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Soil-Site Requirements of Tree Species on Dryzone Adverse Sites.

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အပူပိုင်းဒေသ၊ အလွန်ညံ့သောနေရာတွင် စိုက်ခင်းတည်ထောင်ရန် သစ်မျိုးအလိုက် အဟာရလိုအပ်ချက်ကို လေ့လာခြင်း။

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သစ်တောသုတေသနဌာန

စာတမ်းအကျဉ်းချုပ်

မြန်မာနိုင်ငံ အပူပိုင်းဒေသတွင် သစ်တောများကို လောင်စာထင်းရရှိရန်နှင့် သစ်တောထွက်ပစ္စည်း ရရှိပြီးအသုံးပြုရန်အတွက်၊ အလွန်အကျွံခုတ်လုပ်မှုများခြင်းကြောင့် အလွန်ညံ့သော မြေနေရာများ ဖြစ်ပေါ်လျက်ရှိပါသည်။ သစ်တောစိုက်ခင်းများ ပြန်လည်ထူထောင်ရာတွင် နိုက်ထရိုဂျင်ဓါတ် အထောက်အကူပြုသည့် သစ်မျိုးများကို စိုက်ပျိုးခြင်းဖြင့် မြေဆီမြေဩဇာ တိုးတက်စေပြီး၊ လောင်စာ၊ ထင်းနှင့် အခြားအသုံးပြုရန်အတွက် သစ်တောထွက် ပစ္စည်းများ ရရှိနိုင်ပါမည်။ ဤလေ့လာချက်တွင် နိုက်ထရိုဂျင်ဓါတ် အထောက်အကူပြုသည့် နိုင်ငံခြား သစ်မျိုး (၂)မျိုးနှင့် ဒေသခံ သစ်မျိုး (၃) မျိုး၊ ပေါင်း (၅) မျိုးကို အပူပိုင်းဒေသအလွန်ညံ့သော မြေနေရာများတွင် စမ်းသပ်စိုက်ပျိုးပြီး မြေဩဇာလိုအပ်ချက်နှင့် အပင်ကြီးထွားမှု အခြေအနေကို လေ့လာဆွေးနွေး တင်ပြထားပါသည်။

Soil-Site Requirements of Tree Species on Dryzone Adverse Sites.

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Abstract

The continual pressure for fuelwood demand in the dryzone area have resulted in severe cutting of indigenous species, eliminating the forest cover that the soils is subjected to erosion and a reduction in productivity. The reestablishment of tree cover with soil improving species could provide a source of feulwood and protection for the soil. In this study five leguminous species, two exotic and three indigenous, were tested on some adverse sites in the dryzone area and the growth potential of these species and the value of fertilization were discussed.

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1. Introduction

The continual pressure for fuelwood demand in dryzone area has resulted in severe cutting of indigenous species, eliminating the forest cover and the soil is subjected to erosion and a reduction in productivity. Sein Thet and Tin Tin Ohn (1983) studied the physical and chemical properties of dryzone forest soils and concluded that since the study sites could not meet the soil nutrient level for the growth of normal forest tree species, the selection of leguminous or other soil improving forest tree species should be considered for reforestation. The reestablishment of a tree cover, perhaps with leguminous or other soil improving species could provide a source of fuelwood and other products as well as protection for the soil. Fertilizer may be required for establishment and growth of some of the species on these sites.

In this study five leguminous species, two exotic and three indigenous, were planted on two adverse sites in the dryzone area to test the site requirement and growth potentials of tree species that may be useful for soil conservation, fuelwood or timber production, and to check the value of fertilizer in establishment and growth on these sites.

2. Materials And Methods

2.1 Study Area

Tow sites, one in Plangyin Reserved Forests, Meiktila Township, Mandalay Division and another in Yeposa Protection Forest, Chaung Oo Township, Sagaing Division were selected and experimental plots were located in each site before the rainy season of 1983. Climatological data for study sites, were taken from the nearest weather station, and shown in Table 1.

Table 1. Climatological Data of Study Sites.

Climatic Factors	Plangyin	Yeposa
Latitude (North)	20^{o} 50'	20^{o} 06'
Longitude (East)	95^{o} 50'	95^{o} 05'
Elevation (Meters) a.s.l	214	81
Rainfall (m.m)	831	831
Rainy days	47	49
Ave. Minimum Temp.. (^{o} C)	21.1	21.2
Ave. Maximum Temp.. (^{o} C)	32.6	32.8
Ave. Sunshine (Hrs/day)	7.7	7.9
Potential Evapotranspiration (mm/day)	4.4	4.0

2.2 Methods

A split-plot factorial design was arranged in randomized complete block with three replications of species (whole-plots) and fertilizer (sub-plots) at each site.
The following five leguminous species were selected for the test.

1. Sha-*Acacia catechu* Willd. (indigenous)
2. Bawzagaing-*Leucaena leucocephala* (Lam) de Wit (Exotic)
3. Mezali- *Cassia siamea* Lam. (indigenous)
4. Kokko- *Albizzia lebbek* Benth. (indigenous)
5. Senegal sha-*Acacia senegal* (L) Willd. (Exotic)

One hundred seedling per plot were planted at the beginning of 1983 rainy season, with spacing of 15' x 15' at Plangyin and 12' x 12' at Yeposa experimental sites, using of 4' x 4' x 1' pit system.

One half of each plot was randomly selected to receive fertilizer treatment while other half received no fertilizer.

Per-mixed fertilizers, providing an N-P_2 O_5-K_2 O ratio of 1-2-1 were used. At the rate of 50 grams/ tree the fertilizer was applied immediately following the first weeding (about two months after planting). The amount of fertilizer per tree was divide into two parts, with each half placed in a slit approximately about 20 cm to either side of the tree.

Composite samples of surface soils for the experimental sites were collected before planting, and acidity (pH), organic matter content (OM), total nitrogen (N), available phosphorus (P), available potassium (K) levels were analysed. Composite samples of surface soils for each sub-plots were also collected in April 1985 and pH, OM, N, P, K, levels were analysed.

The centrally-located 24 trees in each sub-plots were selected and height growth measurements were taken in March 1984 (one year old), and March 1985 (two years old), respectively.

3. Results And Discussion

The mean height growth of the one year old (March 1984) and two years old (March 1985) species tested is recorded in Table 2. For both the study sites, the analysis of variance of one year old data (Table 3) showed that, there was no significant effect for fertilizer treatment, but indicated a significant difference among the species tested. It also signified the block were different.

Table 2. The Mean Height Growths of Species at Experiment Sites.

Height in Inches.

Species	Year	Block I		Block II		Block III	
		1	2	1	2	1	2
			PLANGYI				
Sha	1984	24	30	23	39	26	30
Sha	1985	50	54	48	47	47	53
Bawzagaing	1984	76	93	74	84	88	79
Bawzaging	1985	110	147	110	121	115	125
Mezali	1984	33	38	26	40	30	31
Mezali	1985	48	49	33	60	35	36
Kokko	1984	16	15	17	13	10	12
Kokko	1985	33	39	63	59	37	49
Senegal sha	1984	51	46	44	54	32	47
Senegal sha	1985	78	67	62	75	53	61
			YEPOSA				
Sha	1984	21	16	21	17	18	17
Sha	1985	66	60	55	27	27	20
Bawzagaing	1984	81	60	45	58	42	35
Bawzaging	1985	168	118	118	132	84	76
Mezali	1984	27	42	32	32	24	41
Mezali	1985	59	87	71	53	37	82
Kokko	1984	9	8	7	7	9	11
Kokko	1985	31	15	19	15	28	52
Senegal sha	1984	31	20	25	25	24	24
Senegal sha	1985	66	37	68	62	48	49

1 = No Fertilizer,
2 = Fertilizer

Table 3. The Analysis of Variance for Study Sites of One Year Old Plots Data.

ANOVA

SOURCE OF VARIATION	df	SUMS OF SQUARES	MEAN SQUARES	F
		PLANGYIN		
Blocks	2	68.60	34.30	9.27**
Species	4	16330.9	4082.7	1103.43***
Error $_1$	8	29.5	3.7	-
Fertilizer	1	172.7	172.7	3.86
Species & Fertilizer	4	64.3	16.1	0.36
Error $_2$	10	447.3	44.1	-
Total	29	17113.3		
		YEPOSA		
Blocks	2	253.0	126.5	13.90***
Species	4	6949.8	1737.5	190.93***
Error $_1$	8	72.8	9.1	-
Fertilizer	1	0.3	0.3	0.003
Species & Fertilizer	4	244.9	61.2	0.53
Error $_2$	10	1156.1	115.6	-
Total	29	8676.9		

** – Significant at p = 0.01
*** – Significant at p = 0.001

The analysis of variance for both study sites of two-year-old data (Table 4) showed that, blocks effect, species and fertilization effects, all indicated the same trend as one year old data.

Table 4. The Analysis of Variance for Study Sites of Two Year Old Plots Data.

ANOVA

SOURCE OF VARIATION	df	SUMS OF SQUARES	MEAN SQUARES	F
		PLANGYIN		
Blocks	2	286.5	143.3	213.39**
Species	4	25210.5	6302.6	9003.71***
Error $_1$	8	5.4	0.7	-
Fertilizer	1	480.0	408.0	2.79
Species & Fertilizer	4	283.6	70.9	0.41
Error $_2$	10	1721.5	172.2	-
Total	29	27986.6		
		YEPOSA		
Blocks	2	2095.8	1047.9	9.39***
Species	4	27580.3	6895.1	61.84***
Error $_1$	8	891.8	111.5	-
Fertilizer	1	120.0	120.0	0.15
Species & Fertilizer	4	1182.4	295.6	0.37
Error $_2$	10	8000.1	800.0	
Total	29	39060.4		

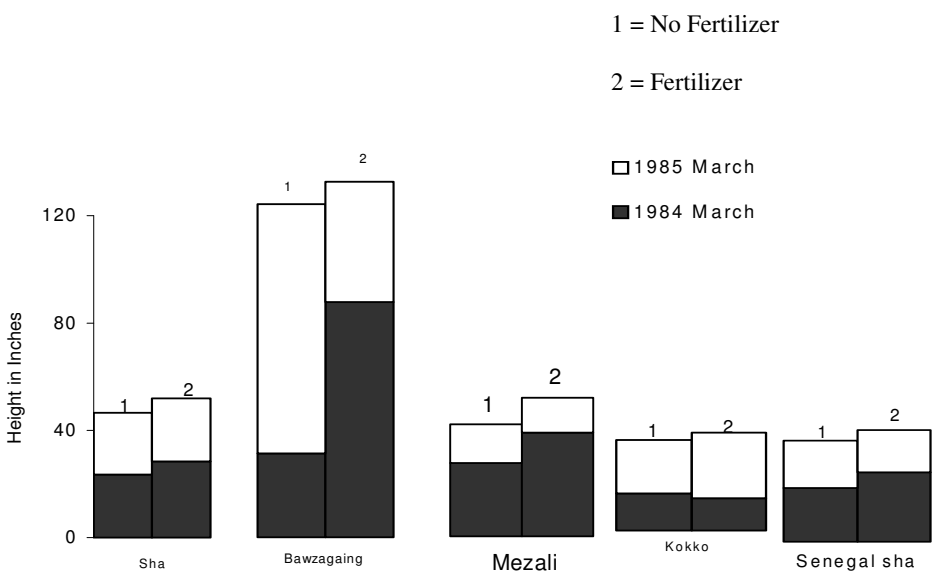
** – Significant at p = 0.01
*** – Significant at p = 0.001

In Figure 1, diagramatic comparison of height growth of species, two year old and one year old at each site were presented. The growth condition of two year old trees by species were shown in Figure 2 to 11. Bawzagaing showed significantly the best Performance, followed by Senegal sha, Sha, Mezali, and lastly Kokko can be considered to be the poorest.

Comparison of some of the chemical properties of the surface soils of the study sites before planting and after planting with leguminous species were shown in Tables 5. Generally speaking, the test showed that leguminous species improved the soil and maintained the nutrients levels of the surface soils.

Many of the apparent direct effects of soil acidity on tree growth may infact, result from its indirect effects on such soil condition as microbial activity and nutrient availability. Most tree species can be grown and tree seedling develop best in soil having reaction range between pH 4.5 and 6.5 (Harold et al., 1966; Pritchett, 1978). The test showed that leguminous species such as bawzagaing, Sha, Senegal sha, subyu, mezali and kokko can be grown at the dryzone sites where almost neutral soil reaction was observed.

Hardwoods are apparently more nutrient demanding than conifers. Pritchett (1978) prescribed an application rate of about 80-40-40 (N-P-K/Kg/ha) for Populus and Plantanus species, and Cromer (1972) used 55 grams of urea per tree for *E.regnans,* for fertilizer trials in young plantations of Eucalyptus. In this study, 50 grams per tree of premixed N-P-K-, (1-2-1) showed no significant effect on the height growth of the species tested.



PLANGYIN

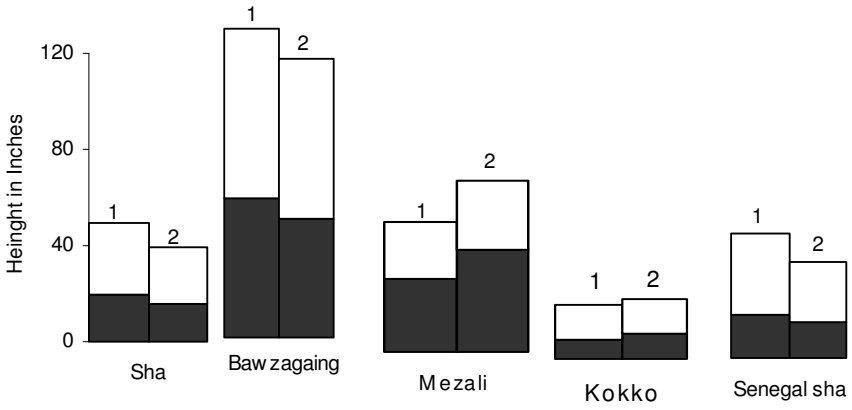


Fig. 1 Mean Height Growth Comparison of Species at Study Sites.

Figure 2. Two years old Kokko, Plangyin site.

Figure 3. Two years old Kokko, Yeposa site.

Figure 4. Two years old Senegal sha, Plangyin site.

Figure 5. Two years old Senegal sha, Yeposa site.

Figure 6. Two years old Sha, Plangyin site.

Figure 7. Two years old Sha, Yeposa site.

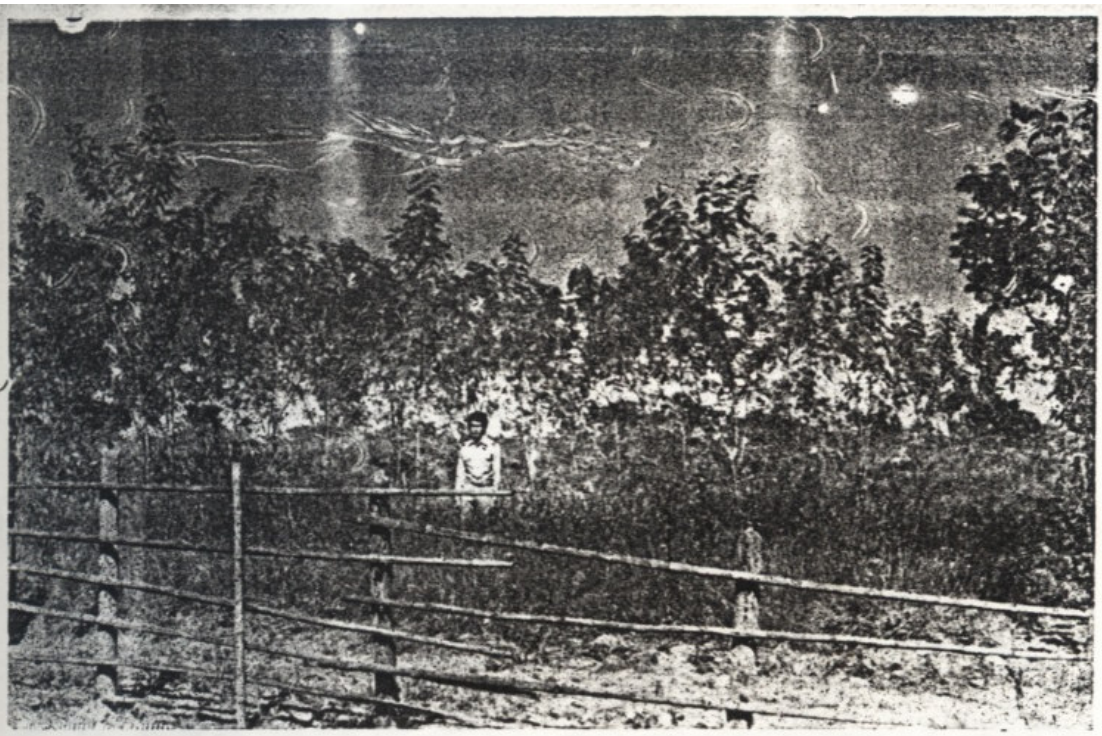


Figure 8. Tow years old fertilized Bawzagaing, Yeposa.

Figure 9. Two years old nonfertilized Bawzagaing, Yeposa.

Figure 10 Two years old fertilized Mezali, Plangyin.

Figure 11 Two years old nonfertilized Mezali, Plangyin.

Table 5. Comparison of Surface Soil Chemical properties of Study Sites.

Plots	Treatment	Properties				
		pH	O.M %	Tot: N %	Ava. P %	Ava: K %
		PLANGYIN				
Before Planting		7.2	3.13	0.0611	0.0005	0.0047
Sha	No Fertilized	7.3	2.89	0.0600	0.0002	0.0051
Sha	Fertilized	7.3	2.84	0.0608	0.0009	0.0067
Bawzagaing	No Fertilized	7.3	2.28	0.0577	0.0001	0.0069
Bawzagaing	Fertilized	7.3	2.66	0.0724	0.0001	0.0082
Mezali	No Fertilized	7.3	2.85	0.0674	nil	0.0065
Mezali	Fertilized	7.2	3.07	0.0682	0.0004	0.0112
Kokko	No Fertilized	7.2	5.97	0.0567	0.0008	0.0113
Kokko	Fertilized	7.1	2.75	0.0656	0.0007	0.0089
Senegal sha	No Fertilized	7.2	2.32	0.0691	0.0002	0.0103
Senegal sha	Fertilized	7.3	2.25	0.0582	0.0005	0.0101
		YEPOSA				
Before Planting		7.0	1.35	0.0396	0.0004	0.0065
Sha	No Fertilized	7.2	1.70	0.0617	0.0006	0.0037
Sha	Fertilized	7.3	1.71	0.0588	0.0008	0.0041
Bawzagaing	No Fertilized	6.7	1.67	0.0386	0.0008	0.0049
Bawzagaing	Fertilized	6.9	2.51	0.0518	0.0024	0.0052
Mezali	No Fertilized	6.7	1.10	0.0378	0.0005	0.0062
Mezali	Fertilized	6.6	1.05	0.0469	0.0020	0.0064
Kokko	No Fertilized	7.1	1.33	0.0489	0.0007	0.0044
Kokko	Fertilized	7.0	1.30	0.0446	0.0013	0.0053
Senegal sha	No Fertilized	6.9	1.95	0.0411	0.0011	0.0050
Senegal sha	Fertilized	6.9	1.39	0.0441	0.0017	0.0052

4. Conclusion

From the studies conducted in the two dryzone adverse sites, with five leguminous species and N-P-K fertilizer treatment tested, it is concluded that;

(1) Site variation existed within the study area which is highly significant, even within the same sites.

(2) There is a highly significant effect among the species, and bawzagaing shows the best performance followed by Senegal sha, sham, mezali and kokko, among the species tested.

(3) Leguminous species can maintain the nutrient levels of surface soils, when grown in adverse sites.

(4) Fertilization of N-P-K (1-2--1) with 50 gm/tree has no significant effect on the leguminous species tested on these study sites.

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