	1	-	1	-	-	1	-	-
	Kapelula	4	3	1	2	2	2	1	-	-
Ntchisi	Chilooko	2	2	-	1	2	1	1	1	-
	Nthondo	3	2	1	2	1	-	-	1	-
Mzimba	Mabulabo	3	2	1	1	1	1	1	-	-
Total		30	21	9	13	12	8	6	4	1
Share (%)		-	100	-	43	40	27	20	13	3

Table 8 Comments on the Sustainable Use of the Reserve


Way of use	No. of responses	Percentage
Rule-establishment, resource use	8	26.7
Punishment for users	1	3.3
Reforestation	2	6.7
Illegal use	5	16.7
Management power given to TA chiefs	4	13.3
Mixed response	8	26.7
No idea	2	5.7
Total	30	100.0

Table 9 Populations and Densities of TA/STAs in 1987 and 1995

District	TA/STA	Population (1987)	Area (km ²)	Density (persons/km ²) (1987)	Annual population increase (%)	Projected population (1995)	Projected density (1995)
Nkhotakota	Mphonde STA	12,571	142	88.5	3.9	17,046	120.0
	Malenga Chanzi TA	31,841	409	77.9	5.1	47,297	115.7
	Kanyenda TA	47,841	604	79.2	7.9	88,094	145.8
	Mwasambo STA	13,139	130	101.1	6.3	21,421	164.7
	Subtotal	(158,041)	(4,259)	(37.1)	(5.2)	(237,082)	55.7
Nichisi	Nihondo STA	11,061	215	51.4	4.0	15,185	70.6
	Chilooko TA	34,878	492	70.1	4.2	48,473	98.5
	Subtotal	(120,860)	(1,655)	(73.0)	(3.3)	(156,707)	94.7
Kasungu	Kapclula TA	14,096	334	42.2	7.1	24,347	72.9
	Winbe TA	52,883	894	59.2	8.7	103,000	115.3
	Simlenba STA	15,597	251	62.1	6.8	26,401	105.1
	Subtotal	(323,453)	(7,878)	(41.1)	(5.1)	(481,557)	61.2
Mzimba	Mabulabo TA	32,808	737	44.5	3.9	44,625	60.5
	Subtotal	(433,696)	(10,430)	(41.6)	(3.7)	(579,982)	55.6
Total		266,705	4,208	63.4		435,889	103.6

Table 10 Types of Group Villages

No.	Type Code	Item						Group village	Traditional authority	District
		Population density		Agriculture		Customary forest				
		High	Low	Cash crop	Self-sufficiency	Available	Unusable			
1	1	○		○		○		Nkhongo	Malenga Chanzi	Nkhotakota
2	1	○		○		○		Sesani	Malenga Chanzi	Nkhotakota
3	1	○		○		○		Kalizangwe	Mwasambo	Nkhotakota
4	1	○		○		○		Gayikaludwe	Kanyenda	Nkhotakota
5	1	○		○		○		Kasiya	Wimbe	Kasungu
6	1	○		○		○		Kapyanga	Wimbe	Kasungu
7	2	○		○			○	Katongole	Mphonde	Nkhotakota
8	2	○		○			○	Pwetekere	Malenga Chanzi	Nkhotakota
9	2	○		○			○	Ungwe	Malenga Chanzi	Nkhotakota
10	2	○		○			○	Chla	Kanyenda	Nkhotakota
11	2	○		○			○	Katimbira	Kanyenda	Nkhotakota
12	2	○		○			○	Chitsulo 2	Mwasambo	Nkhotakota
13	2	○		○			○	Manjondo	Simlemba	Kasungu
14	3	○			○	○		Mphonde	Mphonde	Nkhotakota
15	3	○			○	○		Chanika	Malenga Chanzi	Nkhotakota
16	4	○			○		○	Namakwati	Malenga Chanzi	Nkhotakota
17	4	○			○		○	Aaron	Kanyenda	Nkhotakota
18	4	○			○		○	Chinthumbuka	Kanyenda	Nkhotakota
19	5		○	○		○		Kabwenje	Chiloko	Ntchisi
20	5		○	○		○		Chakutola	Kapelula	Kasungu
21	5		○	○		○		Chinkang'ombe	Kapelula	Kasungu
22	6		○	○			○	Nthondo	Nthondo	Ntchisi
23	6		○	○			○	Matalala	Nthondo	Ntchisi
24	6		○	○			○	Bumpula	Chiloko	Ntchisi
25	6		○	○			○	Kapelula	Kapelula	Kasungu
26	6		○	○			○	Chitetesaka	Mabulabo	Mzimba
27	6		○	○			○	Viri M'nthumbo	Mabulabo	Mzimba
28	7		○		○	○		Ndinda	Nthondo	Ntchisi
29	8		○		○		○	Lungkhwawa Kamanga	Mabulabo	Mzimba
30	8		○		○		○	Kapechira	Kapelula	Kasungu

 : Group village to be chosen as sample village from it

- Type 1: Group villages with a high population density, cash crop cultivation, and customary forests.
- Type 2: Group villages with a high population density and cash crop cultivation, but without customary forests.
- Type 3: Group villages with a high population density, self-sufficient crop cultivation, and customary forests.
- Type 4: Group villages with a high population density and self-sufficient crop cultivation, but without customary forests.
- Type 5: Group villages with a low population density, cash crop cultivation, and customary forests.
- Type 6: Group villages with a low population density and cash crop cultivation, but without customary forests.
- Type 7: Group villages with a low population density, self-sufficient crop cultivation, and customary forests.
- Type 8: Group villages with a low population density and self-sufficient crop cultivation, but without customary forests.

Table 11 Chosen Sample Villages

District	TA/STA	Group Village		Sample Village	Type
Nkhotakota	Kanyenda	Gayikaludwe	1	Chawala	1
		Aaron	2	Aaron	4
	Malenga	Ungwe	3	Mbewa	2
		Chianzi	Chanika	4	Kawerenga
	Mwasambo	Chitsulo	5	Chitsulo 2	2
		Kalizangwe	6	Simwini 2	1
Kasungu	Wimbe	Kapyanga	7	Chipumba	5
	Kapelula	Chakutola	8	Chakutola	5
		Kapichira	9	Kapichira	8
Ntchisi	Chilooko	Bumpula	10	Chin'amba	6
	Nthondo	Matalala	11	Mankhanga	6
Mzimba	Mabulabo	Chitete	12	Kamtchayeni-Kamanga	6

Table 12 Family Structure and Composition of Sample Villages

Village surveyed	1 - 5 persons		6 - 10 persons		11 - 15 persons		More than 15		Average persons
	No. of family	Percentage	No. of family	Percentage	No. of family	Percentage	No. of family	Percentage	
Chawala	24	58.5	12	29.3	4	9.8	1	2.4	5.8
Aaron	20	48.8	20	48.8	0	0.0	1	2.4	5.7
Mbewa	23	57.5	13	32.5	3	7.5	1	2.5	5.5
Kawerenga	28	68.3	9	22.0	3	7.3	1	2.4	6.0
Chitsulo 2	16	40.0	18	45.0	6	15.0	0	5.0	6.0
Simwini 2	15	36.6	20	48.8	5	12.2	1	2.4	7.1
Chipumba	24	60.0	13	32.5	3	7.5	0	2.4	5.8
Chakutola	20	47.6	19	45.2	2	4.8	1	2.4	5.7
Kapichira	25	61.0	15	36.6	0	0.0	1	4.8	6.7
Chig'amba	19	45.2	19	45.2	2	4.8	2	0.0	6.2
Mankhanga	20	50.0	16	40.0	5	5.0	2	0.0	5.4
Kamtchayeni Kamanga	19	47.5	16	40.0	5	12.5	0	2.4	5.0
Total	253	51.7	190	38.9	35	7.2	11	2.2	5.9

Table 13 Paternal or Maternal Societies

	Replies	Percent
Paternal	170	34.8
Maternal	305	62.4
Neither	14	2.8
	489	100.0

Table 14 Percentage of Householders who Attended School and their Educational Careers

		No. of Replies	Percentage	
Total		489	100.0	
Did not attend school		195	37.8	
Attended school		304	62.2	100.0
Educational Level	Rudimentary	26		8.5
	Grades 1 to 5	131		43.1
	Grades 6 to 8	124		40.8
	Elementary school graduates passing the qualification test for upper-level education	17		5.6
	MSCE	3		1.0
	University/college	3		1.0

Table 15 Percentage of Children who Attend School and Reasons for Nonattendance

Reason		No. of Replies	Percentage		
Total		489	100.0		
Under the school age		182	31.2		
Families with School Children	Total	307	62.8	100.0	
	Attend school	159		51.8	
	Do not attend	148		48.2	
	Reasons for nonattendance	Illness	11		7.4
		No interest	41		27.7
		Poverty	27		18.2
Distance		69		46.6	

Table 16 Occupations of Villagers

Occupation	No. of Replies	Percentage
Farmer	452	92.3
Employee	12	2.5
Porter	10	2.0
Fisherman	6	1.2
Carpenter	6	1.2
Fish peddler	2	0.4
Weaver	1	0.4
Total	489	100.0

Table 17 Reasons for Settlement (plural replies)

Reason		No. of Families	Percentage	
Total		489	100.0	
Old settlers		118	24.1	
New settlers	Total	371	75.9	100.0
	Shortage of land	127		34.2
	Desire for new land	101		27.2
	Compulsory settlement	67		18.1
	Marriage	59		15.9
	Freeing conflicts	12		3.2
	Desire to be smallholders	7		1.9
	Avoidance of harmful insects	3		0.8
	Avoidance of diseases	2		0.5
	Business	2		0.5
Avoidance of droughts	1		0.3	

Table 18 Length of Settlement

Length (years)		No. of Families	Percentage	
Total		489	100.0	
Old settlers		118	24.1	
New settlers		371	75.9	100.0
Years	less than 10 years	171		46.1
	10 years to less than 20 years	87		23.5
	20 years to less than 30 years	83		22.4
	30 years or longer	30		8.1

Table 19 Major Crops in Villages Surveyed

District	Village	No. of Farms Surveyed	Maize	Tobacco	Cassava	Ground-nuts	Cotton
Nkhotakota	Chawala	40	40	2	22	8	6
	Aaron	41	41	0	15	3	5
	Mlewa	40	40	5	21	6	6
	Kawerenga	41	41	8	31	5	24
	Chitsulo 2	41	41	13	10	10	2
	Simwini 2	41	41	14	10	7	9
	Subtotal	Number	244	244	42	109	39
	%		100.0	17.2	44.7	16.0	21.3
Kasungu	Chipumba	41	41	21	1	10	0
	Chakutola	42	42	17	0	13	0
	Kapichira	41	41	19	0	16	0
	Subtotal	Number	124	124	57	1	39
	%		100.0	46.0	0.8	31.5	0.0
Ntchisi	Chin'amba	41	41	19	13	9	0
	Mankhanga	40	35	16	13	11	0
	Subtotal	Number	81	76	35	26	20
	%		93.8	43.2	32.1	24.7	0.0
Mzimba	Kamichayeni-Kamanga	40	40	8	12	15	0
	Subtotal (%)		100.0	20.0	30.0	37.5	0.0
Total	Number	489	484	142	148	113	52
	%		99.0	29.0	30.3	23.1	10.6

Table 20 Classification of Households by Farmland Area

District	Surveyed village	No farmland	< 1ha	1 ≥ 2	2 ≥ 3	3 ≥ 4	4 ≥ 5	5 ≥ 10	> 10ha	Total	Average
Nkhosakota	Chavala	2	8	11	13	4	3	0	0	39	1.83
	Aaron	0	16	18	2	3	1	0	1	41	1.55
	Mbowa	0	17	12	6	0	1	4	0	40	1.83
	Kawerenga	0	16	13	11	0	1	0	0	41	1.36
	Chitsulo 2	0	9	8	4	2	6	5	6	40	5.73
	Simvini 2	0	14	7	6	1	2	6	5	41	3.76
	Total	Number	2	80	69	42	10	14	15	12	242
	Share	0.8	33.1	28.5	17.4	4.1	5.8	6.2	5.0	100.0	2.67
Kasungu	Chipumba	0	4	14	8	2	8	2	2	40	3.62
	Chakutola	0	11	17	7	2	1	4	0	42	2.05
	Kapichira	1	8	15	9	1	2	5	0	40	2.35
	Total	Number	1	23	46	24	5	11	11	2	122
	Share	0.8	18.9	37.7	19.7	4.1	9.0	9.0	1.6	100.0	2.66
Ntchisi	Ching'amba	0	15	7	6	1	2	6	5	42	3.69
	Mankhanga	1	14	13	9	0	2	1	0	39	1.63
	Total	Number	1	29	20	15	1	4	7	81	82
	Share	1.2	35.8	24.7	18.5	1.2	4.9	8.6	6.2	100.0	2.70
Mzimba	Kamichyaeni Kanaunga	0	9	13	11	3	4	0	0	40	1.94
	Total	Share	0.0	22.5	32.5	27.5	7.5	10.0	0.0	100.0	1.94
Grand total	Number	4	141	148	92	19	33	33	19	485	489
	Share	0.8	29.1	30.5	19.0	3.9	6.8	6.8	3.9	100.0	2.61

Table 21 Area and Ratio of Cultivated Lands in Sample villages

	Farmers Surveyed		Total Area	Respondents to Income-related Questions	Total Income	Average Income
	Number	Percentage	ha	Number	MK	MK
NON AGRI	5	1.0				
<1.0	139	28.7	83.15	115	144280	1255
1.0<1.9	146	30.2	204.13	127	162593	1280
2.0<2.9	92	19.0	208.94	81	146280	1806
3.0<3.9	21	4.3	68.72	21	60880	2899
4.0<4.9	30	6.2	128.64	29	158532	5467
5.0<9.9	32	6.6	213.88	28	162192	5793
>10.0	24	5.0	423.81	23	99200	4313
Total	484	100.0	1331.27	424	933957	2203

Table 22 Farm Income of Sample Villages and Their Shares

District	Sample Village	Non or N/A		> MK100		100 ~ 999		1,000 ~ 4,999		5,000 ~ 9,999		≥10000		Ave Income	
		Family	%	Family	%	Family	%	Family	%	Family	%	Family	%	Family	%
Nichonkola	Chawala	11	36.7	8	26.7	17	56.7	5	16.7	0	0.0	0	0.0	30	571
	Aaron	4	10.8	3	8.1	20	54.1	14	37.8	0	0.0	0	0.0	37	837
	Mbcwa	11	37.9	4	13.8	11	37.9	11	37.9	3	10.3	0	0.0	29	1569
	Kaverenga	4	10.8	2	5.4	29	78.4	5	13.5	0	0.0	1	2.7	37	841
	Chitsulo 2	3	8.1	1	2.7	13	35.1	15	40.5	4	10.8	4	10.8	37	3340
	Shwini 2	3	7.9	1	2.6	13	34.2	17	44.7	2	5.3	5	13.2	38	4548
Total	Number Share	36	14.8	19	9.1	103	49.5	67	32.2	9	4.3	10	4.8	208	2025
Kasungu	Chipumba	4	10.0	0	0.0	16	44.4	18	50.0	1	2.8	1	2.8	36	1897
	Chakutola	2	4.8	1	2.5	18	45.0	15	37.5	3	7.5	3	7.5	40	4266
	Kapichira	8	19.5	0	0.0	9	27.3	21	63.6	3	9.1	0	0.0	33	2245
Total	Number Share	14	11.4	1	0.9	43	39.4	54	49.5	7	6.4	4	3.7	109	2872
Ntchisi	Ching'amba	3	7.1	1	2.6	19	48.7	16	41.0	1	2.6	2	5.1	39	3093
	Matkhanga	4	11.1	1	2.8	27	75.0	6	16.7	2	5.6	0	0.0	36	1036
Total	Number Share	7	8.5	2	2.4	46	56.1	22	26.8	3	3.7	2	2.4	75	2106
Mzimba	Kamtchayoni														
	Kamanga	6	15.0	2	5.9	18	52.9	13	38.2	1	2.9	0	0.0	34	1249
Total	Number Share	63	12.9	24	5.6	210	49.3	156	36.6	20	4.7	16	3.8	426	2194

Source : Data from the sample village survey.

Table 23 Farm Incomes and their Ratio in Sample Villages

Income (MK)	Farmers Surveyed	Total Income	Average Income	Ratio of Farmers	Share of Income
		MK	MK	%	%
NON AGRI	65	0	0	13.3	0
<MK100	23	1,130	49	5.4	0.1
100 - 999	209	90,413	433	49.3	9.7
1,000 - 4,999	156	326,826	2,095	36.8	35.0
5,000 - 9,999	20	134,989	6,749	4.7	14.5
≥MK10,000	16	380,600	23,788	3.8	40.8
Total	424	933,958	2,602	100.0	100.0

Note : Number of farmland owners is not the same as that of respondents because some farmers did not reply to income-related questions.

Table 24 Profitability of Cultivated Lands Owned by Smallholders in Sample Villages

District	Sample Village	Average Income	Average Area	Profitability
		(MK)	(MK)	(MK)
Nkhotakota	Chawala	571	1.83	312
	Aaron	821	1.27	646
	Mbewa	1569	1.83	857
	Kawerenga	841	1.36	619
	Chitsulo 2	2432	2.73	891
	Simwini 2	4525	2.35	1927
Kasungu	Chipumba	1685	2.56	658
	Chakutola	4266	2.05	2080
	Kapichira	2245	2.35	954
Ntchisi	Ching'amba	3375	2.31	1463
	Kankhanga	1036	1.63	635
Mzimba	Kamtchayeni	1249	1.94	645

Table 25 Use and Shares of Natural Resources

Item	Customary Land		Others	
	Users	Percentage	Users	Percentage
Fuelwood	62	12.7	214	25.9
Grass (roofing, heating)	5	1.0	243	29.5
Edible plants	68	13.9	2	0.2
Fruits	-	-	1	0.1
Honey	-	-	239	28.9
Medicinal plants	115	23.5	126	15.2
Water	-	-	1	0.1
Muraza(?)	-	-	1	0.1
Not currently used	239	48.9	-	-
Total	489	100.0	827	100.0

Table 26 Area of Customary Forests

District	Group Village	Sample Village	Area of Customary Forests
Nkhotakota	Gayikaludwe	Chawala	2.5
	Aaron	Aaron	4.4
	Ungwe	Mbewa	6.4
	Chanika	Kawerenga	1.2
	Chitsulo	Chitsulo 2	3.0
	Kalizangwe	Simwini 2	7.3
Kasungu	Kapyanga	Chipumba	5.4
	Chakutola	Chakutola	2.6
	Kapichila	Kapichira	5.3
Ntchisi	Bumpula	Ching'amba	3.4
	Matalala	Mankhanga	5.7
Mzimba	Chitetesaka	Kamtchayeni-Kamanga	12.8
Average Area			5.0

Table 27 Edible Animals

Name	No. of Replies	Percentage
Bushbuck	202	58.0
Bird	69	19.8
Monkey/baboon	24	6.9
Hare	20	5.7
Wild boar	15	4.3
Hippopotamus	11	3.2
Eland	4	1.1
Elephant	3	0.8
Total	348	100.0

Table 28 Use of Resources from the Reserve

Resource	No. of Users	Percentage
Fuelwood	72	14.7
Timber	51	10.4
Edible plant	51	10.4
Grass	49	10.0
Mammals/birds	45	9.2
Land	37	7.6
Fruits	36	7.4
Honey	23	4.7
Fishes	22	4.5
Water	8	1.6
Plants for rope	6	1.2
Do not use	89	18.2
Total	489	100.0

Table 29 Shares of Animals causing Damage

Animal	Percentage
Monkey	74.8
Wild boar	9.8
Birds	8.1
Baboon	4.6
Others	2.7
Total	100.0

Table 30 Tools to Drive Away Harmful Animals

Tool	Percentage
Traps	29.7
Arrows	25.3
Dogs	17.5
Guns	14.1
Sticks	10.9
Knife	2.5
Total	100.0

Table 31 Attitudes toward the Reserve

Attitude		No. of Replies	Percentage	Conditions for Use	No. of Replies	Percentage
Should not use		40	8.2			
May use:	On various conditions	21	4.3			
	Sometimes	13	2.7			
				Payment	11	32.4
				Should not kill animals	21	61.8
				Funeral only	1	2.9
No reply		415	84.8		1	2.9
Totals		489	100.0		34	100.0

Table 32 Expectations from the Reserve (assuming villagers are permitted to use) (plural answers)

Use		No. of Replies	
		Number	Percentage
Wood	Fuelwood	156	22.3
	Timber	131	18.7
Animals		94	13.4
Grass		71	10.2
Edible plants		63	9.0
Honey		62	8.9
Fishes		62	8.9
Fruits		60	8.6
Total		699	100.0

Table 33 Water Resources for Household Use

	No. of Households	Percentage
Well	277	56.6
River	149	30.5
Well and river	37	7.6
Shallow well	16	3.3
Well and shallow well	3	0.6
Shallow well and river	2	0.4
Dam (incl. reservoir)	1	0.2
Dam and well	3	0.6
Dam and river	1	0.2
Total	489	100.0

Table 34 Distances to Water Resources

Distance (km)	No. of Households	Percentage
Less than 0.5	160	32.7
0.5 to less than 1.0	187	38.2
1.0 to less than 2.0	87	17.8
2.0 or farther	55	11.2
Total	489	100.0

Table 35 Division of Labor for Carrying Water

Division of Labor	No. of Replies	Percentage
Adult male	28	3.9
Adult female	451	62.2
Girl	227	31.4
Boy	18	2.5
Total	724	100.0



18. Questionnaire for Social Analysis (typification)



(SOCIAL - ECONOMIC SURVEY)

INTERVIEW FOR TYPIIFICATION OF LOCAL PEOPLE

THE MASTER PLAN STUDY ON
SUSTAINABLE MULTIPLE-USE RESOURCE
MANAGEMENT OF NKHOTA-KOTA WILDLIFE RESOURCE, MALAWI

QUESTIONNAIRE

IDENTIFICATION

1. RESPONDENT

a Name: Sex: 1 Male
b Position 2 Female
c Group Village name:
d Region: 1 Central

2 Northern

e District: 1. Nkhotakota 2. Ntchisi 3. Kasungu
4 Mzimba

f. Traditional Authority and/or Sub-Traditional Authority:
1. Mphonde 2. Kanyenda 3. Malenga Chanzi
4. Mwansambo 5. Nthondo
6. Chikoloko 7. Kapelula 8. Wimbe
9. Simlemba
10. Mabalabo

g. Village
Please list up on another sheet name of village in Group Village,
number of household. Number of Villages (population, tribe,
religion, paternal (father/maternal (mother) line family and
distance to the Nkhotakota Wildlife Reserve Area.

GROUP VILLAGE'S NAME

VILLAGE'S NAME	POPULATION			NUMBER OF HOUSEHOLD	TRIBE	RELIGION	FAMILY LINE	DISTANCE FOR N.W.R
	MALE	FEMALE	TOTAL					
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

TRIBE
 1. Yao
 2. Tumbuka
 3. Ngoni
 4. Chewa

RELIGION
 1. Christian
 2. Moslems
 3. None
 4. Other

FAMILY LINE
 1. Maternal
 2. Paternal
 3. Both

2. LIVING STYLE

(Main land use)

1. Immigrants (increasing population) area
2. Self sufficient area
3. Merchandised Crops Producing area
4. Various crops producing area
5. Relying on the Nkhota-kota Wildlife Reserve area
6. Others

[]

3. AGRICULTURE
(Main crops)

(Food crops or cash crops, production and acreage of cultivation area)

	ITEM	ACREAGE	FOOD CROP	CASH CROP	PRODUCTION (TON)
1					
2					
3					
4					
5					

4. FREE CULTIVATION LAND

ESTATE - Sizes (acreage) and crops

	ITEM	ACREAGE	FOOD CROP	CASH CROP	PRODUCTION (TON)
1					
2					
3					
4					
5					

5. COMMUNITY (PUBLIC USE) LAND

(SIZE (ACREAGE)/LAND USE/SYSTEM OF MAINTENANCE)

	ITEM	LAND USE	ACREAGE	ORGANIZATION	MAINTENANCE
1					
2					
3					
4					
5					

6. INDUSTRIES (EXCEPT AGRICULTURE)

(Place, capacity, number of employee, production, income)

	ITEM	CAPACITY	PRODUCTION	INCOME	DOMESTIC/EX PORT	EMPLOYEE
1						
2						
3						
4						
5						

7. SOCIAL FORESTRY

(Fuelwood forestation, beekeeping, graveyard, medical plants cultivation) size production per year, income, organization.

A. Do you have any village forest? Yes No

B. If yes how big is it? (hectarage)

C. What are the uses (table)

	LAND USE	ITEM (ha)	PRODUCTION	INCOME	ORGAN. MEMBER	MAINTENANC E
1						
2						
3						
4						
5						

8. AGROFORESTRY

- What type (system), size, benefit, organization.

	COMBINATION TREE/CROP	ACRAGE	PRODUCTION	INCOME	ORGANIZATION	MAINTENANC E
1						
2						
3						
4						
5						

9. LIVESTOCK

- Each group village or village

	LIVESTOCK TYPE	NUMBER	MARKET PLACE	INCOME	ORGANIZATION NUMBER OF MEMBERS
1					
2					
3					
4					
5					

10. FUELWOOD (each Group Village)

A. Do you have enough fuelwood ? 1 = yes
2 = No []

B. Fuelwood name (tree species)

- 1.
- 2.
- 3.
- 4.

C. Collecting place/title of land /size.

- SIZES (HA)
1. Public land []
 2. Private land []

D. Who does the collection.

1. Adult male
2. Children male
3. Adult female
4. Children female []

CONSUMPTION (average volume for household)

11. Fuelwood(firewood) forest.

A. Do you have any fuelwood forest?

Yes	No
-----	----

If yes,

B. Who is the owner ?

C. How big is the forest (acreage)

D. Number of household using the forest.

E. Besides cooking what other purposes do you use the forest for:

.....

.....

.....

.....

12. Situation on popularisation (spread) of forestry.
(Are there some people owning forests)

13. Organisation in Group village.

	ORGANISATION	NUMBER OF MEMBERS	RULES	ACTIVITY
1	Agriculture			
2	Fuelwood			
3	Beekeeping			
4	Medical plants cultivation			
5	Hunting			
6	Social Forestry/agroforestry			
7	Sustainable utilisation of Natural resources			
8	Women's clubs			
9	Others			

C. Is there any relationship with public administration or NGOs.

Yes	No
-----	----

If yes, go to D

9. Any assistance from public administration (government) or NGO

1. Financial
2. Extension wise
3. Others (specify)

Yes	No
-----	----

14. Do you experience any damage from wildlife?

ANIMAL SPECIES	CROP DAMAGED
Bushpig (nguluwe)	
Baboon (nyani)	
Monkey (pusi)	
Porcupine (chinungu)	
Elephant (njobvu)	
Buffalo (njati)	
Hippo (Mvuu)	
Kudu (ngoma, mpoto)	
Eland (nafu)	
Bushbuck (Mbawala)	
Lion (mkango)	
Leopard (kambuku, nyalugwe)	
Birds	

3. How do you chase the animals (what weapons do you use)

15. A. What natural resource benefits do you get from outside the reserve area.

1	NAME	PLACE	WHOSE JOB	TIME/VOLUME	SELLING VOLUME	INCOME
2						
3						
4						
5						

B. What animals do you see around your villages ?

1-----

2-----

3-----

4-----

5-----

C. What do you do with them ?

16. What resources would you like to get from the wildlife Reserve Area.
(see attached pages 14 and 15)

17. If given access to Nkhotakota W.R. do you have any idea for sustainable utilisation of Natural Resources ?

18. Do you have any idea of ECO-TOURISM

19. What are your traditional customs in Group village or village or each tribe ?

1

2.

3.

4.

20. What are traditional prohibited customs in group village or village or each tribe ?

16. OTHER RESOURCES PEOPLE COULD USE IN NATIONAL PARK

No	ITEM		1=SALE 2=HOME	MONTH	CAN YOU PRESERVE IT ? 1=YES 2=NO
1	Matondo				
2	Virungurung u				
3	Nthowa				
4	Mapala				
5	Ngumbi				
6	Mafulufute				
7	Chizuma				
8	Nyenje				
9	Chinaka				
10	Chipatika				
11	Kachiyoyo				
12	Kazinda, Therere				
13	Boa				
14	Utali				
15	Nderema				
16	Kanyendera				
17	Longolwe				
18	Nyozwa				
19	Manda				
20	Chimpindi				

et c					
	<u>FRUITS</u>				
21	Masuku				
22	Nthundu				
23	Nthudza				
24	Maula				
25	Kasokolowe				
26	Nkhuyu				
27	Mfula				
28	Maye				
29	Katope				
	<u>FIREWOOD</u>				
30	Timber				
31	Msambamfumu				
32	Naphini				
33	Mulombwa				
34	Grass				
35	Medical Plants				
36	Fish				
37	Other				

19. Questionnaire for Social Analysis (sampling)



**SUSTAINABLE MULTIPLE USE RESOURCE MANAGEMENT OF
NKHOTAKOTA WILDLIFE RESERVE, MALAWI**

(Socio-economic survey)

QUESTIONNAIRE

Enumerator:..... Date:.....

Checked by:..... Date:.....

General Instructions

9 or 99 for missing data
N/A ----- question does not apply

General Definitions

Household: group of people related or not by blood who live together or eat together and have a common budget for living expenses.

Seasons: Dry - May to September
Wet - October to April

Plantations: > .25 hectares

Consumption: daily - 5 days a week
weekly - 1 to 4 days
monthly - once or twice a month

BACKGROUND INFORMATION		
Region: (1) Central (2) Northern	A1	
District: (1) Nkhatakota (2) Ntchisi (3) Kasungu (4) Mzimba	A2	
Chiefs: (1) Kanyenda (2) Malengachanzi (3) Mphonde (4) Mwadzama (5) Mwansaambo (6) Kalumo (7) Chiloko (8) Kapichira (9) Wimbe (10) Kaluluma (11) Mabalabo	A3	
Villages: (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)	A4	
Name of Household: _____	A5	
Sex of Household: (1) Male (2) Female	A6	
What marriage system do you follow? (1) matrilineal (2) patrilineal	A7	
Education level of household head: (1) none (2) adult literacy (3) std 1 - 5 (4) std 6 - 8 (5) JC (6) MSCE (7) University	A8	
Main occupation of household head: (1) farmer (2) fisherman (3) fishmonger (4) labourer (5) other (specify)	A9	

Household composition:			
Males aged 41 and above	[_____]		
Males aged 18-40	[_____]	A10	
	[_____]	A11	
Males aged <17	[_____]	A12	
Females aged >65	[_____]	A13	
Females 18-64	[_____]	A14	
Females ages <17	[_____]	A15	
Total composition	[_____]	A16	
Education			
males aged 18-64 in primary	[_____]		
males aged 18-64 in secondary	[_____]	A17	
males aged <17 in primary	[_____]	A18	
	[_____]	A19	
males aged <17 in secondary	[_____]	A20	
females aged 16-64 in primary	[_____]	A21	
females aged 18-64 in secondary	[_____]	A22	
females aged <17 in primary	[_____]	A23	
females aged <17 in secondary	[_____]	A24	
How much do you spend per child per year? [_____] K/term		A25	
Occupation			
males aged 41 and above	[_____]	A26	
males aged 18-40	[_____]	A27	
males aged <17	[_____]	A28	
females aged 41 and above	[_____]	A29	
females aged 18-40	[_____]	A30	
females aged <17	[_____]	A31	
For those aged <17 and not in school, give reasons: (1) sickness (2) lack of interest (4) poverty (8) distance too far		A32	

AGRICULTURAL PRODUCTION			
How big is your land? Munda	<input type="text"/>	ha	B1
Dimba	<input type="text"/>	ha	B2
Total	<input type="text"/>	ha	B3
Is your land registered? (1) Yes (2) No			B4
How much land is used for the following:			
1 cropping	<input type="text"/>	ha	B5
2 pasture	<input type="text"/>	ha	B6
4 forest	<input type="text"/>	ha	B7
8 renting out	<input type="text"/>	ha	B8
16 furrow	<input type="text"/>	ha	B9
total	<input type="text"/>	ha	B10
Do you rent land (1) Yes (2) No			B11
If you rent land, state:			
Amount of land rent	<input type="text"/>	ha	B12
Unit price	<input type="text"/>	K/ha	B13
Total payment	<input type="text"/>	K	B14
CROP PRODUCTION			
Which crops do you grow? (1) maize (2) tobacco (4) cassava (8) cotton (16) g/nuts (32) rice (64) beans (128) soya beans (256) other (specify)			B15

For 1993/94 season how much did you harvest?			
Crop code	[] harvested [] tons	B16	
Crop code	[] sold [] tons	B17	
Crop code	[] harvested [] tons	B18	
Crop code	[] sold [] tons	B19	
Crop code	[] harvested [] tons	B20	
Crop code	[] sold [] tons	B21	
Which of the following vegetables do you grow? (1) cabbage (2) tomatoes (4) rape/chinese/mustard (8) pumpkin leaves (16) bean leaves (32) cassava leaves (64) others (specify)		B22	
Which of the following crop plantations do you own?			
(1) banana	[] ha	B23	
(2) cashew nuts	[] ha	B24	
(4) sugarcane	[] ha	B25	
(8) fruits	[] ha	B26	
(16) others (specify)	[] ha	B27	
How much did you get from each plantation after the growing season 1993/94? Crop code [] [] K		B28	
LIVESTOCK PRODUCTION			
Which of the following do you rear (keep)? (1) cattle (2) goats (4) sheep (8) poultry (16) pigs (32) others (specify)		B29	
For 1993/94 season how many of the listed types of livestock did you have and sell?			
Livestock code	[] No owned [] sold []		
Total amount	[] MK	B30	
		B31	
Livestock code	[] No owned [] sold []		
Total amount	[] MK	B32	
		B33	

Livestock code	<input type="text"/>	No. owned	<input type="text"/>	sold	<input type="text"/>	MK	<input type="text"/>	B34	
Total amount							MK	<input type="text"/>	B35
How often do you eat meat (own livestock? (1) daily (2) weekly (4) monthly (3) once a year									B36
Do you practice fish farming? (1) Yes (2) No									B37
How often do you eat fish? (1) daily (2) weekly (3) monthly (4) once a year									B38
Where do you obtain the fish from? (1) own ponds (2) buying from local market (4) buying from formal market (8) fishing (16) buying from peddlers (32) alongside the road									B39
How do you obtain meat? (1) own production (2) buy from traders (3) hunting									B40
What type of wild animals do you eat? (1) elephant (2) hippopotamus (4) eland (8) rabbit (16) bushpig (32) birds (64) buffalo (128) bushbuck (256) snakes (512) others (specify)									B41
How do you obtain them? (1) hunting (2) buying (4) given by friends									B42
What are the other uses of wild animals? (1) hides (2) medicinal purposes (4) income (8) others (specify)									B43
When are they commonly found?									B44
(1) elephant	<input type="text"/>	(2) hippo	<input type="text"/>	(4) eland	<input type="text"/>				
(8) rabbit	<input type="text"/>	(16) bushpig	<input type="text"/>	(32) birds	<input type="text"/>				
(64) buffalo	<input type="text"/>	(128) bushbuck	<input type="text"/>						
(256) snakes	<input type="text"/>	(512) others	<input type="text"/>						
Seasons									
(1) wet season (2) dry season									
(3) throughout the year									
What animals did you see in 6 months period?									
In wildlife reserve									B45
Outside wildlife reserve									B46
What animal species damage your crops? (1) elephant (2) hippo (4) bushbuck (8) baboon (16) eland (32) buffalo (64) bushpig (128) monkey (256) snakes (512) others									B47
Given the chance to hunt in the game park, which weapons would you use? (1) gun (2) arrows and spears (4) poison (8) trap (16) others (specify)									B49

Assuming you have killed the following animals, how much would you sell?			
(1) elephant	<input type="text"/>	K	
(2) hippo	<input type="text"/>	X	B50
(4) eland	<input type="text"/>	X	B51
(8) rabbit	<input type="text"/>	K	B52
(16) bushpig	<input type="text"/>	X	B53
(32) birds	<input type="text"/>	K	B54
(64) buffalo	<input type="text"/>	X	B55
(128) bushbuck	<input type="text"/>	K	B56
(256) snakes	<input type="text"/>	K	B57
(512) others	<input type="text"/>	K	B58
			B59
What types of wild vegetables do you eat? (1) okra (2) black jack (4) mushroom (8) mulozi (16) fwifwi (32) others (specify)			B60
Where do you get these wild vegetables? (1) own garden (2) community forest reserve (3) wild life reserve area			
code <input type="text"/>	place <input type="text"/>		B61
code <input type="text"/>	place <input type="text"/>		B62
code <input type="text"/>	place <input type="text"/>		B63
Which season do you often collect these vegetables? (1) wet season (2) dry season (3) throughout			
	Season		
(1) okra	<input type="text"/>		B64
(2) black jack	<input type="text"/>		B65
(4) mushroom	<input type="text"/>		B66
(8) mulozi	<input type="text"/>		B67
(16) fwifwi	<input type="text"/>		B69
(32) others	<input type="text"/>		B70

What types of wild fruits do you eat and when do you often collect them?

(1) kachere	
(2) maviru <i>Vangoulia infesta</i>	B71
(3) katope (mundyozi)	B72
(4) masuku napaca <i>kirkiana</i>	B73
(5) nyowe <i>sygium cordatum</i>	B74
(6) mateme (maye)	B75
(7) nthudza (nthumbuzga)	B76
(8) bwenba	B77
(9) malambe	B78
(10) mapoza	B79
(11) mahuhu (mtonongoli)	B80
(12) mkundi	B81
(13) nkhuvu (vikuyu)	B82
(14) masawo	B83
(15) matatani	B84
(16) mfula	B85
(17) maula	B86
(18) chitirbe	B87
(19) matwatwa	B88
(20) mphinji	B89
(21) musipani	B90
(22) mthundu	B91
(23) kasokolowe	B92
	B93

What are your sources of light energy for? (1) cooking		C1
(2) lighting		C2
(3) heating		C3
Codes (1) electricity (2) kerosene (4) generator (8) wood (16) grass (32) animal/plant oil (64) charcoal (128) others		C4
Do you have any plans to use other sources of light? (1) Yes (2) No		C5
If charcoal is used as source of firewood, where do you obtain it from? (1) social forest (2) wild reserve (4) charcoal traders (8) markets (16) others (specify)		C6
What are your plans on other sources of light? (1) electricity (2) kerosene (4) generator (8) wood (16) grass (32) animal/plant oil		C7
How much do you pay for the sources of energy per unit amount per month? (1) electricity _____ K		C8
(2) kerosene _____ K		C9
(4) generator _____ K		C10
(8) wood _____ X		C11
(16) grass _____ K		C12
(32) animal/plant oil _____ K		C13
(64) charcoal _____ K		C14
(128) others _____ K		C15
What are the sources of water? (1) well (2) river (4) boreholes (8) tap water (16) dams		C16
How far is the water source? (1) <0.5 km (2) 0.5 - 1 km (3) 1 - 2 km (4) >2 km		C17
Who collects the water? (1) adult male (2) adult female (4) boys (8) girls		C18
Is the water enough or not? (1) Yes (2) No		C19
Do you have any plans to use other sources of water in future? (1) Yes (2) No		C20
If yes, what would be the sources? (1) well (2) river (4) boreholes (8) tap water (16) dams		C21

How much do you collect these fuels per week?			
petroleum	<input type="text"/>	litres	C22
charcoal	<input type="text"/>	bags	C23
fuel wood	<input type="text"/>	headloads	C24
Do you sell part of the fuel? (1) Yes (2) No			C25
If yes, how much?			
(1) petroleum	<input type="text"/> vol	<input type="text"/> K/l	C26
(2) charcoal	<input type="text"/> vol	<input type="text"/> K/bag	C27
(3) fuelwood	<input type="text"/> vol	<input type="text"/> K/headload	C28
Do you have any alternative sources of fuel? (1) Yes (2) No			C29
If yes, what will be the sources? (1) petroleum (2) charcoal (4) fuelwood (8) biogas (16) animal dung			C30
What materials do you use for construction? (1) wood (2) grass (4) mud (8) bricks (16) bamboos (32) others (specify)			C31
Where do you collect the materials? (1) own forest (2) community forests (4) wild reserve area (8) others (specify)			C32
What type of wood species do you use?			C33
How many poles did you use for this construction?			
(1) main house	<input type="text"/>		C34
(2) fence	<input type="text"/>		
(4) kitchen	<input type="text"/>		
(8) granaries	<input type="text"/>		
(16) khola	<input type="text"/>		
(32) bathroom	<input type="text"/>		
(64) toilet	<input type="text"/>		

<p>How long does it take to maintain the construction?</p> <p>(1) main house <input type="text"/></p> <p>(2) fence <input type="text"/></p> <p>(4) kitchen <input type="text"/></p> <p>(8) granaries <input type="text"/></p> <p>(16) khola <input type="text"/></p> <p>(32) bathroom <input type="text"/></p> <p>(64) toilet <input type="text"/></p>	C35	
<p>Do you have any alternatives for future sources of construction materials? (1) Yes (2) No</p>	C36	
<p>If yes what are the sources? (1) tiles (2) corrugated iron sheets (4) burnt bricks (8) unburnt bricks (16) others</p>	C37	
<p>Do you buy these construction materials? (1) Yes (2) No</p>	C38	
<p>If you buy, how much do you pay?</p> <p>(1) wood <input type="text"/> K/pole</p> <p>(2) grass <input type="text"/> X/bundle</p> <p>(4) unburnt bricks <input type="text"/> K/kg</p> <p>(8) burnt bricks <input type="text"/> K/kg</p> <p>(16) bamboo <input type="text"/> K/kg</p> <p>(32) iron sheet <input type="text"/> K/sheet</p> <p>(64) tiles <input type="text"/> K/tile</p>	C39	
<p>How do you get your medical treatment when you are sick? (1) hospital (2) medical plants (4) wild animals (8) groceries (16) others (specify)</p>	C40	
<p>How much did you spend on medical treatment for the past six months?</p> <p>hospital <input type="text"/> K</p> <p>herbalist <input type="text"/> K</p> <p>groceries <input type="text"/> K</p>	C41	
<p>What diseases are predominant in this household? (1) malaria (2) diarrhoea/dysentery (4) epilepsy (8) malnutrition (16) cough (32) headache (64) others (specify)</p>	C42	

How often have you suffered from these diseases within the past 6 months?	Times	C43	
(1) malaria	_____		
(2) diarrhoea/dysentery	_____		
(4) epilepsy	_____		
(8) malnutrition	_____		
(16) cough	_____		
(32) headache	_____		
(64) others (specify)	_____		
What medical plants do you use for curing some of the diseases?		C44	
Where do you collect the medical plants? (1) wildlife reserves (2) own land (4) community forests		C45	
Other than medical plants, do you use some animal parts for medical treatments? (1) Yes (2) No		C46	
If yes, what are the animal species used?		C47	
CUSTOMARY COMMUNITY LAND			
Do you have the following community land?			
(1) community forest	_____ ha	D1	
(2) grazing land	_____ ha		
(4) graveyard	_____ ha		
What commodities do you get from these? (1) grass (2) fuelwood (4) vegetables (8) fruits (16) medicinal plants (32) others (specify)		D2	
Who maintains the community customary land? (1) villagers (2) others		D3	
How do you maintain the land? (1) weeding/cleaning (2) pruning (4) afforestation (8) firebreak		D4	
What sort of punishment do you give to those who do not participate (1) charged money (2) payment in kind (materials) (4) banned to use land (8) others (specify)		D5	

<p>What commodities do you get outside the customary or community land? (1) grass (2) fuelwood (4) vegetables (8) fruits (16) medicinal plants(32) others (specify)</p>	D6	
ACCESSIBILITY TO WILD LIFE		
<p>What resources do you get from the wild life reserve area? (1) fuelwood (2) grass (4) honey (8) timber/bamboos(16) animal/birds (32) vegetables (64) fish (128) fruits (256) land (512) others (specify)</p>	E1	
<p>If given chance, what resources would you like to get from the reserve area? (1) fuelwood (2) grass (4) honey (8) timber/bamboos (16) animal/birds (32) vegetable (64) fish (128) fruits (256) land (512) others (specify)</p>	E2	
<p>Assuming you are given access to the gate, how would you protect the wildlife reserve area? (1) firebreaks (2) aforestation (4) avoid hunting (8) avoid unnecessary cutting of trees (16) introduce civic education (32) appropriate punishment (64) fee (128) others (specify)</p>	E3	
<p>Do you sometimes make specific requests for use of forest resources? (1) Yes (2) No</p>	E4	
<p>What are normally the responses? (1) allowed with conditions (2) not allowed (4) sometimes allowed</p>	E5	
<p>If allowed, what are the conditions? (1) fee (2) do not kill the animals</p>	E6	
INCOME		
<p>What are your sources of income? (1) agriculture (2) livestock (4) hunting (8) fishing (16) firewood (32) employee (64) others (specify)</p>	F1	
<p>In 1993/94 season how much income did you get?</p> <p>Income code Amount MK</p> <p>Income code Amount MK</p> <p>Income code Amount MK</p>	F2	
<p>How much did you spend on clothing for the household in 1993/94?</p> <p>MK _____</p>	F3	

SETTLEMENT

When did you come to settle in this area? (1) <10 years (2) 10 - 20 years (4) 20 - 30 years (8) >30 years

G1

Why did you come to settle here? (1) marriage (2) shortage of land (4) quarrels (8) better land (16) drought (32) government (64) others (specify)

G2

Do you belong to any club? (1) Yes (2) No

G3

If yes, what are the clubs?

Member Fee

(1) farmers club #

G4

(2) womens club #

G5

(4) bee keeping #

G6

(8) football club #

G7

(16) agroforestry #

G8

(32) fuelwood coll#

G9

(64) hunting #

G10

(128) others (specify)

G11

Do you have women in your farmers club? (1) Yes (2) No

G12

If yes, how free are the women in: (1) credit accessibility (2) decision making (4) taking up responsibility

G13

What are the activities you do in these clubs?			
Club code	<input type="text"/>	Activity <input type="text"/> Fee <input type="text"/>	G14
Club code	<input type="text"/>	Activity <input type="text"/> Fee <input type="text"/>	G15
Club code	<input type="text"/>	Activity <input type="text"/> Fee <input type="text"/>	G16
Club code	<input type="text"/>	Activity <input type="text"/> Fee <input type="text"/>	G17
Activities: (1) bee keeping (2) farming (4) tailoring/knitting (8) fundraising (16) afforestation (32) fish farming (64) hunting (128) fuel collection (256) others (specify)			
How much revenue do each of the clubs realise?			
Club code	<input type="text"/>	Amount/year <input type="text"/>	G18
Club code	<input type="text"/>	Amount/year <input type="text"/>	G19
Club code	<input type="text"/>	Amount/year <input type="text"/>	G20
What social relationship exists as regards economic classes of members in the clubs? (1) segregation (2) monetary help (4) solidarity (8) no monetary help (16) material support (32) moral support (64) others (specify)			G21

20. Major Prices in Nkhotakota Town (August, 1995)

Major Prices in Nkhotakota City (August, 1995)

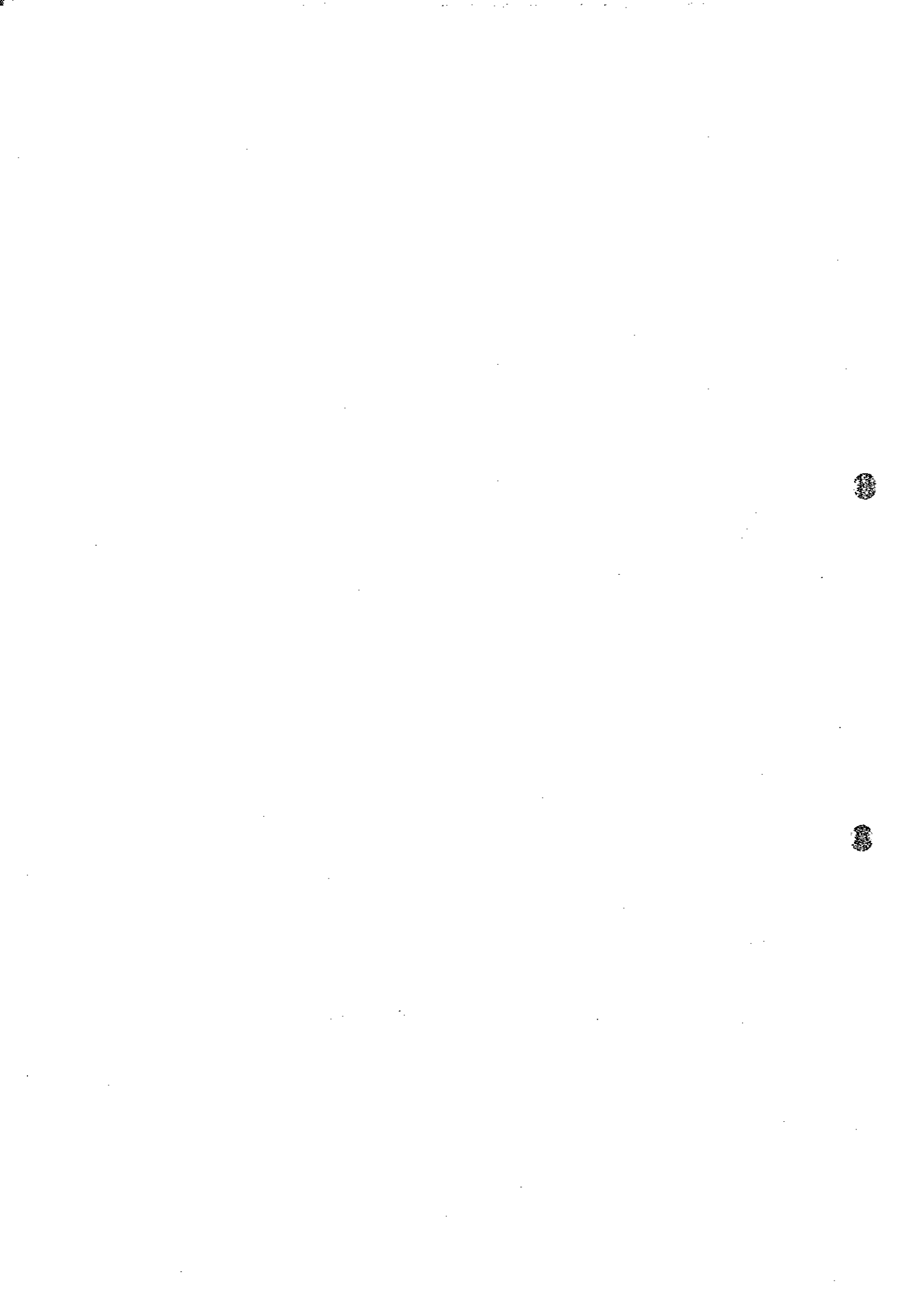
in MK with yen in parentheses (at a rate of ¥6 to MK)

Salaries

5)	250 - 300	(1,500 - 1,800)
4)	1,000	(6,000)
3)	1,500 - 2,000	(9,000 - 12,000)
2)	4,500	(27,000)
1)	6,000 - 9,000	(36,000 - 54,000)

Prices

Maize (fresh)	1.8/kg (11)	Heavy oil (paraffin)	7.5/l (45)
Maize (highest grade flour)	3.0/kg (18)	Diesel oil	8.4/l (50)
Polished rice	12.0/kg (72)	Gasoline	10.0/l (60)
Spinach (10cm bunch)	1.0/2 bunches (6)	Charcoal (30kg)	50.0/sack (300)
Bread	6.8/2 loafs (41)	Firewood	10.0/bunch (60)
Egg	2.5 apiece (15)	Seedling (Eucalyptus)	0.1 apiece (0.6)
Orange	0.1 apiece (0.6)		
Tomato	1.0/8 pieces (6)	Battery	45.0 apiece (270)
Tomato	25.0/kg (150)	(alkaline, Size AA)	3.5 apiece (21)
Banana (large)	20.0 apiece (120)	(non-alkaline, Size AA)	6.5 apiece (39)
Sugar	7.5/kg (45)	Small lighter	0.4/box (2)
Salt	1.5/250g (9)	Match (small box)	
Beer 360ml	5.5/bottle (33)		
Water (mineral)	5.0/500ml (30)	Soap	3.0 apiece (18)
		Thin cloth (1m x 2m)	50.0 (300)
Pencil (with eraser)	0.7 apiece (4)	Short-sleeved shirt	80.0 (480)
Ball-point pen	3.0 apiece (18)	Sneakers	165.0 (990)
		Trousers	80.0 (480)
Toilet paper	3.5/roll (21)	Blanket	195.0 (1,170)
Small radio	185.0/unit (1,110)	Bicycle (Chinese)	1,500.0 (9,000)



21. Data concerning Plan for Securing Fuelwoods



Table 1 Commentary on Table 9-1 in the Main Report

Annual Demand (m ³)	Annual consumption per household. Empirically estimated at 5 m ³ .
Customary Forest Area (ha)	Calculated based on the land use map and field surveying.
Growing Stock (m ³)	Based on the results of the customary forest stock survey, the average first class forest stock was estimated at 45.227 m ³ , the second class forest at 20.613 m ³ , and that of the third class forest at 8.189 m ³ . After forest classes in each model area were surveyed, Makhenjera, Bulumute and Bumphula were classified as the first, third and second class forests, respectively. As a result, total stock was calculated by multiplying the area of customary forests in each village by the stock of each class forest.
Annual Cut Volume (m ³)	The annual volume of timber cut in customary forests according to interviews with villagers.
Supply from and to Other Areas (m ³)	In the case that annual demand exceeds annual cut, a deficit is purchased from other areas. In the reserve case, a surplus is supplied to other areas.

Table 2 Commentary on Table 9-3 in the Main Report

Annual Demand	The population in the fifth year was estimated by adding the intermediate value of the increase in ten years at an annual increase rate of 2%: i.e., Multiplying 400 households by 1.02^5 for Makhenjera, 500 households by 1.02^5 for Bulumute, and 420 households by 1.02^5 for Bumphula, 994 households $\times 5 \text{ m}^3 = 4,968 \text{ m}^3$ for Area A 463 households $\times 5 \text{ m}^3 = 2,315 \text{ m}^3$ for Area B
Supply from Customary Forests (50 years rotation)	Area A: Makhenjera: $\{(45\text{m}^3 \times 1,750\text{ha}) + (55\text{m}^3 \times 1,750\text{ha})\} / 50 \text{ years} = 3,500\text{m}^3$ Bulumute: $\{(8\text{m}^3 \times 250\text{ha}) + (18\text{m}^3 \times 250\text{ha})\} / 50 \text{ years} = 130\text{m}^3$ Total $3,630 \text{ m}^3$ Area B $\{(21\text{m}^3 \times 1,500\text{ha}) + (31\text{m}^3 \times 1,500\text{ha})\} / 50 \text{ years} = 1,560\text{m}^3$
Supply from the Reserve	Area A: 2.0m^3 per day, then $2.0\text{m}^3 \times 365 = 730\text{m}^3$ per year Area B: 1.5m^3 per day, then $1.5\text{m}^3 \times 365 = 548 = 545\text{m}^3$ per year
Purchase from Other Areas	Area A: 608m^3 (84 fagots per day, then $0.02\text{m}^3 \times 84 = 1.68\text{m}^3$, then $1.68\text{m}^3 \times 365 = 613\text{m}^3 \approx 608\text{m}^3$) Area B: 125m^3 (29 fagots per day, then $0.02\text{m}^3 \times 29 = 0.58\text{m}^3$, then $0.58\text{m}^3 \times 365 = 212\text{m}^3 \approx 210\text{m}^3$)

Table 3 Expected Situation after Start of Felling

Category	Model Area	Present State	After Start of Felling
Area of Customary Forests	Area A	2,000 ha	1,925 ha
	Area B	1,500 ha	1,465 ha
Used of Dead/ Trees on the Reserves	Area A	730 m^3	365 m^3
	Area B	545 m^3	183 m^3
Purchase from Other Areas	Area A	608 m^3	0 m^3
	Area B	210 m^3	0 m^3

Table 4 Commentary on Table 9-4 in the Main Report

Estimated Households	Makhenjera: $400 \times 1.02^{10} = 488$ Bulumute: $500 \times 1.02^{10} = 609$ Total 1,097 Bumphula: $420 \times 1.02^{10} = 512$
Fuelwood Demand:	Households by 5.0 m ³
Customary Forest Area	In Areas A and B, 75 ha of 2,000 ha and 35 ha of 1,500 ha respectively, will be converted into plantations.
Growing Stock	The growing stock in ten years was estimated at 10 m ³ more than the current level according to Table 9-1. Accordingly, the stock was estimated at 55 m ³ /ha in Makhenjera, 18 m ³ /ha in Bulumute and 30 m ³ /ha in Bumphula. Total stock was determined by multiplying these estimates by area.
Supply	After the end of the improvement period, rotation will be 30 years and cutting cycle will be 10 years Area A: $99,4000 \text{ m}^3 \div 30 = 3,313 \text{ m}^3$ Area B: $45,415 \text{ m}^3 \div 30 = 1,514 \text{ m}^3$
Supply from the Reserve	See the commentary on Table 9-4.
Harvest Volume of Plantations	A deficit in supply from customary forests and the Reserve will be compensated by the harvest volume of plantations estimated at 100 m ³ /ha. Therefore, the planted area will be 18.07 ha per year in area A and 8.63 ha per year in Area B.

Table 5 Commentary Table 9-5 in the Main Report

Reforested customary forest	See the commentary on Table 9-5.
Around House (5m x 5m)	Area A: 1,097 houses x 25 m ² = 2.7 ha Area B: 512 houses x 25 m ² = 1.3 ha
Roadside (60% of total) Length (m) at 3 m intervals in 4 lines	Area A: 0.37 ha x 0.6 = 0.22 ha 0.22 x 1,111 pieces = 247 pieces 247 pieces x 3 / 4 = 185 m Total length in 5 years: 185 m x 5 = 925 m Area B: 0.33 ha x 0.6 = 0.20 0.20 x 1,111 pieces = 222 pieces 222 pieces x 3 / 4 = 167 m Total length in 5 years: 167 m x 5 = 835 m
Footpath (40% of total) Length (m) at 3 m intervals in one line	Area A: 0.37 ha x 0.4 = 0.15 ha 0.15 x 1,111 pieces = 167 pieces 167 pieces x 3 = 501 m Total length in 5 years: 501 m x 5 = 2,505 m Area B: 0.33 ha x 0.4 = 0.13 ha 0.13 x 1,111 pieces = 144 pieces 144 pieces x 3 = 432 m Total length in 5 years: 432 m x 5 = 2,160 m

Table 6 State of Customary Forests

Model Area	Area (ha)	Stock (m ³ /ha)	Normal (m ³)	MAI (m ³)
Area A	1,925	51.6	99,400	3,313
Area B	1,465	31.0	45,415	1,514

Note: Stock in Area A is the weighted mean of 55.0 m³ in Makhenjera and 18.0 m³ in Bulumute.

Table 7 Commentary Table 9-6 in the Main Report

Area of Plantations (ha)	Area A: 1,807m ³ / 100m ³ x 5 = 90.35 ha Area B: 863m ³ / 100m ³ x 5 = 43.15 ha
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Table 8 Commentary on Table 9-18 in the Main Report

①	Forestation costs were determined by dividing the total of forestation and tending costs by 26.70 ha.
②	The discounted value factor is 1/1.06 ⁿ .
③	The appraised value is a future value.
④	The harvest volume is estimated at 100.00 m ³ per ha.

22. Procedure of LANDSAT Data Analysis



1 First Image Analysis

LANDSAT data are usually provided on magnetic tape called CCT (Computer Compatible Tape). LANDSAT colour composite images can be prepared by loading the tapes original data into the computer image processing system and allocating blue, green or red colours to a combination of three proper bands chosen from seven bands (for TM) or four bands (for MSS). The interactive computer system is used to combine these bands so that an optimum combination can be chosen. Computer processing is divided into "pre-processing" and "image processing".

1) Pre-processing

LANDSAT data contain various noises and strains made at the time acquisition of data collection. Therefore, correction and adjustment is required prior to their processing. This is called pre-processing, which includes the following operations.

i) Radiometric Correction

Correction of instrumental noises and atmospheric-caused strains.

ii) Scan Line Correction

Correction of sensor sensitivity and omitted data.

iii) Geometric Correction

Correction of any distorted satellite orbit or position, or satellite location distorted by the earth's rotation, and transfer of coordinates to the existing topographical map.

iv) Histogram Matching of Consecutive Shots to Prepare Image Mosaics

To prepare images covering the study area, the tones of two shots on the right and left sides will be matched to form mosaic images.

2) Image Processing

Image processing is a method in which false-colour images are prepared for manual interpretation of land cover, using highly accurate data correction in the prior processing stage. False-colour images are depicted by allocating blue, green or red colours to Bands 1, 3 and 4 for LANDSAT TM and Bands 4, 5 and 7 for LANDSAT MSS. Although various band combinations are possible in preparing false-colour images, the above-mentioned combinations were judged optimum in this case, through trials and errors on the interactive image-processing computer system display.

After processing, finalized false-colour images for land cover analysis and interpretation were printed on photographic paper at a scale of 1:200,000. This was done for both cases of the LANDSAT MSS in September 1984 and LANDSAT

TM in September and October 1993. These images can be used with the same accuracy as ordinary topographical maps because they were geometrically corrected by using Zone 36 in the universal traverse mercator coordinates for projection system, ARC1950 for datum, and CLARK1880 for spheroid. Boundaries of the Nkhotakota Reserve, according to an existing topographical map drawn on a scale of 1:50,000, are superimposed.

2 Preparation of the First Land Cover Classification Map

As in the process of preparing false-colour images, independent unsupervised land cover classification was carried out by cluster analysis using highly accurate data correction in the pre-processing. At this stage, classification had to be done without sufficient knowledge as to the state of the local land cover. Therefore, criteria were determined on the basis of information available in Japan. Results of the manual interpretation of previously prepared false-colour images provided very effective data for estimating the state of the local land cover. As a result, the following land cover classes were determined and the first land cover classification map was prepared.

- Forest
- Savanna/Bushland
- Grassland
- Grassland/Burned vegetation
- Agriculture
- Bareland
- Major Settlement
- Water bodies

3 Implementation of Field Survey (Land Cover Observation)

To verify the independent unsupervised land cover classification images, prepared by cluster analysis in the first image analysis, a land cover survey was carried out on the site for one month in July 1995. During this period, the Reserve and its vicinity, distance of 20 km from its boundary, were extensively observed. Due to a problem of accessibility, the observation and reporting focused on the areas along roads accessible by vehicles. As many training samples as possible were collected at many various points by referring to the false-colour images, previously prepared on a scale of 1:200,000, in order to determine whether the tones reflected in the images corresponded to the actual state land cover conditions or not.

In this land cover survey, using LANDSAT images, the latest image data (as of September and October 1993) were obtained and analyzed, although taken in the dry season. It was impossible to analyze image data taken during the rainy season when the surveyed area was constantly covered with clouds. For this reason, we experienced the following difficulties and constraints during the field survey. First, major portions of forest throughout the study area, mainly in the Nkhotakota Wildlife Reserve, consisted of deciduous broad-leaved trees which extensively shed leaves during the dry season. As a result, it was discovered that in a forest where leaves had already fallen, the forest was misclassified into grassland or burned grassland in the first analysis of images taken during the dry season. The infrared sensor in the satellite scanned through branches, directly

responding to the grassland or topsoil because the green of forest trees that the sensor should have captured was lost as the leaves fell. Even in similar areas covered with deciduous broad-leaved trees, tree species and density exerted significant effect on the reflectivity of the sensor, making a distinct difference between the vicinity of the Nkhotakota Reserve and the Kasungu National Park. This created difficulties for the study team in determining the delicate seasonally timing of leaves falling through a remote sensing method.

On the other hand, major portions of farmland (mainly maize field) extending throughout the study area will likely become bare land, with weeds or soil exposed in the dry season after harvesting. Accordingly, it was found that the distribution of farmland could not be accurately determined in the first image analysis. Moreover, in areas where soil was directly exposed, the sensor responded directly to soil tone (the southwestern part of the study area is largely divided into reddish brown soil and grayish white soil, both of which correspond to the respective qualities of their parent rocks). As a result, a single farmland was divided into two sections.

Direct observation of the study area also made it clear that certain details of the study area, including Eucalyptus plantations extensively dotting the area, rivers and wet grassland along the shore of the lake, could not be fully observed in the first image analysis.

From the above experience, it is important to correct and amend the sensor's results, and the disparity between satellite images and realities observed on the site by using as many training samples as possible during a land cover classification using satellite images. Accordingly, the second image analysis for land cover classification is for the preparation of a land cover classification map closer to realities, through a supervised classification method based on data (training samples) collected in this field survey.

4 Second Image Analysis

In the second image analysis, land cover classification by a maximum likelihood method will be carried out by referring to training samples of every land cover type collected in the field survey. At this stage, data on the three bands, Bands 2, 3 and 4 from LANDSAT TM, and another three bands, Bands 4, 5 and 7 from LANDSAT MSS, were used to classify each image data pixel into images with spectral reflectance characteristics similar to pixel data extracted as training samples. This process was carried out by Command MAXCLASS on the ERDAS image processing system.

As a result, items in the land cover classification maps were changed to the following classes based on the results of our field observation. A final map was printed at a scale of 1:200,000. This operation covered images taken in both 1984 and 1993.

Woodland I: Woodland in Malawi is usually called Miombo and is composed of deciduous broad-leaved trees, mainly *Brachystegia* spp. Miombo called Msuku¹ is currently prevailing in the Nkhotakota Wildlife Reserve and is composed mainly of *Brachystegia* spp. with an open canopy of approx. 10 m high. This area was classified as Woodland I

¹ Wildlife Society of Malawi, 1989: An Introduction to the Common Trees of Malawi

according to the land cover classification for this study. In September and October, when the images being used were taken, *Brachystegia* spp. shed leaves resulting in doubts that the satellite images did not fully reflect a true distribution as previously mentioned. The area of this woodland may be miscalculated as less. There is an evergreen forest in the upper part of Mt. Chipata in the Nkhotakota Wildlife Reserve, which, however, occupies a very small area by scale of satellite image analysis (1:200,000). It was not extracted in the process of mapping.

Woodland II: This is a different type of woodland in Malawi called "Thengo", which has extensively developed throughout the country often found in infertile plateaus². A typical distribution of Woodland II is found in the Kasungu National Park and is extensively seen west of the study area in the satellite image. This area is classified as Woodland II for this study. Similar to Woodland I, this has an open canopy mainly of *Brachystegia* spp. exists. However, it is as low as 5 to 6 m in height compared with Woodland I because the amount of rainfall is less than in Nkhotakota. The crown density is also low and, due to these combined reasons, the near infrared band shows a low reflectance where Woodland II is clearly distinguished from Woodland I by the satellite sensor.

Reforestation: Eucalyptus plantations dot a vast farmland area. They are not found in the Nkhotakota Reserve or its 10 km buffer zone. They were classified into reforestation in this study, as they are geometrically distributed and tinged with red in the satellite image. This category was newly added as a land cover class in the second image analysis.

Grassland: A large grassland extends near Salima, close to Lake Malawi, in the satellite image of the study area. According to our field observation, this area is extensively used for grazing. When the grassland area in the Nkhotakota Wildlife Reserve was determined in the first analysis, many locations were included in the calculation. As previously mentioned, this was because weeds covering the woodland were captured by the sensor after leaves had fallen. It is viewed that areas which should have fallen under Agriculture I or II were in part classified into grassland.

Wet Grassland: Wet grasslands covered with reeds, which are distributed on the shore of Lake Malawi, along rivers, or continuous dumbos cutting plateaus, were classified into wet grassland. This type of area reflects a deep, sharp red colour due to the reflectivity of the strong near infrared area in the satellite image and, due to this, distribution can be easily traced. However, crops just prior to harvesting in sugar cane estates also take on a red colour in the image and may make it difficult to distinguish them from grasslands.

² Wildlife Society of Malawi, 1989; An Introduction to the Common Trees of Malawi

Grassland/Burned: Grasslands with soil heavily exposed by burning were classified into grassland/burned, distinguished from usual grassland. However, farmland is also extensively burned after harvesting and here classified into grassland/burned.

Agricultures I and II: Both Agricultures I and II cover large maize, tobacco or cassava fields and are not different from each other in cultivated crop and productivity. The distinction of Agriculture I from Agriculture II is based on a difference in soil due to the spectral properties of the ground. This was due to the fact that image data used in the analysis were taken in the dry season after harvesting. Both cover large areas surrounding the study area and extend prominently. Their largeness highly impressed us during the field survey. Although farmland should not be located in the Reserve, approx. 400 ha of farmland was detected by the satellite image analysis in 1993.

Water Bodies: Lake Malawi, small or large lakes, swamps and rivers are classified into water bodies.

Cloud: Any portion covered with clouds is classified as cloud. Portions of the ground shaded by clouds were also classified as cloud.



23. Land Cover Area and Land Cover Change Diagram



Table 1 Area Statistics of Land Cover in 1984

	Inside Wildlife Reserve (Ha)	2 km Buffer Zone (Ha)	5 km Buffer Zone (Ha)	10 km Buffer Zone (Ha)
WOODLAND I	154,150.40 (85.94%)	30,356.28 (64.84%)	37,911.06 (55.27%)	50,704.38 (41.71%)
WOODLAND II	1,682.55 (0.94%)	459.81 (0.98%)	290.25 (0.42%)	294.30 (0.24%)
REFORESTATION	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)
GRASSLAND	6,989.40 (3.90%)	36.63 (0.08%)	0.00 (0.00%)	0.00 (0.00%)
WET GRASSLAND	59.76 (0.03%)	568.44 (1.21%)	1,726.20 (2.52%)	7,163.82 (5.89%)
GRASSLAND/BURNED	16,255.35 (9.06%)	3,807.36 (8.13%)	4,113.45 (6.00%)	7,577.73 (6.23%)
AGRICULTURE I	225.90 (0.13%)	11,316.78 (24.17%)	23,597.64 (34.40%)	43,143.48 (35.49%)
AGRICULTURE II	0.00 (0.00%)	251.37 (0.54%)	715.95 (1.04%)	653.85 (0.54%)
BARREN/BARELAND	5.49 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	36.63 (0.03%)
WATER	0.00 (0.00%)	19.53 (0.04%)	243.63 (0.36%)	12,004.02 (9.87%)
CLOUD	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)
UNCLASSIFIED	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)
Total	179,368.85 (100.00%)	46,816.20 (100.00%)	68,598.18 (100.00%)	121,578.21 (100.00%)

Note: The significant digit is to two decimal places.

Table 2 Area Statistics of Land Cover in 1993

	Inside Wildlife Reserve (Ha)	2 km Buffer Zone (Ha)	5 km Buffer Zone (Ha)	10 km Buffer Zone (Ha)
WOODLAND I	134,614.82 (75.05%)	19,037.52 (40.66%)	19,818.81 (28.89%)	20,765.97 (17.08%)
WOODLAND II	10,355.67 (5.77%)	4,231.80 (9.04%)	4,989.69 (7.27%)	6,885.45 (5.66%)
REFORESTATION	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)
GRASSLAND	12,208.05 (6.81%)	60.21 (0.13%)	0.00 (0.00%)	0.00 (0.00%)
WET GRASSLAND	72.18 (0.04%)	470.34 (1.00%)	1,828.17 (2.67%)	5,563.89 (4.58%)
GRASSLAND/BURNED	20,273.58 (11.30%)	5,967.45 (12.75%)	7,545.60 (11.00%)	9,739.89 (8.01%)
AGRICULTURE I	327.06 (0.18%)	14,465.25 (30.90%)	28,518.48 (41.57%)	51,268.32 (42.17%)
AGRICULTURE II	93.06 (0.05%)	2,268.90 (4.85%)	5,090.22 (7.42%)	13,333.23 (10.97%)
BARREN/BARELAND	29.79 (0.02%)	0.00 (0.00%)	182.97 (0.27%)	299.07 (0.25%)
WATER	0.00 (0.00%)	33.48 (0.07%)	399.96 (0.58%)	11,906.46 (9.79%)
CLOUD	1,394.64 (0.78%)	281.25 (0.60%)	224.28 (0.33%)	1,815.93 (1.49%)
UNCLASSIFIED	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)	0.00 (0.00%)
Total	179,368.85 (100.00%)	46,816.20 (100.00%)	68,598.18 (100.00%)	121,578.21 (100.00%)

Note: The significant digit is to two decimal places.

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▦ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

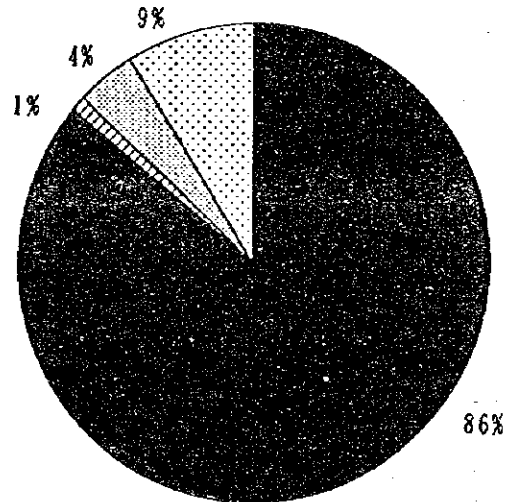


Fig.1 Land Cover Area (Inside the Nkhotakota Wildlife Reserve : 1984)

Note : Grassland/burned means land whose surface is exposed by burning or other factors in this and following figures

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▦ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

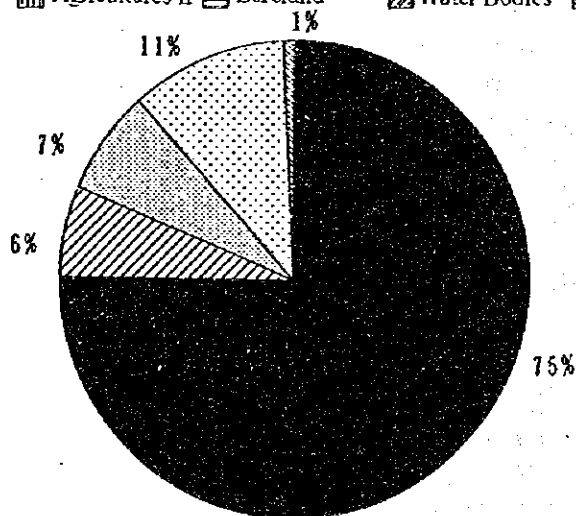


Fig.2 Land Cover Area (Inside the Nkhotakota Wildlife Reserve : 1993)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▪ Agricultures II ▦ Bareland ▥ Water Bodies ▣ Cloud

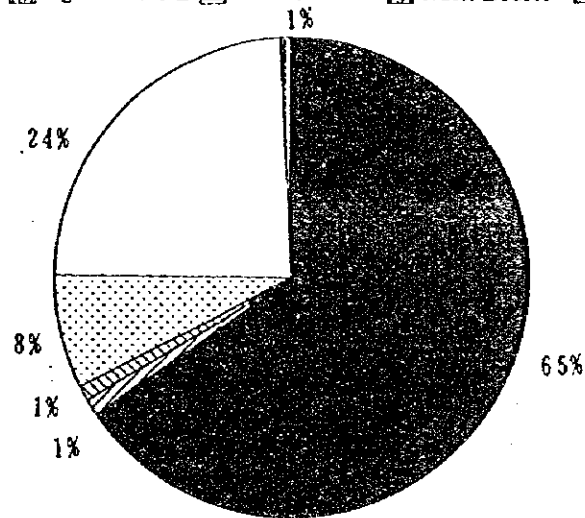


Fig.3 Land Cover Area (2km Buffer Zone : 1984)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▪ Agricultures II ▦ Bareland ▥ Water Bodies ▣ Cloud

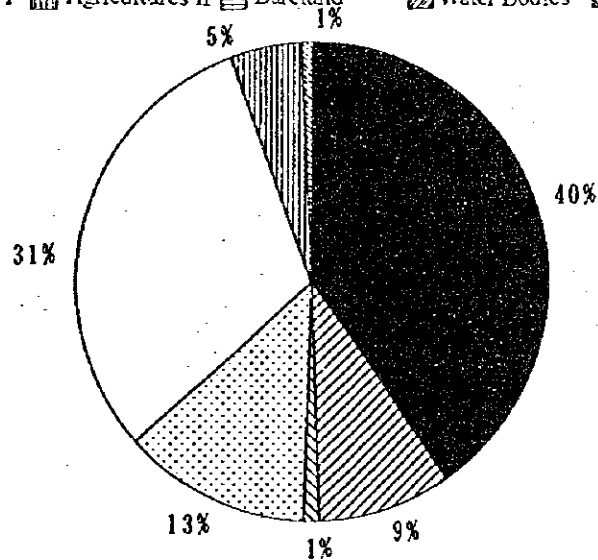


Fig.4 Land Cover Area (2km Buffer Zone : 1993)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▪ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

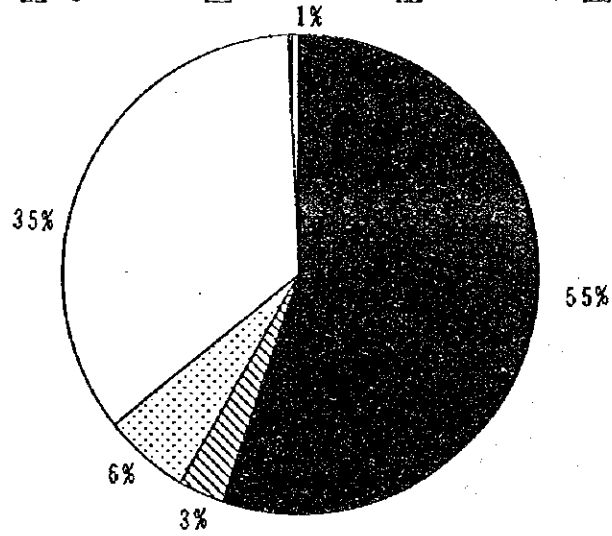


Fig.5 Land Cover Area (5km Buffer Zone : 1984)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▪ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

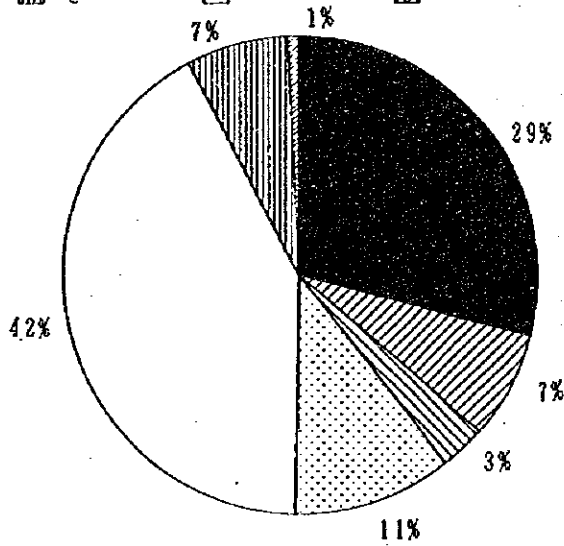


Fig.6 Land Cover Area (5km Buffer Zone : 1993)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▦ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

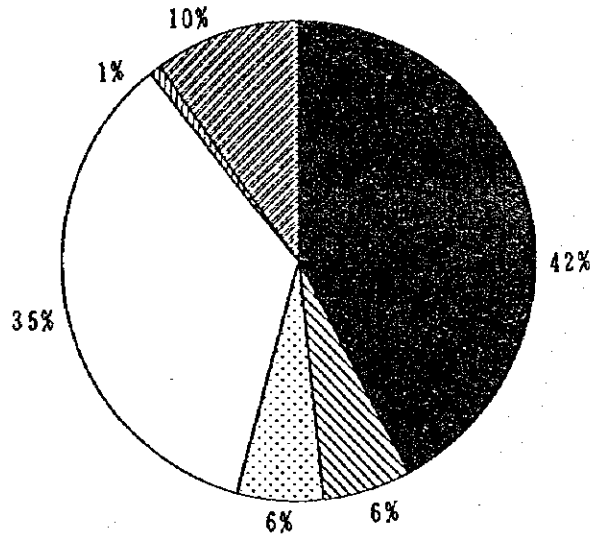


Fig.7 Land Cover Area (10km Buffer Zone : 1984)

■ Woodland I ▨ Woodland II ▩ Grassland ▧ Wet Grassland ▤ Grassland/Burned
 □ Agricultures I ▦ Agricultures II ▨ Bareland ▩ Water Bodies ▧ Cloud

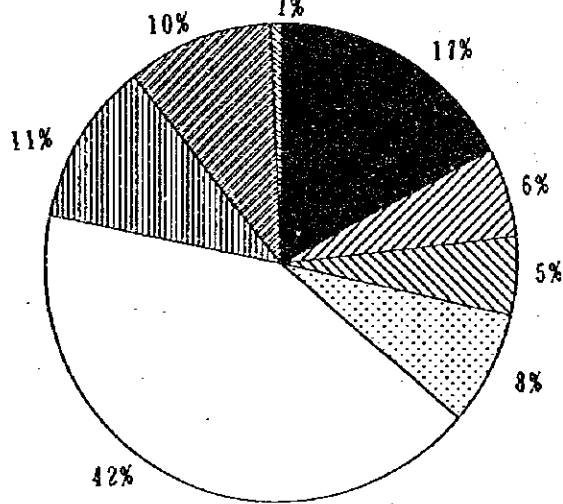


Fig.8 Land Cover Area (10km Buffer Zone : 1993)

Table 3 Area Statistics of Land Cover Change between 1984 and 1993

	Inside Wildlife Reserve (Ha)	2 km Buffer Zone (Ha)	5 km Buffer Zone (Ha)	10 km Buffer Zone (Ha)
WOODLAND				
no change	135,031.20 (86.68%)	19,671.12 (63.83%)	20,663.91 (54.09%)	22,579.02 (44.27%)
to grassland	19,144.17 (12.29%)	3,177.72 (10.31%)	3,626.46 (9.49%)	3,882.60 (7.61%)
to wet grassland	1.93 (0.00%)	5.31 (0.02%)	15.12 (0.04%)	39.69 (0.08%)
to agriculture	224.91 (0.14%)	7,747.11 (25.14%)	13,632.39 (35.69%)	23,229.45 (45.55%)
to barren/bareland	17.82 (0.01%)	0.00 (0.00%)	62.46 (0.16%)	177.75 (0.35%)
to water	0.00 (0.00%)	2.52 (0.01%)	19.62 (0.05%)	23.13 (0.05%)
to cloud	1,362.87 (0.87%)	212.31 (0.69%)	181.35 (0.47%)	1,067.04 (2.09%)
Sub-total	155,832.95 (100.00%)	30,816.09 (100.00%)	38,201.31 (100.00%)	50,998.68 (100.00%)
GRASSLAND				
no change	13,275.09 (57.11%)	1,260.81 (32.80%)	1,042.11 (25.33%)	1,474.92 (19.46%)
to woodland	9,866.16 (42.44%)	988.29 (25.71%)	878.49 (21.36%)	770.58 (10.17%)
to wet grassland	16.38 (0.07%)	29.70 (0.77%)	210.96 (5.13%)	464.04 (6.12%)
to agriculture	56.07 (0.24%)	1,550.07 (40.32%)	1,892.61 (46.01%)	4,528.80 (59.76%)
to barren/bareland	0.00 (0.00%)	0.00 (0.00%)	17.55 (0.43%)	22.59 (0.30%)
to water	0.00 (0.00%)	9.18 (0.24%)	71.01 (1.73%)	127.71 (1.69%)
to cloud	31.05 (0.13%)	5.94 (0.15%)	0.72 (0.02%)	189.09 (2.50%)
Sub-total	23,244.75 (100.00%)	3,843.99 (100.00%)	4,113.45 (100.00%)	7,577.73 (100.00%)
WET GRASSLAND				
no change	53.82 (90.06%)	297.54 (52.34%)	1,066.32 (61.77%)	3,856.23 (53.83%)
to woodland I	1.89 (3.16%)	0.63 (0.11%)	43.92 (2.54%)	270.36 (3.77%)
to grassland	3.78 (6.33%)	102.60 (18.05%)	141.66 (8.21%)	952.65 (13.30%)
to agriculture I	0.27 (0.45%)	164.61 (28.96%)	419.40 (24.30%)	1,956.78 (27.31%)
to water	0.00 (0.00%)	3.06 (0.54%)	54.90 (3.18%)	127.80 (1.78%)
Sub-total	59.76 (100.00%)	568.44 (100.00%)	1,726.20 (100.00%)	7,163.82 (100.00%)
AGRICULTURE				
no change	138.87 (61.47%)	7,272.18 (62.86%)	17,661.96 (72.64%)	34,704.54 (79.24%)
to woodland	20.07 (8.88%)	2,609.10 (22.55%)	3,222.18 (13.25%)	4,019.22 (9.18%)
to grassland	58.59 (25.94%)	1,486.53 (12.85%)	2,735.28 (11.25%)	3,418.29 (7.80%)
to wet grassland	0.00 (0.00%)	137.34 (1.19%)	532.62 (2.19%)	949.95 (2.17%)
to barren/bareland	7.65 (3.39%)	0.00 (0.00%)	102.95 (0.42%)	73.53 (0.17%)
to cloud	0.72 (0.32%)	63.00 (0.54%)	42.21 (0.17%)	559.80 (1.28%)
to water	0.00 (0.00%)	0.00 (0.00%)	16.38 (0.07%)	72.00 (0.16%)
Sub-total	225.90 (100.00%)	11,568.15 (100.00%)	24,313.59 (100.00%)	43,797.33 (100.00%)
BARREN/BARELAND				
no change	4.32 (78.69%)			25.20 (68.80%)
to woodland	1.17 (21.31%)			11.43 (31.20%)
Sub-total	5.49 (100.00%)			36.63 (100.00%)
WATER				
no change		18.72 (95.85%)	238.05 (97.71%)	11,555.82 (96.27%)
to woodland I		0.18 (0.92%)	0.00 (0.00%)	0.81 (0.01%)
to wet grassland		0.45 (2.30%)	3.15 (1.29%)	253.98 (2.12%)
to grassland/burned		0.00 (0.00%)	0.09 (0.04%)	11.43 (0.10%)
to agriculture		0.18 (0.92%)	2.34 (0.96%)	181.98 (1.52%)
Sub-total		19.53 (100.00%)	243.63 (100.00%)	12,004.02 (100.00%)
Total	179,368.85	46,816.20	68,598.18	121,578.21

Note: The significant digit is to two decimal places.

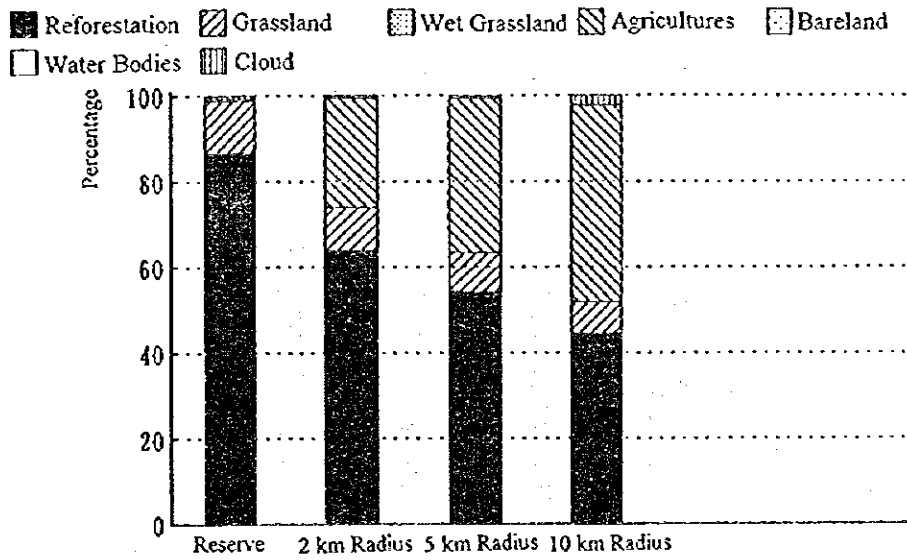


Fig.9 Change of Land Utilization from Woodland

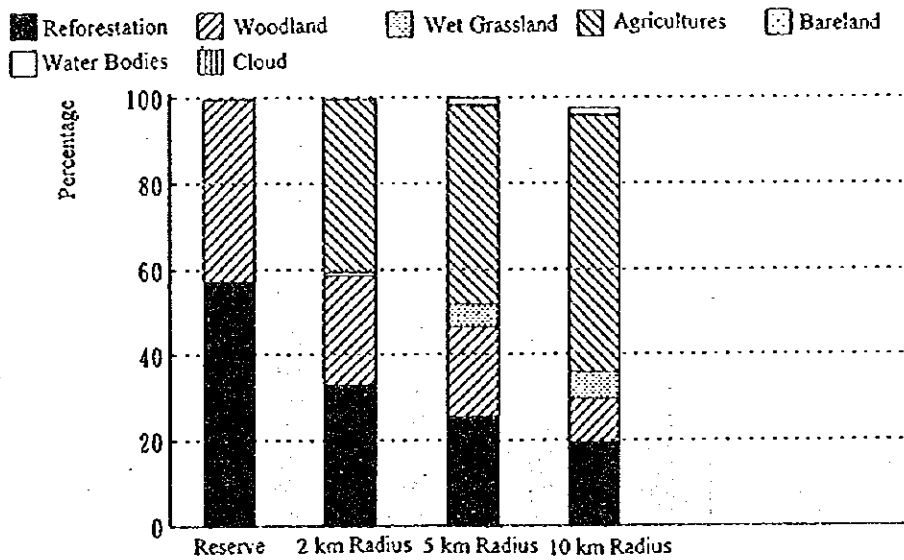


Fig.10 Change of Land Utilization from Grassland

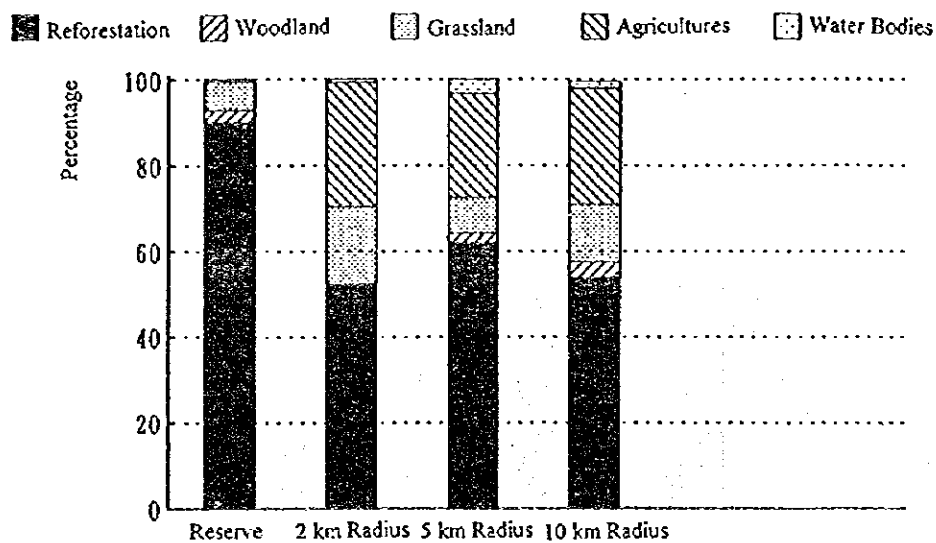


Fig.11 Change of Land Utilization from Wet Grassland

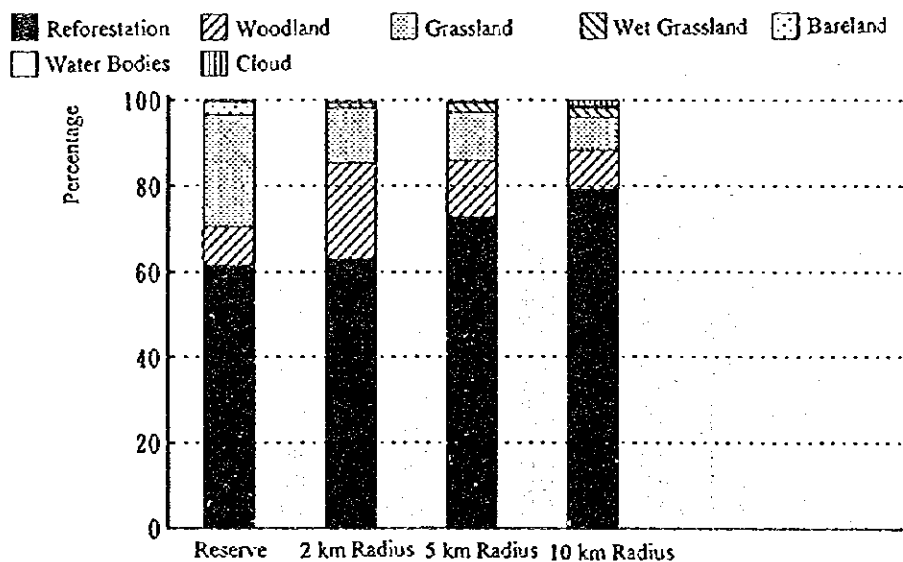


Fig.12 Change of Land Utilization from Agriculture

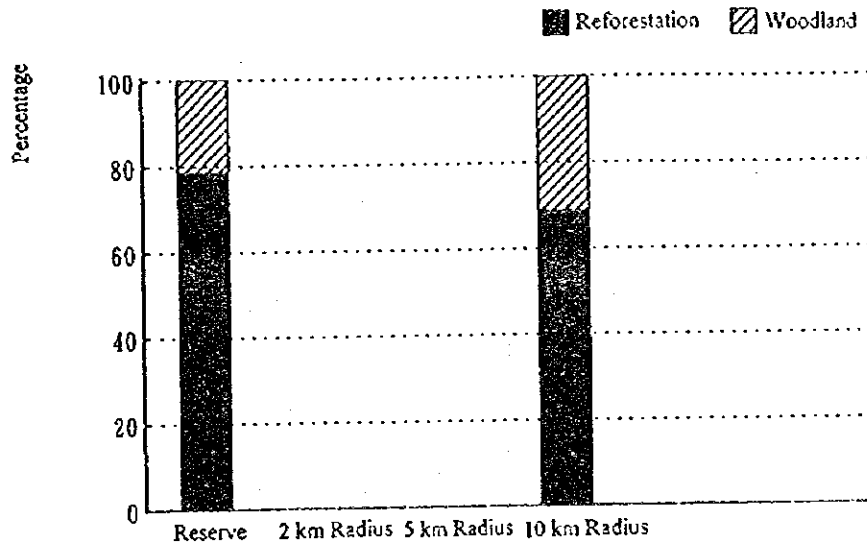


Fig.13 Change of Land Utilization from Barren/Bareland

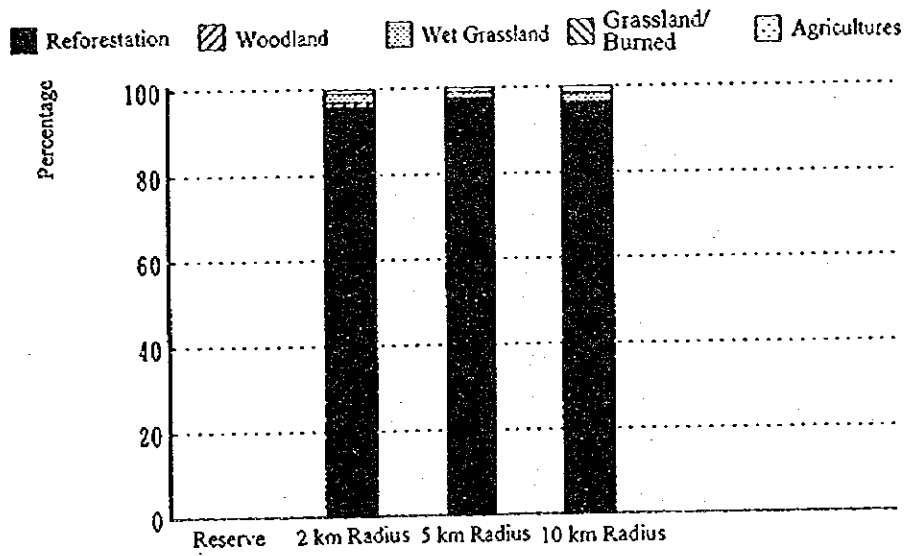
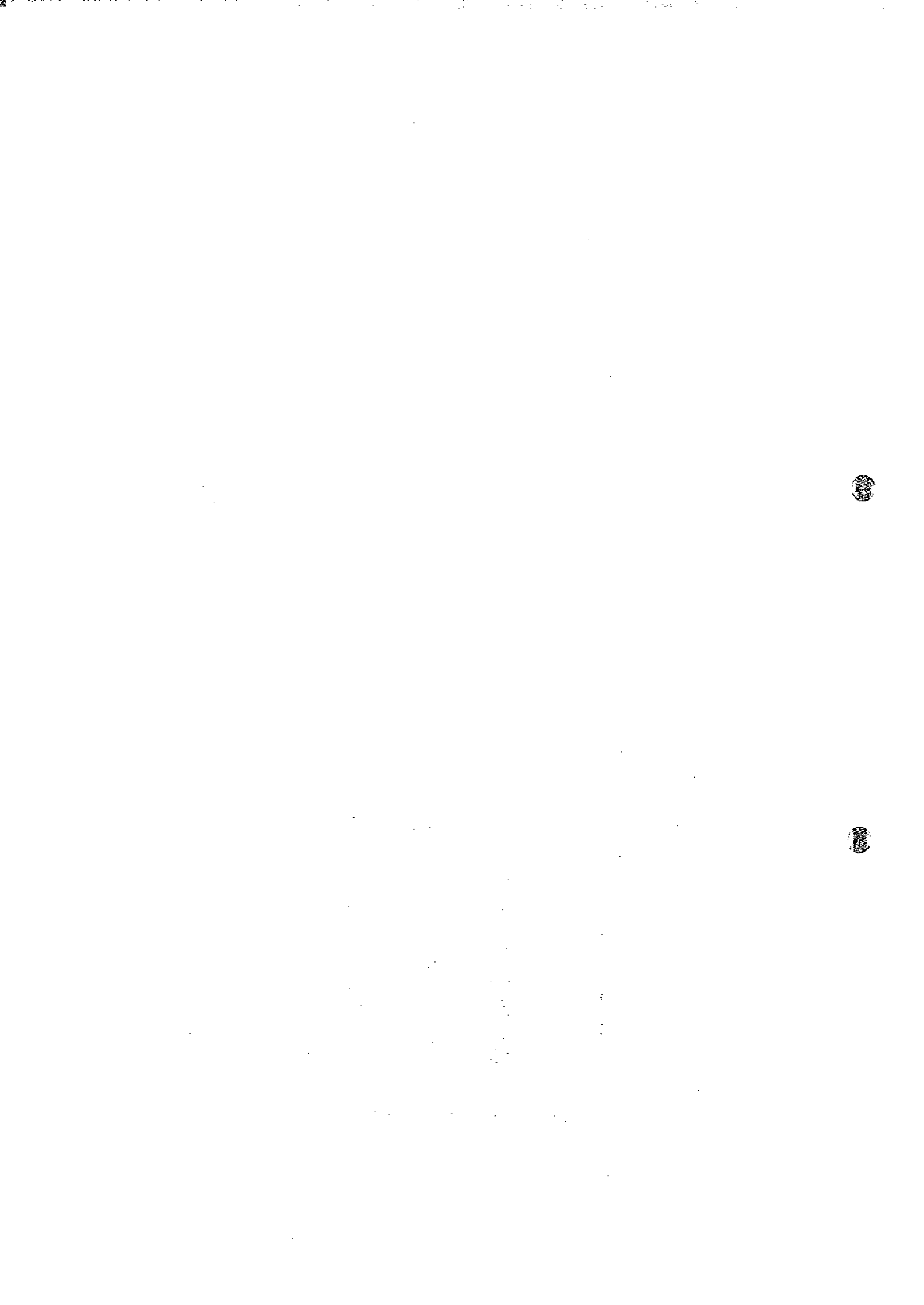


Fig.14 Change of Land Utilization from Water



24. Land Use and Vegetation around the Reserve



Land Use and Vegetation around the Reserve

Department	Traditional Authority	Urban Area	Field	Irrigated Sugarcane Field	Paddy Field	Miombo Forest	Dry Grassland	Seasonally Wet Grassland	Wet Land	Water Body	Bare Land	Total
Nkhotakia	Kanyenda	380	10,672	94	454	5,040	1,557	1,092	1,608	581	378	21,856
	Malenga Chanzi Mphonde	244	20,472		1,720	9,045	3,639	913	3,489	1,012	206	40,740
	Mwadzama*	12	8,175	69	37	10,713	3,161	294	881	388		23,730
Ntchisi	Nthondo Chilooko	533	22,135			14,020	1,826	382	106			39,002
Kasungu	Kapelula	261	14,013			12,938	2,037	500		69		29,818
	Wimbe	113	8,999			5,591	941					15,644
	Simlemba		1,288			929	1,066			31		3,314
Mzimba	Mabulabo	28	3,525	6	294	10,280	1,031	94		175	25	15,458
	Total	1,571	89,279	169	2,505	68,556	15,258	3,275	6,084	2,256	609	189,562

Note : Including Mwanasambo Sub-traditional Authority



25. Standards for Interpreting Aerial Photographs and Area by Forest Type

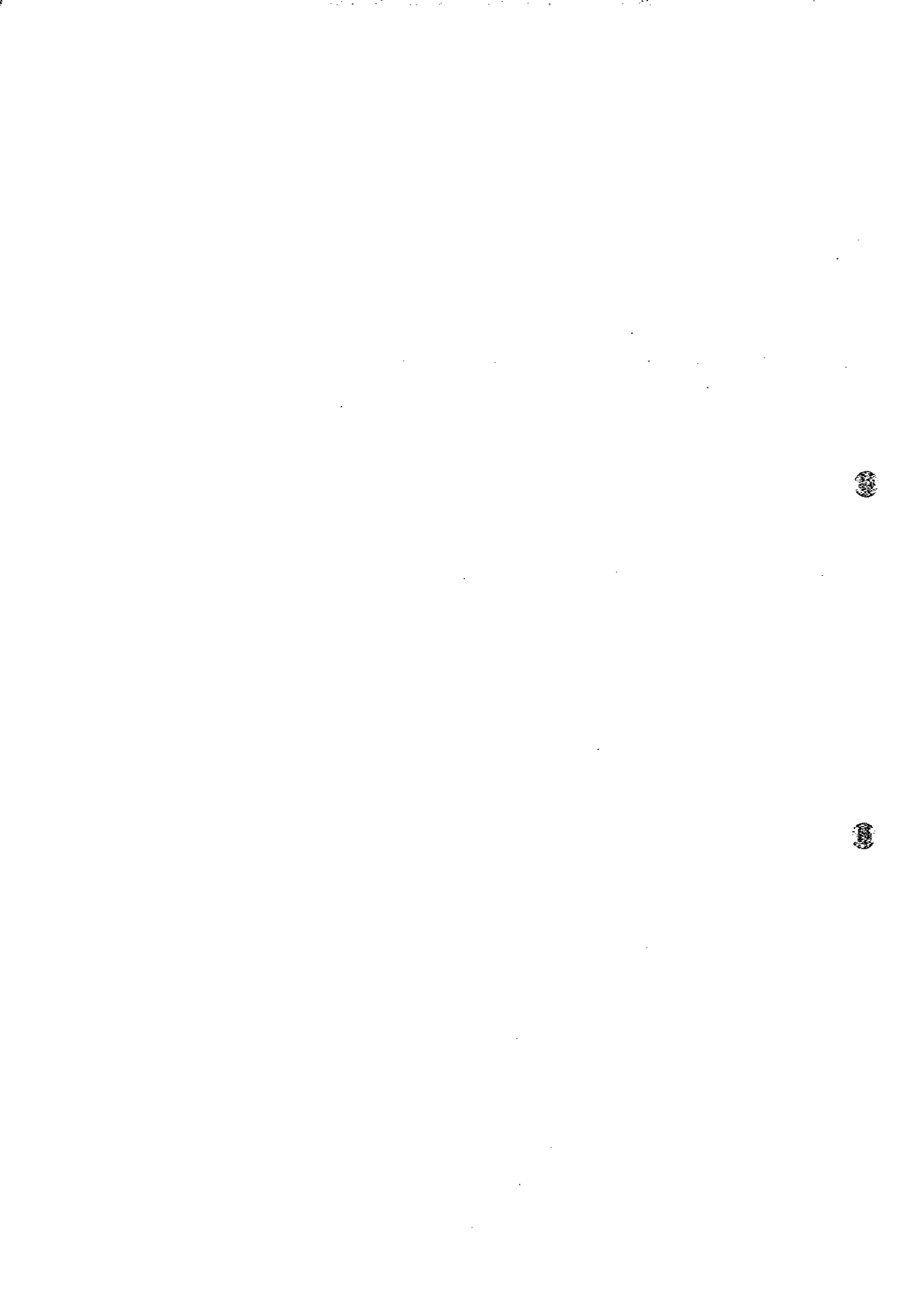


Table 1 Standards for Interpreting Aerial Photographs

Forest Type		Code	Standard
Forest	Evergreen Broad-leaved Forest	Height: 20 m or more; Crown density: 70% or more	EH3D3
		Height: 20 m or more; Crown density: 30-70%	EH3D2
		Height: 20 m or more; Crown density: less than 30%	EH3D1
		Height: 10 m - 20 m; Crown density: 70% or more	EH2D3
		Height: 10 m - 20 m; Crown density: 30%-70%	EH2D2
		Height: 10 m - 20 m; Crown density: less than 30%	EH2D1
		Height: less than 10 m; Crown density: 70% or more	EH1D3
		Height: less than 10 m; Crown density: 30%-70%	EH1D2
		Height: less than 10 m; Crown density: less than 30%	EH1D1
	Miombo Forest	Height: 20 m or more; Crown density: 70% or more	MH3D3
		Height: 20 m or more; Crown density: 30-70%	MH3D2
		Height: 20 m or more; Crown density: less than 30%	MH3D1
Height: 10 m - 20 m; Crown density: 70% or more		MH2D3	
Height: 10 m - 20 m; Crown density: 30%-70%		MH2D2	
Height: 10 m - 20 m; Crown density: less than 30%		MH2D1	
Height: less than 10 m; Crown density: 70% or more		MH1D3	
Height: less than 10 m; Crown density: 30%-70%		MH1D2	
Height: less than 10 m; Crown density: less than 30%		MH1D1	
Non-forest	Land under cultivation	V	Demarcation is clear. Distributed on a small scale, only on the east side of the Reserve.
	Grassland	G	Tone is white or gray. Abundant on slopes.
	River	St	Only the wide Bua River crossing the center of the Reserve.
	Wetland	S	Seasonally distributed in fall lowlands. Tone is dark gray, or light black and gray.
	Other remaining areas (rocky area)	R	Distributed on a very small scale throughout the Reserve. Tone is light grayish white.

Table 2 Area by Forest Type

Forest Type		Code	Area (ha)	Share (%)
Forest	Evergreen Broad-leaved	Height: 20 m or more; Crown density: 70% or more	EH3D3 54	0.03
		Height: 20 m or more; Crown density: 30-70%	EH3D2 0	0.00
		Height: 20 m or more; Crown density: less than 30%	EH3D1 0	0.00
		Height: 10 m - 20 m; Crown density: 70% or more	EH2D3 0	0.00
		Height: 10 m - 20 m; Crown density: 30%-70%	EH2D2 0	0.00
		Height: 10 m - 20 m; Crown density: less than 30%	EH2D1 0	0.00
		Height: less than 10 m; Crown density: 70% or more	EH1D3 0	0.00
		Height: less than 10 m; Crown density: 30%-70%	EH1D2 0	0.00
		Height: less than 10 m; Crown density: less than 30%	EH1D1 0	0.00
	Miombo	Height: 20 m or more; Crown density: 70% or more	MH3D3 23,676	13.16
		Height: 20 m or more; Crown density: 30-70%	MH3D2 37,191	20.68
		Height: 20 m or more; Crown density: less than 30%	MH3D1 7,543	4.19
		Height: 10 m - 20 m; Crown density: 70% or more	MH2D3 40,637	22.59
		Height: 10 m - 20 m; Crown density: 30%-70%	MH2D2 32,091	17.84
		Height: 10 m - 20 m; Crown density: less than 30%	MH2D1 10,433	5.80
		Height: less than 10 m; Crown density: 70% or more	MH1D3 14,890	8.28
		Height: less than 10 m; Crown density: 30%-70%	MH1D2 4,425	2.46
		Height: less than 10 m; Crown density: less than 30%	MH1D1 431	0.24
	Non-forest	Land under cultivation	V 621	0.35
Grassland		G 6,801	3.78	
River		St 474	0.26	
Wetland		S 251	0.14	
Other remaining areas (rocky area)		R 360	0.20	
Total			179,878	100.00

