

# "DRY DUST" FROM COCONUT FIBRE MILLS. A USEFUL SOIL AMELIORANT

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## SUMMARY

(a) Data from a series of pot experiments have shown that known deficiencies of phosphorus, potassium, magnesium, boron and copper in the cinnamon sand can be corrected by an application of dry fibre dust +  $(NH_4)_2SO_4$  and  $CaCO_3$ .

(b) These composite "soils" (soil and fibre dust) are characterized by a double deficiency of N and S. Nitrogen, applied as  $NH_4NO_3$  was not effective in promoting satisfactory plant growth.

(c) Application of  $(NH_4)_2SO_4$  (N + S) alone, greatly increased the acidity of the "soil" and in the absence of Ca this was responsible for the death of plants. A dressing of  $CaCO_3$  was effective in correcting soil acidity.

(d) Soil moisture data have shown that the water holding capacity of cinnamon sand was increased in direct proportion to the amount of fibre dust incorporated in the "soil".

## 1. INTRODUCTION

In Ceylon large quantities of fibre dust are accumulated as byproduct from mills that manufacture coconut fibres. On *a priori* grounds, it seems that this material could be used to maintain and improve the humus content of depleted soils, but to date it has not been used, primarily because of its low nutrient value, its slow rate of decomposition and the possibility that it might become a breeding ground for insect pests.

At present, decortication of coconut husks for fibre is carried out by either of two processes. In the older and more common process coconut husks are retted and available plant nutrients would be leached away. In the newer, mechanical method dry husks are decorticated without leaching and the dust should retain all plant nutrients that were present in the original husks.

The dust from retted husks could be used as a mulch, but it would tend to widen the carbon-nitrogen ratio of deficient soils and thereby induce an acute nitrogen deficiency. On the other hand, "dry dust" as it is called, should be effective both in retaining moisture, and as a source of other nutrients. It should have some advantages over husks (that are frequently buried) since it is in the form of fine particles that would form an intimate mixture with any soil.

The nutrient content in random samples of "retted dust" and "dry dust" are recorded in Table I.

Nutrients	(% wet Wt.)	R. dust	D. dust
N	(Element)	0.410	0.420
P	"	0.021	0.048
K	"	0.500	1.674
Ca	"	0.130	0.130
Mg	"	0.150	0.107

Table I. Showing percentage composition of major nutrients in the two forms of fibre dust.

In some localities any use of fibre dust as a mulch on coconut soils has been discouraged in the belief that this material might contain toxic compounds (although there is no direct evidence for or against this belief). However, this possibility would be equally valid in respect to other compounds such as tannins, resins and turpentine, all of which are present in wood wastes. Allison and Anderson (1) have observed that saw-dust or other wood products have no toxic effect if these materials are used in conjunction with adequate nitrogen. In our experiments using sealed pots there was no evidence of any toxic effect, even though toxic substances could not be leached from the "soil".

In these experiments an uniform mixture of cinnamon sand and dry fibre dust was used to fill a number of polystyrene pots, each of which was planted to *Paspalum commersonii* (Lam) or *Phaseolus lathyroides* (L). These pots were then used in experiments to determine the nutrient status of this "soil".

In any one experiment all pots contained the same amount of the composite soil (by volume) and except for calcium all nutrients were applied in solution. Dosages were calculated on the basis of lbs. or cwts./acre. All plants were grown from seeds, and after germination the number of seedlings was reduced to one uniform plant per pot. All pots were watered daily, their water content being brought to constant level (85% field capacity) by weight. In order to avoid contamination that water was filtered, passed through a commercial water softener, distilled and re-distilled before use. The final distillation was in pyrex glass. The experiments were conducted in the Institute's Phytosolarium.

The soil (cinnamon sand) used in these experiments was obtained from Horekelly Estate. It is known to be deficient (4) in N, P, K, Ca, Mg, S and B; for optimal growth of *Paspalum commersonii* it requires :

N	(5 cwts/acre $(\text{NH}_4)_2\text{SO}_4$ )
P	(3 cwts/acre $\text{NaH}_2\text{PO}_4 \cdot 2\text{H}_2\text{O}$ )
K	(6 cwts/acre $\text{K}_2\text{SO}_4$ )
Ca	(5 cwts/acre $\text{CaCO}_3$ )
Mg	(1½ cwts/acre $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ )
S	(1 cwt/acre Sulphur)
B	(6 lbs./acre $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ )

All experiments were of simple factorial design, and the yield from any treatment (pot) comprised all material harvested one inch above soil level and dried to constant weight in a dehydrator. For details of techniques see Paltridge and Santhirasegaram (3).

## 2. EXPERIMENTAL

### A. Experiment I

- (a) *Objective* : To determine the nutrient requirement of *Paspalum commersonii* (Lam) and *Phaseolus lathyroides* (L) grown on a composite soil comprising equal volumes of cinnamon sand and D/dust.
- (b) *Design and procedure* : This was a  $2^6$  factorial experiment using two species with one replicate of each treatment, and 6 nutrients, viz: N, P, K, Ca, Mg and X (a mixture of Fe, Cu, Zn, Mn and Mo). Ca was applied as  $\text{CaCO}_3$  powder mixed with the top 1½" of the soil. All other nutrients were applied in solution. Forms and rates of application are shown in Table II.

Designation	Chemical	Rate of application/acre
N <sub>6</sub>	NH <sub>4</sub> NO <sub>3</sub>	6 cwts. = 236 lbs. N
P <sub>3</sub>	NaH <sub>2</sub> PO <sub>4</sub> ·2H <sub>2</sub> O	3 cwts. = 67 lbs. P + 49 lbs. Na
K <sub>3</sub>	K <sub>2</sub> SO <sub>4</sub>	3 cwts. = 150 lbs. K + 70 lbs. S
Ca <sub>10</sub>	CaCO <sub>3</sub>	10 cwts. = 448 lbs. Ca
Mg <sub>1½</sub>	MgSO <sub>4</sub> ·7H <sub>2</sub> O	1½ cwts. = 18 lbs. Mg + 22 lbs. S
Fe <sub>14</sub>	FeSO <sub>4</sub> ·7H <sub>2</sub> O	14 lbs. = 2.8 lbs. Fe + 1.6 lbs. S
Cu <sub>14</sub>	CuSO <sub>4</sub> ·5H <sub>2</sub> O	14 lbs. = 3.6 lbs. Cu + 1.7 lbs. S
Zn <sub>14</sub>	ZnSO <sub>4</sub> ·7H <sub>2</sub> O	14 lbs. = 3.0 lbs. Zn + 1.6 lbs. S
Mn <sub>14</sub>	MnSO <sub>4</sub> ·4H <sub>2</sub> O	14 lbs. = 3.5 lbs. Mn + 2.0 lbs. S
Mo <sub>1</sub>	(NH <sub>4</sub> ) <sub>6</sub> Mo <sub>7</sub> O <sub>24</sub> ·4H <sub>2</sub> O	1 lb = 0.5 lbs. Mo + 0.7 lb. N

Table II. *Forms and rates of nutrients applied in Experiment I.*

The *Paspalum* was planted on 19th July, 1957 and harvested three times, viz. 2nd September, 3rd October and 5th November.

The original fertilizer dressings were supplemented as follows :

On 14th September, 1½ cwt/acre NH<sub>4</sub>NO<sub>3</sub> was added to all N pots.

On 16th October, 28 lbs./acre Mg·SO<sub>4</sub>·7H<sub>2</sub>O was added to all Mg pots.

On 22nd October, 1½ cwt/acre NH<sub>4</sub>NO<sub>3</sub> was added to all N pots.

*Phaseolus* was planted on 10th September and harvested three times, viz. 24th October, 23rd November and 30th December. No additional nutrients were applied.

(c) *Results:* Throughout this experiment the effect of N was very marked and at first harvest plants in the N<sub>0</sub> pots had produced only two or three leaves. Relative yields are recorded in Table III.

Harvest	<i>Paspalum</i>		<i>Phaseolus</i>	
	N <sub>6</sub>	N <sub>0</sub>	N <sub>6</sub>	N <sub>0</sub>
1st	100	0.02	100	2.5
2nd	100	0.04	100	1.8
3rd	100	0.14	100	4.4

Table III. *Relative yields for N<sub>6</sub> and N<sub>0</sub> treatments.*

All N<sub>0</sub> treatments were therefore discarded and the data reanalysed as a 2<sup>5</sup> factorial for P, K, Ca, Mg and "X". : See Table IV and Fig. 1.

#### *Paspalum*

Analysis of the combined data for three harvests of *Paspalum commersonii* showed that K and Mg had increased yields independently. There was also a K-Mg interaction which was negative and significant

at the 0.1% level. Ca was responsible for some depression in yield (overall decrement of 18%). "X" alone had no significant effect but there was a negative interaction with K and with K-Mg; (both significant at the 5.0% level). P had no effect on yield.

Treatments		Nil	K	Mg	KMg	Effective treatment and level of Significance%	
Nil	Nil	Nil	1.10	19.25	18.54	16.30	K 0.1
		X	5.90	14.18	15.78	16.10	Mg 0.1
	Ca	Nil	0.80	17.50	12.19	13.42	Ca 1.0
		X	4.74	10.12	15.71	8.51	KMg 0.1
P	Nil	Nil	1.01	16.63	20.21	18.36	K X 5.0
		X	5.89	14.55	13.77	14.34	KMg X 5.0
	Ca	Nil	1.34	15.74	13.92	14.73	
		X	3.40	12.34	12.50	16.48	

Table IV. Showing cumulative yields of all treatments and level of significance for all treatments effecting the yield of *P. commersonii*.

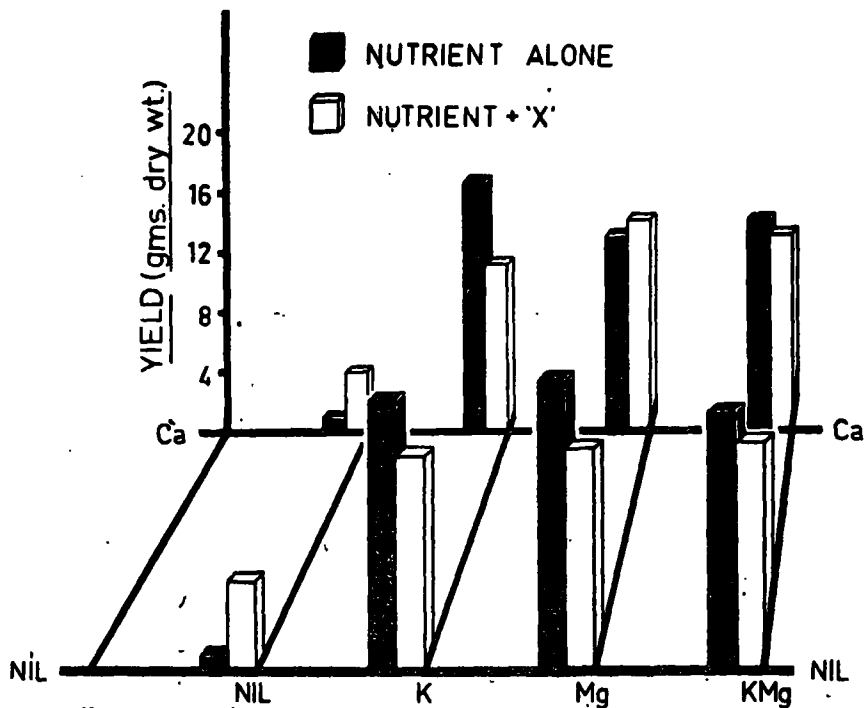


Figure 1 — Mean total yield of treatments affecting growth of *Paspalum commersonii*.

In individual harvests the pattern of responses was essentially the same, but there was some variation in the response to X in successive harvests. In the first and third harvests X was responsible for an overall increase in yield (not significant), but in the second harvest there was a depression (significant at 1%). Interactions with K and K-Mg were constant. Ca consistently depressed yields but that effect was significant only in the second harvest. P was without any effect. Mean yields for all effective treatments (K, Mg, X and Ca) are recorded in Table V.

Harvest	Treatments		Nil	K	Mg	K Mg	Effective treatment and level of Significance (%)	
1 45 days	Nil	Nil	0.99	6.36	7.89	6.12	K	1.0
		X	4.28	5.18	5.88	7.42	Mg	1.0
	Ca	Nil	1.00	7.00	4.86	6.16	K Mg	1.0
		X	3.62	5.26	5.91	6.28	K Mg X	1.0
2 76 days	Nil	Nil	0.06	9.08	9.07	9.64	K	0.1
		X	1.61	5.55	6.38	5.14	Mg	0.1
	Ca	Nil	0.07	6.81	6.02	5.61	X	1.0
		X	0.44	4.14	5.70	4.76	Ca	1.0
3 109 days	Nil	Nil	0.00	2.50	2.40	1.56	K Mg	0.1
		X	0.00	3.62	2.51	2.65	K	0.1
	Ca	Nil	0.00	2.81	2.17	2.30	Mg	1.0
		X	0.00	1.82	2.49	1.45	K Mg	0.1

Table V. Showing mean yields and level of significance for all treatments affecting the yield of *P. commersonii* in three successive harvests.

#### *Phaseolus*

The effect of K, Mg and X on *Phaseolus lathyroides* was essentially similar to those recorded for *Paspalum commersonii*. However, cumulative yields showed that Ca (which depressed yields of *Paspalum*) and P (which had no effect on the grass) were responsible for some increase in yield (14% and 18% respectively). Cumulative yields for all treatments and levels of significance of effective treatments are shown in Table VI.

		Treatments	Nil	K	Mg	K Mg	Effective treatments and level of Significance(%)	
Nil	Nil	Nil	1.55	4.61	3.06	4.30	K	1.0
		X	4.43	3.43	3.78	4.12	Mg	0.1
	Ca	Nil	0.67	4.97	5.36	5.74	X	5.0
		X	4.68	3.13	4.91	4.47	Ca	5.0
P	Nil	Nil	0.83	5.69	5.41	2.28	P	5.0
		X	4.60	5.91	5.70	4.72	K Mg	0.1
	Ca	Nil	0.63	6.11	6.75	6.01	KX	1.0
		X	3.40	4.25	6.29	6.05	MgCa	1.0
						X Ca	5.0	
						KMg X	1.0	
						KMg P	1.0	

Table VI. *Phaseolus lathyroides*. Showing cumulative yields for all treatments and the level of significance for all effective treatments.

In the first harvest no individual nutrient had any significant effect, but there was a significant interaction between K and Mg (significant at the 1.0% level). In the second harvest K, Mg and K-Mg all gave a significant increase in yield. In the third harvest, and in addition to the effects of K and Mg, there was a positive effect from Ca (significant at the 0.1% level).

#### (d) Discussion

In this experiment, and in all three harvests of *Paspalum commersonii*, the addition of Ca lead to some depression in yield but the data for *Phaseolus* showed a progressive increment from Ca in successive harvests. This result is in accord with the known higher demand for Ca by many leguminous plants.

P had no effect on the yield of either species.

K, Mg and K-Mg were all effective in promoting increased growth, and it is a matter of some importance that, in general, they were equally effective. Under normal circumstances, and if two nutrients increase yields independently, then a positive interaction (which may, or may not be significant) would be expected. In this experiment, however, the K-Mg interaction was negative and highly significant; especially in the case of *Paspalum commersonii*.

Paltridge and Santhirasegaram (4) have recorded deficiencies of both K and Mg in the cinnamon sand and they estimated the requirement for normal growth of *Paspalum commersonii* at 6 cwts/acre  $K_2SO_4$  and  $1\frac{1}{2}$  cwts/acre  $MgSO_4 \cdot 7H_2O$ . In this experiment 65 gms./pot of fibre dust was mixed with the soil and this should be equivalent to 15.32 cwts.  $K_2SO_4$  + 4.50 cwts.  $MgSO_4 \cdot 7H_2O$  per acre. i.e., amounts well in excess of the requirement for normal growth.

Some of this K and Mg might be present in forms which were not available for plant growth. This seems unlikely since about 70% of potassium is lost when coconut husks are retted, and would mean that at least that amount (i.e. = 10 cwts.  $K_2SO_4$ /acre) is soluble in water.

It may be noted that three nutrients, K, Mg and X were all applied as sulphate, and this would suggest that the observed increments from K, Mg, K-Mg and X might all represent an effect from the sulphur contained in these treatments. Experiment II was designed to test that hypothesis.

## B. Experiment II

### (a) Objective

To study the effect of Sulphur, Calcium and two forms of Nitrogen on the growth of *Paspalum commersonii* (Lam) grown on a soil comprising equal volumes of cinnamon sand and D/dust.

### (b) Design and procedure

This was a  $3 \times 2^2$  factorial experiment with two replicates of all treatments. The treatments were:

**Nitrogen** (a) Nil

(b)  $NH_4NO_3$  (3 cwts/acre = 118 lbs. N)

(c)  $(NH_4)_2SO_4$  (5 cwts/acre = 118 lbs. N and 136 lbs. S)

**Calcium** (a) Nil

(b) Ca (i.e. 10 cwts/acre  $CaCO_3$  added to all no sulphur treatments) or (17 cwts/acre  $CaSO_4 \cdot 2H_2O$  added to all Sulphur treatments)

**Sulphur** (a) Nil

(b) S (i.e. 17 cwts/acre  $CaSO_4 \cdot 2H_2O$  added to all Calcium treatments) or (3.2 cwts/acre elemental Sulphur added to all no-Calcium treatments).

No basal application of nutrients was made.

The experiment was planted on 27th February, 1958 and harvested twice viz. 9th April and 12th May.

Mean yields from two replicates and levels of significance of effective treatments are recorded in Table VII.

Treatments	Nil	Ca	S	CaS	Effective treatments and level of Significance (%)
Nil	0.05	0.04	0.03	0.05	N 0.1 S 0.1
$NH_4NO_3$	1.44	1.20	3.36	3.03	NS 1.0 S Ca 5.0
$(NH_4)_2SO_4$	1.24	3.01	3.00	2.57	N S Ca 5.0

Table VII. Mean yields and levels of significance for all treatments affecting the yield of *Paspalum commersonii* in the first harvest.

### (c) Results

As in Experiment I, plants receiving no N made very little growth. The main effect of S was significant at the 0.1% level and there were significant interactions with N, Ca and N-Ca.

After the first harvest only the  $\text{NH}_4\text{NO}_3 + \text{S}_4$  treatments and the  $(\text{NH}_4)_2\text{SO}_4 + \text{CaCO}_3$  treatments made re-growth (See Plate I). In other treatments the plants died.

### d) Discussion

It is evident from these results that this composite soil was deficient in S. In the first harvest  $\text{NH}_4\text{NO}_3$  in the presence of S increased yields by 142%;  $(\text{NH}_4)_2\text{SO}_4$  alone gave a comparable increment; and there was no further response from  $(\text{NH}_4)_2\text{SO}_4 + \text{S}$ .

In Experiment I, the death of plants in all  $\text{K}_0$  and  $\text{Mg}_0$  treatments could therefore be attributed to a deficiency of S, and the comparable responses to  $\text{K}_2\text{SO}_4$  and  $\text{MgSO}_4$  and the K-Mg treatment could all be attributed to S.

In this experiment the death of plants in the  $(\text{NH}_4)_2\text{SO}_4$  no  $\text{CaCO}_3$  treatments may be attributed to acidity caused by  $(\text{NH}_4)_2\text{SO}_4$  in the absence of  $\text{CaCO}_3$  (see Table VIII). This effect has already been recorded (5).

Treatments	Yield at 2nd H	PH
$(\text{NH}_4)_2\text{SO}_4$ .. ..	0.00	4.90
$(\text{NH}_4)_2\text{SO}_4 + \text{CaCO}_3$ .. ..	3.56	8.00
$(\text{NH}_4)_2\text{SO}_4 + \text{S}_4$ .. ..	0.00	4.05
$(\text{NH}_4)_2\text{SO}_4 + \text{CaSO}_4$ .. ..	0.00	3.95

Table VIII. Mean yields and soil pH for all ammonium sulphate treatments at the second harvest.

From these two experiments it is evident that this composite soil is deficient in N and S. That double deficiency may be corrected by the application of  $(\text{NH}_4)_2\text{SO}_4$  but this compound has an adverse effect on soil pH which must be corrected by the addition of  $\text{CaCO}_3$ .

It is a point of considerable economic importance that incorporation of dry dust and lime and a dressing of sulphate of ammonia will overcome all of the known nutrient deficiencies in the cinnamon sand.

## C. Experiment III

### (a) Objective

To determine the optimum amount of D/dust required for the growth of *Paspalum commersonii* (Lam) on cinnamon sand.

### (b) Design and procedure

This was a  $2^4 \times 5$  factorial experiment with two replicates of all treatments. The five rates of dust applications were :—

(a) 0% dust (Cinnamon sand only).

(b) 12.5% dust + 87.5% cinnamon sand by volume.

- (c) 25.0% dust + 75.0% cinnamon sand by volume.  
 (d) 37.5% dust + 62.5% cinnamon sand by volume.  
 (e) 50.0% dust + 50.0% cinnamon sand by volume.

Four nutrients, K, P, Ca and Mg were each applied at two levels.

Forms and dosages were as in Experiment I. All pots received a basal dressing of 5 cwts/acre  $(\text{NH}_4)_2\text{SO}_4$ .

The experiment was planted on 18th December, 1957 and harvested three times viz. 13th February, 24th March and 28th April, 1958. During the progress of the experiment additional N was added to all pots as follows :

Date	Rate	Total to date
5.2.58	$2\frac{1}{2}$ cwts./acre $(\text{NH}_4)_2\text{SO}_4$	$7\frac{1}{2}$ cwts.
11.3.58	$1\frac{1}{4}$ cwts./acre $(\text{NH}_4)_2\text{SO}_4$	$8\frac{3}{4}$ cwts.
21.3.58	$2\frac{1}{2}$ cwts./acre $(\text{NH}_4)_2\text{SO}_4$	$11\frac{1}{4}$ cwts.
17.4.58	$2\frac{1}{2}$ cwts./acre $(\text{NH}_4)_2\text{SO}_4$	$13\frac{3}{4}$ cwts.

(c) Results

P and Mg had no significant effect on yields in any harvest, and mean yields for eight replicates (two replicates of Nil, P, Mg and P Mg) are recorded in Table IX.

Harvests	Treatments	Soils					Effective treatments and level of significance (%)	
		(a)	(b)	(c)	(d)	(e)		
1 57 days	Nil	1.60	3.67	3.43	3.71	3.13	Soils	5.0
	Nil							
	K	2.96	3.41	2.40	3.65	3.34	Soils × K	1.0
	Ca						Soils × Ca	1.0
2 96 days	Nil	1.52	4.51	3.50	3.20	2.90		
	Ca							
	K	5.02	3.11	3.78	2.33	2.81		
	Nil	0.00	1.79	2.40	2.10	3.87	Soils	0.1
3 130 days	Nil	0.97	1.85	2.27	1.60	3.20	K	5.0
	K						Ca	0.1
	Ca	0.65	5.67	6.62	7.64	5.91	Soils × K	1.0
	K	6.05	5.16	5.76	5.21	4.77	Soils × Ca	1.0
3 130 days	Nil	0.00	0.16	0.06	0.05	0.94	K × Ca	5.0
	Ca							
	K	0.00	0.00	0.23	0.01	0.18	Soils	0.1
	Nil	0.04	3.89	5.08	6.72	6.47	K	0.1
3 130 days	Ca						Ca	0.1
	K	2.99	7.45	8.41	7.37	5.34	Soils × K	0.1
							Soils × Ca	0.1
							K × Ca	0.1

Table IX. Showing mean yields and the level of significance for all treatments affecting the yield of *Paspalum commersonii*.

(d) Discussion

It will be observed that in this experiment Ca applied at 10 cwts/acre  $\text{CaCO}_3$  had a dominant effect; especially in later harvests. This would follow from the effect on pH of  $(\text{NH}_4)_2\text{SO}_4$  which was added as a basal dressing. Regardless of the presence or absence of K, Ca increased yields considerably in all soil mixtures and at all harvests.

Assuming that addition of Ca is essential, the effect of K in the several composite soils may be described as follows.

In the first harvest, and in the absence of added K, there were significant differences in the yield from different soils. Yields improved progressively from soil (a) to soil (c) and they decreased progressively in soils (d) and (e). In treatments with added K there was a progressive depression in yield from soil (a) to soil (c) (See Figure II).

In the second harvest a similar response was obtained from the  $\text{K}_0$  treatments, but in the presence of  $\text{K}_3$  all "soils" gave comparable yields.

In the third harvest and in the absence of K optimum yields were recorded for soils (c) and (d). In the  $\text{K}_3$  treatments optimum results were recorded for soil (c). Differences between  $\text{K}_0$  and  $\text{K}_3$  were significant only in soils (a), (b) and (c).

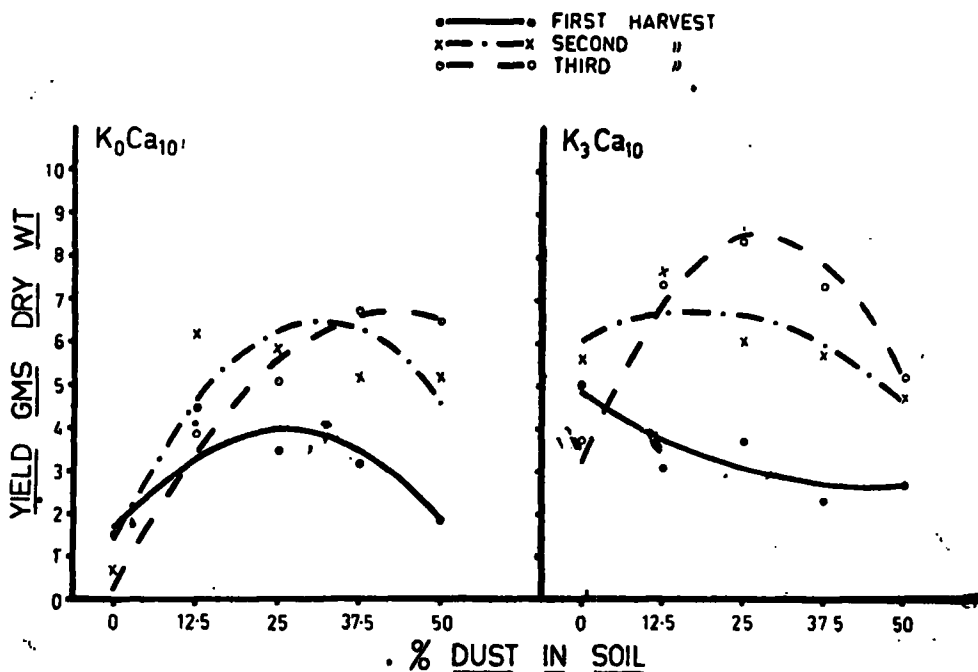


Figure II — Mean yields from the soil dust mixtures in presence and absence of potassium in three successive harvests.

In effect this experiment showed that in each of five "soils" containing fiber dust —

- i. There was no deficiency of magnesium or phosphorus.
- ii. The addition of ammonium sulphate (N + S) and calcium carbonate met all nutrient requirements for satisfactory plant growth.
- iii. Optimum yields were recorded for soils (c) and (d): comprising 25.0 and 37.5% dry dust.

#### D. Experiment IV

##### (a) Objective

To determine the water retaining capacity of the soil dust mixtures used in Experiment III.

##### (b) Procedure

The five soil-dust mixtures (a) to (e) were separately placed in large earthenware pots, each with a drainage hole and with a layer of rubble two inches thick placed at the bottom, to facilitate free drainage. In each pot a Bouyoucos soil moisture block was buried at a depth of 4" and the soils were then allowed to settle under periodic application of water. Each treatment was in duplicate. Observations were commenced after a period of two months. At that time all pots were brought to 100% field capacity and then allowed to drain over-night. Thereafter soil moistures were recorded at regular intervals until all treatments recorded 0% field capacity. The pots were then brought to 100% field capacity, and these observations repeated.

After these preliminary observations, all pots were appropriately manured and planted to *Paspalum commersonii*. Three uniform seedlings were thus established and maintained in each pot. Soil moistures were again recorded when the plants were actively growing.

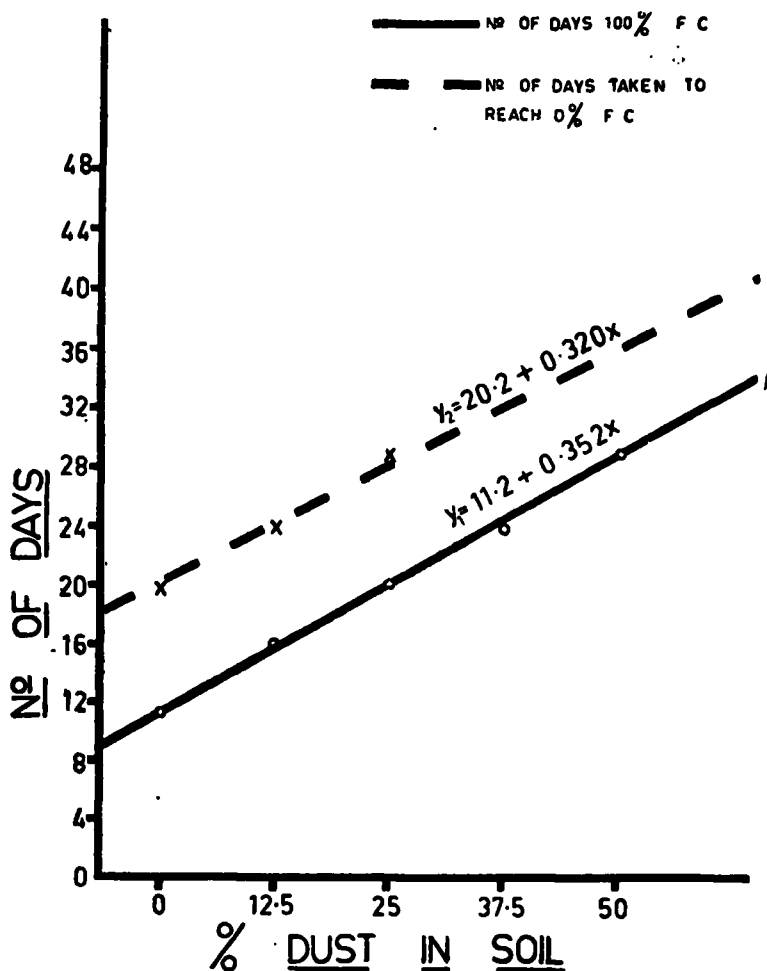


Figure III — The number of days at 100% F.C. and the time taken to reach 0% in the soil dust mixtures.

(c) *Results*

The data from this experiment are summarised in Table X and in Figure III : using mean values for the two replicates.

<i>Treatment</i>	<i>% Dust in Soil</i>	<i>No. of days at 100% F.C.</i>	<i>No. of days taken to read 0% F.C.</i>
No Plants	0.0	11	20
	12.5	16	24
	25.0	20	29
	37.5	24	32
	50.0	29	36
With Plants	0.0	1	6
	12.5	1	7
	25.0	1	8
	37.5	3	9
	50.0	6	13

Table X. *Showing mean values for the number of days at 100% F.C. and the time taken to reach 0% F.C. in 5 soil dust mixtures.*

Water holding capacity of the soil increased with increasing amounts of dust.

### 3. GENERAL DISCUSSION

These experiments have shown that dry fibre dust could be used to correct many of the known nutrient deficiencies in cinnamon sand.

The water holding capacity of this soil was increased in direct proportion to the amount of dust incorporated.

Optimum yields were recorded for a mixture comprising three parts of dust and five parts of sand.

In practice, and under field conditions that mixture could be achieved by spreading dry fibre dust as a uniform layer three inches in depth, and then ploughing to an over-all depth of eight inches.

It is suggested that a suitable admixture of dry fibre dust would also improve the fertility and water-holding capacity of other depleted soils but that the optimum mixture (dosages) would vary with the nutrient status and W.H.C. of the soil concerned.

A mixture of soil and dry fibre dust might also be of value for high-land cropping and it should be particularly useful for pastures.

In the past, where pastures—under coconuts—have been given annual dressings of fibre dust, the dust has been applied in large quantities and it has remained undecomposed for long periods. It is suggested this was because the dust was not incorporated in the soil and because a very wide C/N ratio inhibited the development of organisms which are responsible for the decomposition of organic debris.

Unmanured plots on Bandirippuwa Estate have been top-dressed with 1-1½ inches of fibre dust and then harrowed, annually for a number of years. The yield of coconuts (c.f. manured trees) has been low. This adverse effect on yield may also be attributed to the absence of nitrogenous fertilizer.

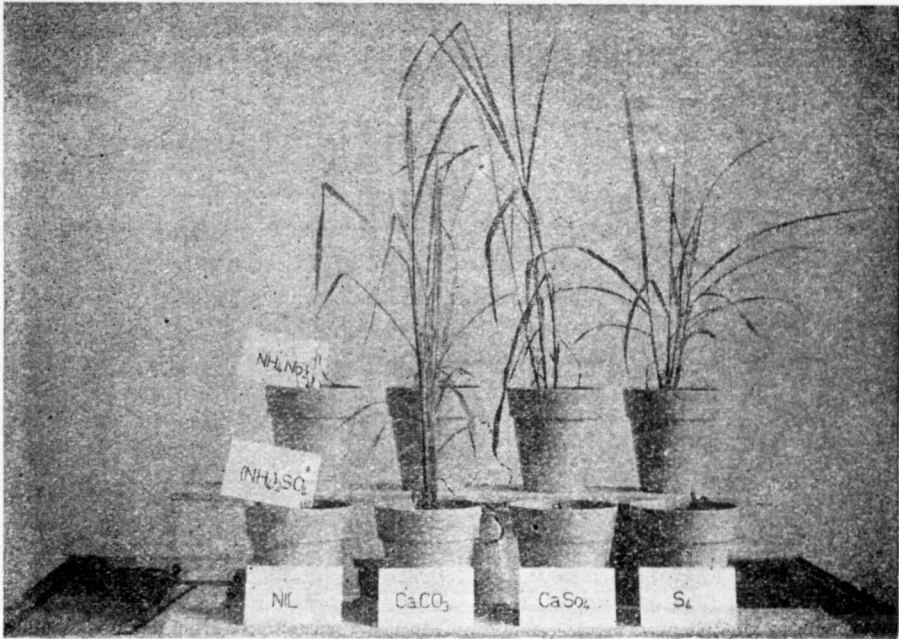


Plate I — Experiment II. Showing effect of forms of N, Ca and S on *Paspalum commersonii* prior to second harvest.

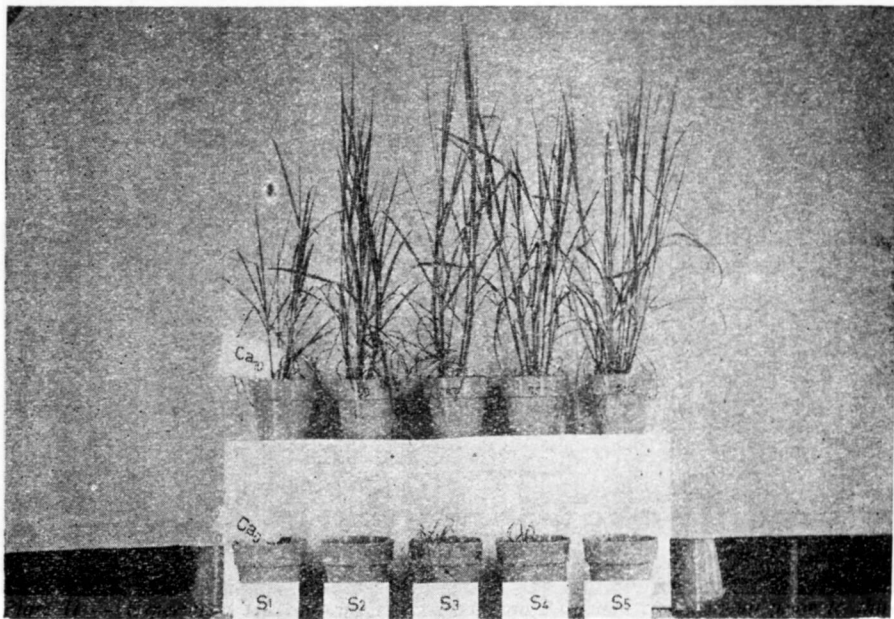


Plate II — Experiment III. Showing effect of Ca on *Paspalum commersonii* prior to third harvest.

While some addition of nitrogen is essential for effective use of fibre dust, it is possible that any soil-dust mixture carrying an adequate and well modulated leguminous cover crop would benefit from the combination of organic debris and nitrogen which is fixed by the legume bacteria.

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