Table 2. Expenditure and receipts from the cropping sequences.

Cropping sequence	Total expenditure (Rs)			Gross return (Rs)			Benefit cost ratio		
	1990	1991	1992	1990	1991	1992	1990	1991	1992
Groundnut - Black gram - maize + other enterprises	11265	12093	12806	45321	46621	49725	4.02	3.85	3.88
Groundnut - gingelly - ragi + other enterprises	10620	11400	11521	39331	41774	44677	3.70	3.66	3.87
Groundnut - cotton	5575	5210	5440	16022	15855	18480	2.87	3.04	3.39
Sorghum - cotton	5150	5177	5195	16525	16670	17970	3.20	2.22	3.26

Table 3. Employment opportunities and per day production from cropping sequences

Cropping sequence	1990		1991		1992		Per day Rs/ha/day		
	Mandays	Woman days	Mandays	Woman days	Mandays	Woman days	1990	1991	1992
Groundnut - Black gram - maize + other enterprises	242	1045	248	1100	238	1080	124	127	136
Groundnut - gingelly - ragi + other enterprises	224	1025	227	1050	220	1046	107	114	122
Groundnut - cotton	170	910	165	990	166	995	44	43	51
Sorghum - cotton	144	908	153	910	157	900	45	46	49
Additional labour in integrated farming system	70	126	78	125	68	115			
Equated mandays	70	113	78	113	68	104			
	183		191		172				

family labour is achieved. Higher per day income of Rs.100 and above was obtained in improved cropping system with farming system activities. Similar results were also obtained from the studies of Rangasamy *et al.*, (1992).

The adoption of IFS of groundnut black gram - maize or groundnut - gingellly-*ragi* with other components *viz.*, poultry, fish, dairy and rabbit rearing resulted in higher net return and benefit-cost ration over the conventional cropping system of groundnut-cotton or sorghum-cotton. The IFS utilises the farm resources effectively and resulted in increased number of labour days over the conventional cropping systems.

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EFFECTS OF AMENDMENTS ON SOIL CHARACTERISTICS AND PLANT RESPONSES IN GROUNDNUT - BLACK GRAM CROPPING SEQUENCE

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ABSTRACT

Studies were made under red lateritic soils of Vamban for finding out the effects of soil amendments, both organic and inorganic like pressmud, rice husk, FYM, lime and gypsum on the soil physical properties and yield of groundnut. The results revealed that the yield of groundnut was signi ficantly increased by application of lime (4 t/ha). Soil hardness was not significantly affected, How ever, the pH of soil was significantly increased due to application of lime (4 t/ha) and pressmud (5 t/ha). There was indications of the residual effects of amendments on the subsequent crop, blackgram.

KEY WORDS : Amendments, Soil Characteristics, Plant Responses, Groundnut, Black gram

Table 1. Effect of amendments on soil and yield parameters*

Treatment	Per cent emergence	Root length in cm	Shelling per cent	Pod yield of groundnut kg/ha	Soil hardness kg/sq. inch	Soil pH
Gypsum 2 t/ha (Full basal)	83.1	30.3	80.3	1683	2.83	5.1
Gypsum 2 t/ha (1/2 basal + 1/2 top dress)	83.5	35.9	77.4	1567	3.00	5.4
Lime 2 t/ha (Full basal)	83.2	36.4	76.3	1633	2.83	5.3
Lime 2 t/ha (1/2 basal + 1/2 top dress)	79.0	40.5	77.3	1633	2.67	6.0
Lime 4 t/ha (Full basal)	84.5	43.3	74.5	1533	3.17	5.9
Lime 4 t/ha (1/2 basal + 1/2 top dress)	82.3	42.6	77.6	1983	3.00	6.0
Rice husk 5 t/ha	82.3	44.4	75.5	1733	3.17	5.3
Pressmud 5 t/ha	82.9	37.1	76.8	1667	3.00	5.8
FYM 5 t/ha	82.6	36.1	73.3	1517	2.83	5.2
Control	79.4	29.3	71.9	1150	3.00	5.2
CD	6.8	3.7	2.1	129	0.8	0.2

* Mean of three replications

In any crop production programme, successful establishment of a uniform stand of a desired density is a very important aspect. The crop density is adversely affected by poor emergence of seedlings due to soil crusts. In many arid and semi-arid regions, soil crusting, is quite common. In these regions, the rapid drying of soil enhances the development of soil crusts (Prihar, 1974; Gupta and Yadav, 1978). The red lateritic soil types of Pudukkottai area, have high soluble iron and alumina which are responsible for binding soil particles, are irreversibly oxidised and result in the formation of soil crust. This kind of soil crust is an impediment for the seedling emergence of crops and also for crops like groundnut the penetration of pegs and formation of pods will be very much affected. Therefore, a study was planned to findout the effects of amendments on the changes in soil characteristics as well as yields of crops in a groundnut based cropping sequence.

MATERIALS AND METHODS

Field trials were conducted during 1987-88 with application of amendments under red lateritic soils of National Pulses Research Centre farm, Vamban, Pudukkottai. The following set of treatments were imposed. The amendments were applied basally and thoroughly incorporated into the soil.

Gypsum 2 t/ha (full basal), Gypsum 2 t/ha (1/2 basal + 1/2 top dress), Lime 2 t/ha (full basal), Lime 2 t/ha (1/2 + 1/2 top dress), Lime 4 t/ha (full basal), Lime 4 t/ha (1/2 basal + 1/2 top dress), Rice husk 5 t/ha, Pressmud 5 t/ha, FYM 5 t/ha, and Control.

The field trial was conducted with randomised blocks design with three replications. Groundnut (JL 24) was raised as the test crop. Observations on per cent emergence, root length, shelling percentage and pod yield were recorded. Soil characteristics like soil hardness, and soil pH were recorded. Another experiment, to findout the residual effect of applied amendments was also conducted. For this, the original plots were divided into two equal halves and for one half the same treatments were again applied and for the other half, no amendment was added. Black gram (KB 51) was raised as the test crop, and observations on the grain yield, per cent emergence, root length, soil hardness and soil pH were recorded.

RESULTS AND DISCUSSION

The results of the field experiment conducted during 1987-88 with the various amendment treatments are given in Table 1. From the data, it is evident that the pod yield of groundnut was significantly influenced by application of lime (4

Table 2. Residual effect of amendements on soil and yield parameters*

Treatment	Per cent emergence		Root length in cm		Grain yield of Black gram kg/ha		Soil hardness kg/sq. inch		Soil pH	
	T	R	T	R	T	R	T	R	T	R
Gypsum 2 t/ha (Full basal)	61.1	59.5	36.7	32.4	507	577	2.83	3.08	5.6	5.7
Gypsum 2 t/ha (1/2 basal + 1/2 top dress)	58.9	58.1	33.3	33.1	447	453	3.00	2.58	5.7	6.2
Lime 2 t/ha (Full basal)	61.8	62.1	42.8	38.6	543	590	2.70	2.50	5.8	6.3
Lime 2 t/ha (1/2 basal + 1/2 top dress)	60.3	54.5	43.6	37.3	580	610	2.70	2.75	6.1	6.0
Lime 4 t/ha (Full basal)	63.3	60.1	44.3	37.0	553	522	2.70	3.00	6.1	6.0
Lime 4 t/ha (1/2 basal + 1/2 top dress)	62.9	59.2	46.8	36.7	507	527	3.00	2.75	6.2	5.9
Rice husk 5 t/ha	67.2	60.9	44.8	37.3	507	540	2.75	2.50	6.2	6.1
Pressmud 5 t/ha	64.0	63.5	47.9	35.8	580	630	2.70	2.80	6.1	5.7
FYM 5 t/ha	58.0	58.3	42.2	34.9	513	583	3.30	2.70	5.6	5.7
Control	49.8	51.7	28.4	28.1	313	327	3.20	2.92	5.7	5.7
Main plot CD	3.4		5.5		103		NS		NS	
Sub-plot CD	1.0		1.8		23					

T = Treated; R = Residual * Mean of three replications

/ha), half basal and half top dressed. The yield evel was to the tune 893 kg/ha. Other treatments ike rice husk (5 t/ha). gypsum (2 t/ha) full basal, pressmud (5 t/ha), lime (2 t/ha) full basal and lime (2 t/ha) full basal and lime (2 t/ha), half basal and half top dress also increased the pod yield significantly over the control.

The per cent emergence was not statistically significant. However, the shelling percentage was significantly increased by lime and gypsum application. With regard to soil properties, soil hardness was not significantly influenced by amendments which may be to short term effect of the treatments. However, root growth was favourably affected by amendments like lime and rice husk. The pH of the soil was significantly increased by amendments like lime and pressmud applications at 2 t and 4 t/ha of lime and at 5 t/ha of pressmud. The results are corroborative to the results obtained by Mathan *et al.* (1986).

The results of the trial on the residual effect of the applied amendments presented in Table 2, revealed that the grain yield of black gram was not increased due to application of amendments. All the treated plots recorded significantly higher grain yield over control again indicating the residual effect of amendments. Per cent emergence followed the same trend. However, no significant changes in soil hardness and soil pH could be discernible. The grain yield of black gram was found to be greater under the sequence of black gram after groundnut. From the data, it was found that application of lime (4 t/ha) or pressmud (5 t/ha) was found to be beneficial for alleviation of the problem.

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