Leaflet No. 7/2000

Government of the Union of Myanmar
Ministry of Forestry
Forest Department

The Effect of Chemical Fertilizer Application on *Eucalyptus* Plantation at Dry Zone Greening Area

U Htin Kyaw, Research Assistant (2),
Daw Thida Swe, Research Assistant (3),
Daw Thida Cho, Research Assistant (3),
and
Daw Tin Tin Ohn, Assistant Director,
Forest Research Institute, Yezin
April, 2000

အပူပိုင်းဒေသစိမ်းလန်းစိုပြည်ရေး၊ ယူကလစ်စိုက်ခင်းများတွင် ခါတ်မြေဩဇာ၏ အကျိုးအာနိသင်ကို စမ်းသပ်ခြင်း

ဦးထင်ကျော်? B.Sc. (I.C) (Ygn.) သုတေသနလက်ထောက်-၂၊
ဒေါ်သီတာဆွေ? B.Sc. (Chem.) (Mdy.) ? သုတေသနလက်ထောက်-၃၊
ဒေါ်သီတာချို? B.Sc. (Chem.) (Mdy.) ? သုတေသနလက်ထောက်-၃
နှင့်
ဒေါ်တင်တင်အုံး ၊ B.Ag (Mdy.), M.S. (U.F) ? လက်ထောက်ညွှန်ကြားရေးမှူး၊
သစ်တောသုတေသနဌာန၊ရေဆင်း။

စာတမ်းအကျဉ်းချုပ်

အပူပိုင်းဒေသတွင် စိမ်းလန်းစိုပြည်ရေး စိုက်ခင်းများတည်ထောင်ရာ၌ အပင်အဟာရခါတ်ပိုင်းဆိုင်ရာ အထောက်အကူ ပြုစေရန်အတွက် ကျောက်ပန်းတောင်းမြို့နယ်-စိုင်ဖြူကာကွယ်တော၊ မင်းဘူးမြို့နယ်-လေးပင်အိုင် ကာကွယ်တော၊ မကွေးမြို့နယ်- ဒေါင်းနေကာကွယ်တော နှင့် စစ်ကိုင်းမြို့နယ်-ခြေရာတော် ကာကွယ်တောများရှိယူကလစ်စိုက်ခင်း များတွင် ယူရီးယား၊ တီစူပါ ဖော့စဖိတ်၊ ပိုတက်ရှ် မြေဩဇာ နှင့် ဘိုရွန်ခါတ်တို့ပါဝင်သော စမ်းသပ်ချက်(၆)မျိုး TSP (50)g, TSP (100)g, 3N:2P;1K (160)g, 3N:2P:1K (80)g, 3N:2P:1K (80)g + B (0.03)g ဖြင့် 1998 ခုနှစ်တွင် စမ်းသပ်ခဲ့ပါသည်။ ယင်းမြို့နယ်တွင် အဓိက အဟာရခါတ်များ ချို့တဲ့နေသည်ကို တွေ့ရပြီး မင်းဘူး မြို့နယ်နှင့် ကျောက်ပန်းတောင်းမြို့နယ်တွင် မြေအနည်းငယ်ချဉ် (P^H 4.5-6.0) သည်ကလွဲ၍ ကျန်မြို့နယ်များသည် အင်ဇက် ယိုင်သောမြေ (P^H 7.5-9.0) များဖြစ်သည်ကို တွေ့ရပါသည်။ မြေဆွေးခါတ်ပါဝင်မှု နည်းပါးပြီး မြေမှာ **Loamy sand** နှင့် **sandy loam** အမျိုးအစားတို့ဖြစ်ပါသည်။ ကျောက်ပန်း တောင်းမြို့နယ်တွင် ခါတ်မြေဩဇာ ထည့်ခြင်းဖြင့် အပင်ကြီးထွားမှု ကောင်းလာသည်ကို တွေ့ရသော်လည်း TSP (100)g တစ်မျိုးတည်းဖြင့် အပင်ကြီးထွားမှု အကောင်းဆုံးဖြစ်သည်ကို တွေ့ရပါသည်။ စစ်ကိုင်း၊ မကွေး၊ မင်းဘူးမြို့နယ်တွင် 3N:2P: 1K (80g မှ 160g) ထည့်သွင်းခြင်းသည် အပင်ကြီးထွားမှု ပို၍ ကောင်းစေ ပါသည်။ ဘိုရွန်ခါတ် အပင်ကြီးထွားမှုပေး အကျိုးသက်ရောက် မှုကို ထင်ရှားစွာ မတွေ့ရပါ။

The Effect of Chemical Fertilizer Application on *Eucalyptu* Plantation at Dry Zone Greening Area

U Htin Kyaw, B.Sc. (I.C) (Ygn.), Research Assistant (2),
Daw Thida Swe, B.Sc. (Chem.) (Mdy.), Research Assistant (3),
Daw Thida Cho, B.Sc. (Chem.) (Mdy.), Research Assistant (3),
and
Daw Tin Tin Ohn, B.Ag (Mdy.), M.S. (U.F), Assistant Director,
Forest Research Institute, Yezin

Abstract

With an objective of providing plant nutritional information for the establishment of dry zone greening plantation, chemical fertilizer experiment of Urea, Triple Super Phosphate (TSP) and Murate of potash with or without boron (B), consisting of 6 treatments (TSP-50 g, TSP-100g, 3N: 2P: 1K-160g, 3N: 2P: 1K- 80g, 3N:2P: 1K - 80g+ B-0.03g) with 4 replications was conducted in 1998 at the Saiphyu protected public forest, Kyaukpadaung Township, Laybinaing protected public forest, , Minbu Township, Daung Ne protected public forest, Magway Township, and Chayardaw protected forest, Sagaing Township. All of the study area are generally Loamy sand and Sandy loam with very low organic matter in association with either slightly alkaline or alkaline reaction (P^H 7.5-9.0) except in Minbu and Kyaukpadaung sites where soil reaction is slightly acid condition (P^H 4.5-6.0). Although relatively better growth were noted in fertilizer treated plots at Kyaukpadaung, the growth as determined by plant height was found to be the best by the application of 100g TSP/plant. By the utilization of 80-160g (3N:2P:1K)/plant, better growth can be expected in Sagaing Township, Magway Township and Minbu Township. However, plant growth in all sites tested did not respond to boron(B) application.

Contents

		Page
1.	Introduction	1
2.	Study Areas	1
3.	Mayerials and Methods	1
4.	Results and Discussion	2
5.	Conclusion	6
6.	Literature Cited	

Tables

1.	Different ratio and amount (gm / plant) of ferlilizers	2
2.	Physical and Chemical Properties of the Study Area	4
3.	Plant Height (cm) as affected by different fertilizer application, Kyaukpadaung (January, 2000)	5
4.	Plant Height (Cm) as affected by different fertilizer application, Minbu (January, 2000)	5
5.	Plant Height (Cm) as affected by different fertilizer application, Magway (January, 2000)	6
6.	Plant Height (Cm) as affected by different fertilizer application, Sagaing (January, 2000)	6

APPENDICES

I.	Physical and Chemical Properties of Soil in Kyaukpadaung.
II.	Physical and Chemical Properties of Soil in Minbu.
III.	Physical and Chemical Properties of Soil in Magway.
IV.	Physical and Chemical Properties of Soil in Sagaing.

1. Introduction

Owing to increasing population either planned reforestation or revegetation is very crucial in dry zone area to meet local demand of fuel woods. In order to produce more fuel woods use of growth limiting nutrients through chemical fertilizers application is needed since soil fertility as determined by plant nutrient parameters in the particular areas are generally very low mainly due to the soil erosion.

As a consequences, the government of the Union of Myanmar had launched the greening project for the critical districts of arid zone of central Myanmar in 1993 as a national task.

Some Physical and Chemical properties and growth of plantations in dry zone area had already been investigated for the proper management of dry zone revegetation program (Some Physical and Chemical Properties of Dry Zone Forest Soil (1983), Study On the Effectiveness of the Application Of Fertilizers in Dry Zone Forest Plantations (1988), The Properties and Utilization of Soil in the Greening Project for the Nine Critical Districts of the Arid Zone of Central Myanmar (1996)).

However, more information are still needed to make technical support. Thus, this study was carried out on Eucalyptus plantation at dry zone area in 1998.

2. Study Area

Fertilizer experiments were carried out in the following areas.

1. Saiphyu Protected Public Forest in Kyaukpadaung Township, Mandalay Division.
2. Leybinaingma Protected Public Forest in Minbu Township, Magway Division.
3. Daung Ne Protected Public forest in Magway Township, Magway Division.
4. Chay Yar Daw Protected forest in Sagaing Township, Sagaing Division.

3. Materials and Methods

The experiments were conducted with 6 fertilizer treatments and each treatment was replicated into 3 times except in Kyaukpadaung where it was 4 replications. Experimental units (EU), measuring 84' x 84', consisting of 49 *Eucalyptus camaldulensis* were assigned as Randomized Complete Block Design (RCBD).

Different ratio of fertilizers application were practiced at 1- 1 ½ month after planting. Different ratios and amount of fertilizers are shown in following table.

Table(1) **Different ratio and amount of Fertilizer**

Sr.No	Treatments	Amounts (gm/plant)			
		urea	TSP	Potash	Boron
1.	Control	-	-	-	-
2.	37Kg P_2O_5/ha		50g		
3.	75Kg P_2O_5/ha		100g		
4.	60Kg N/ha + 40 Kg P_2O_5/ha + 20 Kg K_2O/ ha	173.93	118.53	44.45	
5.	30Kg N/ha + 20Kg P_2O_5/ha + 10Kg K_2O/ha	86.93	59.24	13.33	
6.	30Kg N/ ha + 20 Kg P_2O_5 /ha + 10 Kg K_2O /ha + 0.0225 Kg B /ha	86.93	59.24	13.33	.03

Plant height measuring were made in November 1998 and December 1999. Soil sample collections were done before fertilizer application from each location tested. Collected soil samples were analyzed at forest soil laboratory, Forest Research Institute to be recorded as site characterization.

4. Results and Discussion

Some Physical and Chemical properties of study area are described in (table 2).

The soil in Minbu site is generally Sandy Loam with slightly acid condition. Total N and soil Organic matter content, on the other hand, are terribly low, but available Phosphorus is found to be medium level for plant growth.

Sandy clay loam soils with p^H 5.5-7 were observed in Kyaukpadaung site. Fairly amount of total soil N and Organic matter were contained in the soil. Phosphate fertilizer response could be expected on account of markedly low content of available soil P.

Dominant textural Class in Magway was Sandy loam with poor moisture retention. Soil reaction in this site, in general, is slightly alkaline (P^H 7.5-9.3). In addition, available soil P, total soil N and soil Organic matter contents are recorded as very low level.

In Sagaing site, the soils are varied from Sand to Loamy sand with alkaline reaction. Total soil N, available soil P and soil Organic matter are found to be low for normal plant growth.

Plant growth as determined by plant height parameter were not significantly different in among fertilizer treatments ($P > 0.05$) regarding all sites tested.

Plant heights as affected by the treatments in Kyaukpadaung were shown in (Table 3). According to the visible and actual data observation, the growth was notably the best in the treatment receiving 100g TSP/plant alone though all plants were responsive to fertilizer application. It is probably because of soil P insufficienly in this soil (Table 2).

In Minbu plantation site, although plant heights were subjected to be responsive to fertilizer, better growth was observed by the application of 3N:2P:1K-

160g (Table 4). Plant heights responded to the treatments in Magway and Sagaing are very resemble as found in Minbu (Table 5 and 6).

Plant growths are lightly to be responsive to Boron nutrient only at Minbu site. The reasons for the regional differences in the responsiveness of Boron is not known yet but it might be due to the soil moisture differences at the time of fertilizer application.

Table (2) **Physical and Chemical Properties of Soil in study Area**

Sr No	Township	Soil depth (cm)	P^H	Total N %	Ava.P mg/100gm	Extractable Nutrients mg/100g			OM%	Texture			Textural classes
						K	Ca	Mg		Sand %	Silt %	Clay %	
1.	Saiphyu	0-10	5.89-7.24	.013-.0611	.007-.657	3-11	22-70	5.8-14.6	2.33-3.54	71-91	3-11	5-20	Sandy clay loam
	Protected Public Forest	40-50	5.79-7.16	.0111-.0365	.002-.048	0.6-6.6	34-86	14.8-28.4	1.8-3.62	63-70	4-9	26-31	Sandy clay loam
	Kyaukpadaung	80-90	5.47-6.24	.0013-.0333	.002-.061	2-8.4	38-60	11.1-19.8	2.81-3.06	66-67	4-9	21-25	Sandy clay loam
2.	Leybinaingma	0-10	4.9-6.66	.0067-.0382	.002-.276	1.4-6.4	14-76	2-41.2	.73-3.95	78-86	1-12	4-15	Loamy sand
	Protected Public Forest	40-50	4.54-5.88	.0069-.0544	.024-.242	0.8-11.4	10-86	2.4-39.8	.36-3.56	51-78	2-9	12-20	Sandy loam
	Minbu Township	80-90	4.71-5.76	.0062-.0449	nil-.076	1.4-17.6	8-62	3-23.6	.47-4.01	66-77	4-17	12-17	Sandy loam
3.	Daung Ne	0-10	7.48-8.95	.0113-.0568	nil-.0073	0.8-11.8	36-92	2.8-38.8	.02-3.81	52-76	9-25	13-20	Sandy loam
	Protected Forest,	40-50	8.48-8.97	.017-.0568	nil-.0094	0.6-12.8	28-80	7-34.2	.59-3.51	59-81	3-23	13-20	Sandy loam
	Magway Township	80-90	8.63-9.33	.0116-.0526	nil-.015	1.0-7.4	10-860	1.4-13.4	.59-3.24	61-79	7-27	6-17	Sandy loam
4.	Chay Yar Daw	0-10	8.32-8.81	.0225-.0417	.003-.101	2.2-7.8	268-520	12-50	1.68-2.71	77-79	6-10	8-14	Loamy sand
	Protected Forest	40-50	8.57-8.84	.0243-.0488	.001-.186	0.26-4.00	50-560	18-50	1.84-3.62	61-73	13-18	12-20	Sandy loam
	Sagaing Township	80-90	8.61-9.03	.0194-.0317	.001-.141	3-5.4	272-460	12-56	1.4-3.09	77-88	5-11	2-5	Sand

Table (3) **Plant height (cm) as affected by different fertilizer application, Kyaukpadaung (January,2000)**

Sr. No.	Treatments	Plant Height (cm)
1.	Control	121.00
2.	37Kg P_2O_5/ha (1P)	129.58
3.	75Kg P_2O_5/ha (2P)	152.35
4.	60Kg N/ha + 40 Kg P_2O_5/ha + 20 Kg K_2O/ ha (3N:2P:1K)	145.66
5.	30Kg N/ha + 20Kg P_2O_5/ha +10Kg K_2O/ha (3N:2P:1K)	145.50
6.	30Kg N/ ha + 20 Kg P_2O_5 /ha + 10 Kg K_2O /ha + 0.0225 Kg B /ha (3N:2P:1K) + 0.03 (B)	148.13
	F-Test	n.s
	C.V%	14.35

Table (4) **Plant height (cm) as affected by different fertilizer application, Minbu (January,2000)**

Sr.No.	Treatments	Plant Height (cm)
1.	Control	97.21
2.	37Kg P_2O_5/ha (1P)	91.05
3.	75Kg P_2O_5/ha (2P)	100.08
4.	60Kg N/ha + 40 Kg P_2O_5/ha + 20 Kg K_2O/ ha (3N:2P:1K)	140.31
5.	30Kg N/ha + 20Kg P_2O_5/ha +10Kg K_2O/ha (3N:2P:1K)	121.09
6.	30Kg N/ ha + 20 Kg P_2O_5 /ha + 10 Kg K_2O /ha + 0.0225 Kg B /ha (3N:2P:1K) + 0.03 (B)	129.46
	F-Test	n.s
	C.V%	14.12

Table (5) **Plant height (cm) as affected by different fertilizer application, Magway (January,2000)**

Sr.No.	Treatments	Plant Height (cm)
1.	Control	84.95
2.	37Kg P_2O_5/ha (1P)	84.36
3.	75Kg P_2O_5/ha (2P)	93.70
4.	60Kg N/ha + 40 Kg P_2O_5/ha + 20 Kg K_2O/ha (3N:2P:1K)	115.05
5.	30Kg N/ha + 20Kg P_2O_5/ha + 10Kg K_2O/ha (3N:2P:1K)	106.47
6.	30Kg N/ha + 20 Kg P_2O_5/ha + 10 Kg K_2O/ha + 0.0225 Kg B/ha (3N:2P:1K) + 0.03 (B)	89.87
	F-Test	n.s
	C.V%	15.26

Table (6) **Plant height (cm) as affected by different fertilizer application, Sagaing (January,2000)**

Sr.No.	Treatments	Plant Height (cm)
1.	Control	75.07
2.	37Kg P_2O_5/ha (1P)	77.35
3.	75Kg P_2O_5/ha (2P)	75.33
4.	60Kg N/ha + 40 Kg P_2O_5/ha + 20 Kg K_2O/ha (3N:2P:1K)	97.37
5.	30Kg N/ha + 20Kg P_2O_5/ha + 10Kg K_2O/ha (3N:2P:1K)	100.58
6.	30Kg N/ha + 20 Kg P_2O_5/ha + 10 Kg K_2O/ha + 0.0225 Kg B/ha (3N:2P:1K) + 0.03 (B)	74.19
	F-Test	n.s
	C.V%	19.32

Kyaukpadaung Twonship

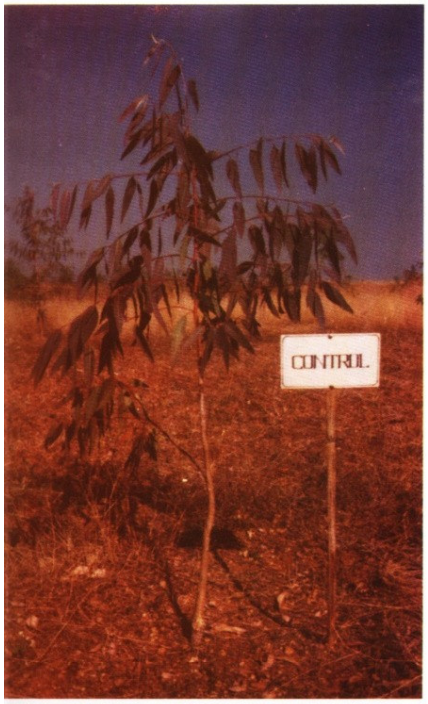

Plate 1(a)
2 years old *Eucalyptus camaldulensis* Plantation at Saiphyu Protected Public Forest (Control)

Plate 1(b)
2 years old *Eucalyptus camaldulensis* Plantation at Saiphyu Protected Public Forest (T.S.P 100g)

Minbu Township

Plate 2(a)
2 years old *Eucalyptus camaldulensis*
Plantation at Leybinaingma Protected
Public Forest (Control)

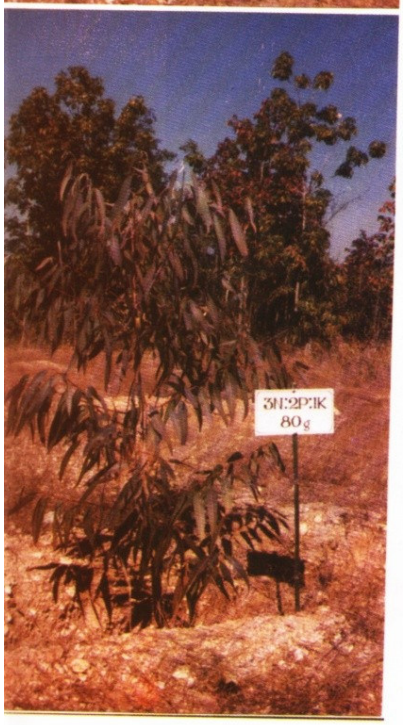

Plate 2(b)
2 years old *Eucalyptus camaldulensis*
Plantation at Leybinaingma Protected
Public Forest (3N:2P:1K 80g)

Magway Township

Plate 3(a)
2 years old *Eucalyptus camaldulensis* Plantation at Daung Ne Protected Public Forest (Control)

Plate 3(b)
2 years old *Eucalyptus camaldulensis* Plantation at Daung Ne Protected Public Forest (3N:2P:1K 160g)

Plate 4. (a) 2 years old *Eucalyptus camaldulensis* Plantation at Chay Yar Daw Protected Forest (Control)

Plate 4. (b) 2 years old *Eucalyptus camaldulensis* Plantation at Chay Yar Daw Protected Forest (3N:2P:1K 80g)

Profile in Study Area

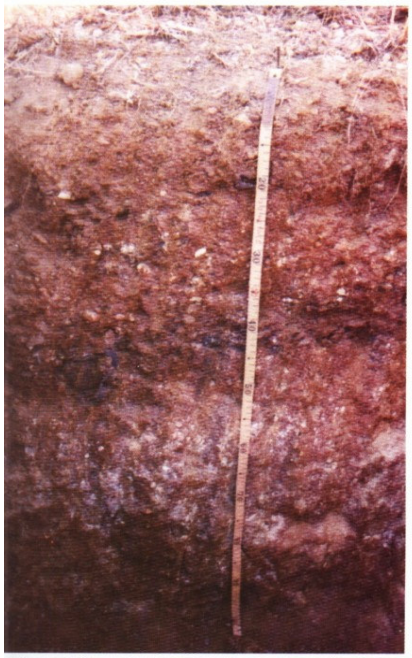

Plate 5(a)
Soil Profile in Saiphyu Protected Public Forest, Kyaukpadaung Township.

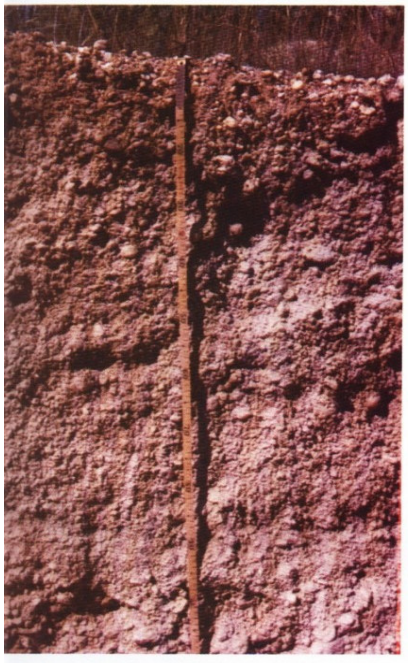

Plate 5(b)
Soil Profile in Leybinaingma Protected Public Forest, Minbu Township.

Plate 5(c)
Soil Profile in Daung Ne Protected Public Forest, Magway Township.

Plate 5(d)
Soil Profile in Chay Yar Daw Protected Forest, Sagaing Township.

5. Conclusion

This study was implemented in 1998 with an objective of technical supporting as far as fertilizer application was concerned at dry zone area. As interpreted through physical and chemical soil analysis, total soil N, available soil P and soil Organic matter are generally found to be very low since major textural classes are Sandy to Sandy loam with poor soil moisture retention capabilities. Thus, it is suggest to use fertilizer in order to improve the growth of *Eucalyptus camaldulensis* plantation, particularly 3N:2P:1K-160 g gave better growth comparing other ratio and amount of fertilizer tested. On account of being tested for one year with *Eucalyptus* in dry zone where moisture is frequently the most limiting factors in many cases. It is needed to continue the similar fertilizer trial associated with different moisture level or irrigation to obtain the interaction between moisture and fertilizer that influenced on the growth of plantation in dry zone area.

APPENDIX I

Physical And Chemical Properties of Soil in Kyaukpadaung

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	7.24	0.0611	0.000657	0.0110	0.070	0.0134	2.360	81	3	11	Loamy Sand
40-50	7.16	0.0365	0.000048	0.0006	0.056	0.0148	1.800	73	13	14	Sandy Loam
80-90	6.24	0.0333	0.000061	0.0020	0.046	0.0198	2.840	66	4	25	Sandy Clay Loam
0-10	6.25	0.0130	0.000017	0.0074	0.052	0.0146	3.540	77	6	13	Sandy Loam
40-50	6.18	0.0152	0.000002	0.0006	0.062	0.0182	3.620	57	4	38	Sandy Clay
80-90	6.23	0.0013	0.000002	0.0026	0.052	0.0110	3.060	58	28	10	Sandy Loam
0-10	5.89	0.0147	0.000007	0.0050	0.044	0.0114	2.700	71	6	20	Sandy Clay Loam
40-50	5.93	0.0111	0.000002	0.0066	0.034	0.0224	3.800	63	4	31	Sandy Clay Loam
80-90	5.79	0.0093	0.000002	0.0032	0.042	0.0194	3.140	53	8	38	Sandy Clay
0-10	5.97	0.0173	0.000026	0.0030	0.022	0.0058	2.330	91	4	5	Sandy
40-50	5.79	0.0175	0.000006	0.0030	0.044	0.0158	2.610	70	9	26	Sandy Clay Loam
80-90	5.47	0.0152	0.000004	0.0084	0.038	0.0160	2.810	67	9	21	Sandy Clay Loam
A_2	5.22	0.0836	0.000370	0.0098	0.054	0.0116	1.440	84	6	14	Loamy Sand
B_1	5.06	0.0599	0.000039	0.0022	0.086	0.0238	3.000	60	6	30	Sandy Clay Loam
B_2	4.62	0.0491	0.000036	0.0018	0.052	0.0176	3.120	68	7	30	Sandy Clay Loam
A_3	5.86	0.0665	0.001040	0.0074	0.056	0.0066	1.580	83	11	6	Loamy Sand
B_1	4.87	0.0367	0.000039	0.0056	0.076	0.0284	3.210	54	6	36	Sandy Clay
B_2	4.92	0.0314	0.000025	0.0100	0.060	0.0266	3.150	60	3	35	Sandy Clay Loam

APPENDIX II

Physical And Chemical Properties of Soil in Minbu

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	5.17	0.0345	0.000104	0.0050	0.046	0.0156	1.980	78	8	11	Loamy Sand
40-50	5.31	0.0237	0.000056	0.0026	0.026	0.0062	2.160	85	6	6	Sand
80-90	4.83	0.0088	0.000048	0.0038	0.032	0.0072	2.070	74	6	17	Sandy Loam
0-10	4.62	0.0206	0.000044	0.0032	0.038	0.0040	2.300	73	8	19	Sandy Loam
40-50	4.63	0.0250	0.000026	0.0028	0.050	0.0028	2.570	69	7	20	Sandy Loam
80-90	4.82	0.0650	0.000032	0.0042	0.030	0.0030	2.220	86	8	2	Sand
0-10	5.26	0.0270	0.000108	0.0024	0.036	0.0066	0.730	81	4	15	Sandy Loam
40-50	5.18	0.0209	0.000024	0.0046	0.040	0.0092	1.490	77	2	16	Sandy Loam
80-90	5.22	0.0098	0.000024	0.0042	0.030	0.0074	0.500	80	7	9	Loamy Sand
0-10	4.52	0.0297	0.000026	0.0024	0.022	0.0048	0.850	83	7	6	Loamy Sand
40-50	4.54	0.0312	0.000026	0.0028	0.038	0.0050	1.160	67	9	19	Sandy Loam
80-90	4.71	0.0119	0.000050	0.0030	0.008	0.0076	1.740	84	8	4	Sand
0-10	5.18	0.0382	0.000054	0.0014	0.028	0.0024	1.150	82	11	3	Sand
40-50	5.36	0.0281	0.000042	0.0008	0.032	0.0042	0.360	87	10	4	Sand
80-90	5.36	0.0067	0.000024	0.0014	0.034	0.0038	0.470	67	12	17	Sandy Loam
0-10	5.31	0.0080	0.000276	0.0026	0.024	0.0178	2.360	81	4	16	Sandy Loam
40-50	5.34	0.0377	0.000048	0.0018	0.010	0.0088	1.570	76	6	16	Sandy Loam
80-90	5.16	0.0200	0.000022	0.0062	0.024	0.0112	1.850	75	4	17	Sandy Loam
0-10	5.54	0.0120	0.000118	0.0024	0.048	0.0028	1.510	81	9	5	Loamy Sand
40-50	5.41	0.0325	0.000242	0.0018	0.038	0.0024	0.530	83	7	5	Sand
80-90	5.27	0.0165	0.000030	0.0026	0.042	0.0044	0.630	80	6	10	Sand

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	4.90	0.0111	0.000160	0.0056	0.040	0.0050	1.930	86	1	9	Loamy Sand
40-50	5.88	0.0069	0.000098	0.0062	0.032	0.0046	1.240	86	5	6	Sand
80-90	5.73	0.0062	0.000076	0.0058	0.050	0.0084	2.100	91	1	4	Sandy
0-10	6.66	0.0268	0.000022	0.0170	0.047	0.0388	0.860	60	1	37	Sandy Clay
40-50	5.54	0.0529	0.000022	0.0114	0.046	0.0158	1.350	74	1	23	Sandy Clay Loam
80-90	5.10	0.0452	0.000039	0.0176	0.036	0.0236	0.920	55	13	28	Sandy Clay Loam
0-10	5.50	0.0289	0.000084	0.0062	0.044	0.0126	2.350	73	7	15	Sandy Loam
40-50	5.34	0.0410	0.000018	0.0082	0.028	0.0198	2.190	69	23	4	Loamy Sand
80-90	5.22	0.0346	0.000034	0.0090	0.042	0.0178	2.790	66	17	13	Sandy Loam
0-10	5.75	0.0258	0.000092	0.0066	0.054	0.0053	1.740	83	9	4	Sand
40-50	5.48	0.0544	0.000090	0.0242	0.082	0.0398	2.610	51	9	41	Sandy Clay
80-90	5.00	0.0449	0.000066	0.0072	0.062	0.0068	2.710	77	6	12	Sandy Clay Loam
0-10	5.84	0.0303	0.000070	0.0048	0.044	0.0020	1.630	83	7	3	Sand
40-50	5.48	0.0338	0.000034	0.0026	0.046	0.0050		81	6	8	Loamy Sand
80-90	4.13	0.0250	0.000028	0.0042	0.044	0.0094	1.860	69	4	24	Sandy Clay Loam
0-10	5.61	0.0120	0.000032	0.0042	0.024	0.0078	0.970	67	8	21	Sandy Clay Loam
40-50	5.26	0.0379	0.000106	0.0040	0.034	0.0044	1.120	78	8	12	Sandy Loam
80-90	5.18	0.0341	0.000028	0.0038	0.038	0.0072	2.410	58	12	26	Sandy Clay Loam
0-10	5.48	0.0138	0.000042	0.0028	0.030	0.0066	1.390	78	12	8	Loamy Sand
40-50	5.34	0.0261	0.000026	0.0034	0.038	0.0060	1.750	77	5	13	Loamy Sand
80-90	5.25	0.0106	0.000360	0.0022	0.012	0.0062	1.530	75	8	15	Sandy Loam

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	6.24	nil	0.000216	0.0032	0.072	0.0118	2.800	83	11	2	Sand
40-50	5.65	0.0292	0.000076	0.0022	0.048	0.0050	0.960	85	8	3	Sand
80-90	5.66	0.0178	nil	0.0048	0.058	0.0058	0.870	90	3	2	Sand
0-10	5.59	nil	0.000040	0.0018	0.076	0.0070	0.950	81	8	8	Loamy Sand
40-50	4.96	0.0317	0.000030	0.0048	0.024	0.0110	2.940	58	8	33	Sandy Clay Loam
80-90	4.84	0.0243	0.000032	0.0026	0.032	0.0074	2.320	66	7	22	Sandy Clay Loam
0-10	6.12	0.027	0.000122	0.0002	0.030	0.0056	1.050	81	10	4	Loamy Sand
40-50	5.45	0.0356	0.000088	0.0032	0.02	0.0180	1.910	74	9	14	Sandy Loam
80-90	4.95	0.0217	0.000022	0.008	0.032	0.0342	4.010	38	9	52	Clay
0-10	5.13	0.0351	0.000142	0.0066	0.014	0.0412	3.950	68	10	20	Sandy Clay Loam
40-50	4.82	0.0384	0.000044	0.0074	0.022	0.0220	3.560	54	8	35	Sandy Clay Loam
80-90	5.76	0.0224	0.000039	0.0056	0.034	0.0390	2.570	62	9	26	Sandy Clay Loam
A_1	4.27	0.0578	0.000234	0.0022	0.022	0.0290	1.220	85	9	6	Loamy Sand
A_2	4.12	0.0514	0.000065	0.0046	0.038	0.0058	1.010	84	9	6	Loamy Sand
B_1	3.37	0.0359	0.000063	0.0052	0.028	0.0130	3.850	78	10	17	Sandy Loam

APPENDIX III

Physical And Chemical Properties of Soil in Magway

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	8.75	0.0568	nil	0.0044	0.282	0.0382	0.200	78	15	5	Loamy Sand
40-50	8.63	0.0366	0.000002	0.0006	0.288	0.0198	2.080	69	10	22	Sandy Clay Loam
80-90	8.76	0.0253	0.000001	0.0014	0.294	0.0120	1.630	71	27	6	Sandy Loam
0-10	7.48	0.0427	0.000005	0.0118	0.114	0.0154	3.500	52	25	20	Sandy Loam
40-50	8.58	0.0364	nil	0.0056	0.268	0.0298	2.470	60	16	21	Sandy Clay Loam
80-90	8.63	0.0304	nil	0.0074	0.208	0.0336	2.490	70	24	6	Sandy Loam
0-10	7.84	0.0980	0.000007	0.0082	0.048	0.0148	1.230	59	4	40	Sandy Clay
40-50	8.48	0.0214	0.000001	0.0128	0.220	0.0396	2.510	72	6	18	Sandy Loam
80-90	8.71	0.0116	trace	0.0044	0.016	0.0180	2.490	71	16	9	Sandy Loam
0-10	8.63	0.0260	trace	0.0094	0.318	0.0166	02.350	80	3	14	Sandy Loam
40-50	8.50	0.0266	0.000001	0.0066	0.330	0.0176	2.030	67	12	24	Sandy Clay Loam
80-90	8.69	0.0147	0.000001	0.0024	0.366	0.0214	1.670	54	20	30	Sandy Clay Loam
0-10	8.56	0.0153	nil	0.0046	0.296	0.0150	2.570	67	11	24	Sandy Clay Loam
40-50	8.66	0.0366	0.000001	0.0018	0. 342	0.0130	1.800	77	3	16	Sandy Loam
80-90	8.80	0.0268	0.000001	0.0024	0.358	0.0134	1.980	78	13	9	Loamy Sand
0-10	8.48	0.0215	0.000005	0.0088	0.278	0.0040	3.220	67	9	21	Sandy Clay Loam
40-50	8.75	0.0219	trace	0.0082	0.308	0.0070	1.950	57	10	28	Sandy Clay Loam
80-90	8.84	0.0157	0.000003	0.0058	0.330	0.0068	1.160	71	12	16	Sandy Loam
0-10	8.63	0.0371	trace	000016	0.394	0.0028	1.130	67	12	17	Sandy Loam
40-50	8.76	0.0341	nil	0.0044	0.370	0.0196	1.090	75	6	17	Sandy Loam
80-90	8.83	0.0245	nil	0.0012	0.382	0.0104	0.810	80	7	13	Sandy Loam

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	8.81	0.0281	0.000001	0.0010	0.410	0.0144	1.250	87	18	17	Sandy Loam
40-50	8.83	0.0271	trace	0.0044	0.320	0.0320	0.900	70	13	17	Sandy Loam
80-90	9.05	0.0250	0.000001	0.0012	0.380	0.0440	0.590	83	6	7	Sandy
0-10	8.69	0.0405	trace	0.0006	0.700	0.0278	1.210	60	16	18	Sandy Loam
40-50	8.97	0.0333	0.000002	0.0082	0.800	0.0302	0.590	85	8	8	Loamy Sand
80-90	8.99	0.0183	0.000002	0.0034	0.860	0..1340	0.730	89	6	4	Sand
0-10	8.66	0.0351	trace	0.0016	0.920	0.0174	1.550	56	18	21	Sandy Clay Loam
40-50	8.87	0.0433	trace	0.0042	0.252	0.0230	2.660	61	16	20	Sandy Loam
80-90	9.11	0.0266	trace	0.0018	0.190	0.0520	0.840	76	15	9	Sandy Loam
0-10	8.54	0.0277	0.000003	0.0022	0.170	0.0136	1.670	60	19	19	Sandy Loam
40-50	8.69	0.0243	trace	0.0012	0.138	0.0260	1.380	59	23	17	Sandy Loam
80-90	8.89	0.0196	0.000003	0.0032	0.038	0.0144	2.740	81	10	5	Loamy Sand
0-10	8.66	0.0378	0.000002	0.0020	0.050	0.0362	3.510	67	12	18	Sandy Loam
40-50	8.74	0.0402	trace	0.0030	0.044	0.0342	3.510	68	12	17	Sandy Loam
80-90	8.96	0.0253	0.000002	0.0020	0.042	0.0294	2.290	79	17	8	Sandy Loam
0-10	8.76	0.0429	trace	0.0036	0.036	0.0124	3.460	71	13	16	Sandy Loam
40-50	8.95	0.0245	nil	0.0014	0.028	0.0214	2.130	81	5	16	Sandy Loam
80-90	9.16	0.0121	trace	0.0010	0.010	0.0238	1.750	62	15	18	Sandy Loam
0-10	8.95	0.0118	trace	0.0012	0.406	0.0112	3.810	87	6	5	Sand
40-50	8.93	0.0299	trace	0.0016	0.398	0.0144	3.320	65	16	19	Sandy Loam
80-90	8.93	0.0255	0.000002	0.0010	0.404	0.0228	3.240	63	18	14	Sandy Loam

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	8.93	0.0113	trace	0.0074	0.392	0.0146	3.700	79	9	10	Loamy Sand
40-50	8.90	0.0449	0.000001	0.0042	0.386	0.0122	1.230	78	8	10	Loamy Sand
80-90		0.0235	0.000001	0.0020	0.390	0.0014	1.780	85	6	7	Sand
0-10	8.82	0.0180	0.000009	0.0092	0.202	0.0086	2.980	76	9	18	Sandy Loam
40-50		0.0170	0.000001	0.0032	0.356	0.0104	2.430	61	19	16	Sandy Loam
80-90	8.78	0.0121	trace	0.0050	0.368	0.0124	2.300	64	18	16	Sandy Loam
0-10	8.62	0.0190	0.000030	0.0008	0.262	0.0388	2.720	75	10	14	Sandy Loam
40-50	8.68	0.0583	0.000015	0.0058	0.172	0.0242	2.430	66	10	20	Sandy Loam
80-90	8.92	0.0526	trace	0.0034	0.344	0.0104	2.300	61	19	17	Sandy Loam
0-10	8.93	0.0371	trace	0.0044	0.343	0.0108	2.190	72	12	16	Sandy Loam
40-50	8.97	0.0402	0.000001	0.0058	0.404	0.0212	2.120	71	13	13	Sandy Loam
80-90	9.33	0.0382	0.000001	0.0036	0.318	0.0306	1.840	68	19	13	Sandy Loam
A_1	8.12	0.0759	0.000005	0.0028	0.368	0.0110	4.030	55	22	14	Sandy Clay Loam
A_2	8.04	0.0522	trace	0.0038	0.330	0.0208	2.030	65	19	19	Sandy Loam
B_1	7.77	0.0307	0.000001		0.332	0.0322	1.170	72	16	15	Sandy Loam

APPENDIX IV

Physical And Chemical Properties of Soil in Sagaing

Depth (cm)	p^H	Total N%	Ava. P%	Extractable Nutrients			O.M%	Texture			Remark
				K%	Ca%	Mg%		Sand %	Silt%	Clay %	
0-10	8.32	0.0396	0.000001	0.0046	0.520	0.028	2.710	77	10	8	Loamy Sand
40-50	8.84	0.0475	0.000001	0.0032	0.560	0.050	3.620	61	18	20	Loamy Sand
80-90	9.03	0.0281	0.000001	0.0030	0.374	0.056	3.090	77	11	2	Sand
0-10	8.53	0.0361	0.000078	0.0022	0.268	0.022	2.250	79	10	8	Loamy Sand
40-50	8.95	0.0369	0.000001	0.0008	0.500	0.018	2.150	80	10	6	Loamy Sand
80-90	8.76	0.0281	0.000002	0.0054	0.460	0.022	2.590	85	6	5	Sand
0-10	8.50	0.0417	0.000101	0.0050	0.324	0.026	2.420	73	13	10	Sandy Loam
40-50	8.57	0.0488	0.000001	0.0028	0.050	0.024	1.930	73	13	12	Sandy Loam
80-90	8.75	0.0317	0.000000	0.0044	0.398	0.038	1.800	76	10	10	Sandy Loam
0-10	8.81	0.0225	0.000186	0.0078	0.326	0.050	1.680	85	6	6	Sand
40-50	8.82	0.0243	0.000141	0.0040	0.370	0.032	1.840	91	5	4	Sand
80-90	8.61	0.0194	0.000190	0.0038	0.272	0.024	1.400	88	5	4	Sand
A_1	7.88	0.0823	0.000005	0.0070	0.378	0.026	3.200	55	22	14	Sandy Clay Loam
A_2	9.79	0.0343	0.000000	0.0003	0.268	0.084	2.790	65	19	19	Sandy Loam
B_1	10.59	0.0320	0.000001	0.0042	0.166	0.144	3.070	72	16	15	Sandy Loam

Literature Cited

1. Mehm Ko Ko Gyi, Kyi Win. (1991).Trial Planing of *Acacia senegal* and Acacia auriculifomis in the Central Dry Zone of Myanmar.
2. Sann Lwin, Htin Kyaw, Win Lei Lei Than, Cho Cho Win (1996).The properties and Utilization of Soil in the Greening Project for the Nine Critical Districts of the Arid Zone of Central Myanmar (Part I).
3. Sann Lwin, Htin Kyaw, Cho Cho Win (1997). The properties and Utilization of Soil in the Greening Project for the Nine Critical Districts the Arid Zone of Central Myanmar (Part II)
4. Sein Thet, Tin Tin Ohn (1982-83). Some Physical and Chemical Properties of Dry Zone Forest Soils
5. Sein Thet, Khin Maung Yin, Tin Tin Ohn (1988). Study in the Effectiveness of the Application of Fertilizer in Dry Zone Forest and Plantations
6. Sein Thet (1986). Soil Site Requirements of Tree Species on Dry Zone adverse sites
7. Tin Tin Ohn, Cho Cho Win.(1997). Comparative Study on thee Effect of Different ratios of Soil and Manure on the Nursery Growth of some Commercial Hard-wood and Dry Zone Forest Species