low to medium saline conditions. The genotypes such as Raj-3077, SW-37 and SW-2560 were appeared to be stable as regression remained close to unity but their lower mean grain yield than population mean made unsuitable for saline soils. Similarly the genotype SW-36 was a low yielder which was further coupled with lower 'bi' value and also considered as unsuitable for saline environment.

From the present study it revealed that the genotypes DWR-39, DWR- 162 and Raj-1972 were found stable and their response to the changes in environmental conditions was better as indicated by higher mean grain yield. The genotypes such as KRL-1-4 and K-65 although found to have higher yield potential and their performance under saline environments can be improved by crossing with the above genotypes so that higher productivity under stress is achieved.

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REFERENCES

BAHL, P.N., MEHRA, R.B. and MAKIN, B.K. (1980). Phenotypic stability and adaptability of newly developed cultivars of bengal gram Madras Agric. J., 67: 567 -72.

BILBRO, S.D. and RAY, L.L. (1976). Environmental stability and adaptation of several cotton cultivars. Crop Sci., 16:821-824.

EBERHART, S.A. and RUSSELL, W.A. (1966). Stability parameters for comparing varieties. Crop Sci., 6: 36-40.

RICHARDS, L.A. (Ed). (1954). Diagnosis and Improvement of Saline and Alkali Soils. USDA Hand Book No.60

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FERTILISER APPLICATION TO GROUNDNUT BASED ON SOIL TEST CROP RESPONSE EQUATIONS

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ABSTRACT

Soil test crop response studies were conducted in red lateritic soil of the Regional Research Station, Vridhachalam. Fertility gradients were created and different levels of NPK were applied. VRI I groundnut was raised as test crop. Based on yield of pod and haulm, available nutrient contents in soil at harvest stage and uptake of principal plant nutrient elements crop response equations were developed. Test verification of these equations for their applicability revealed that these fertiliser prescription equations hold good at lower levels of targeted yield upto 20 q/ha beyond which there is deminished response to the applied nutrients.

KEY WORDS : Groundnut, Fertiliser Prescription, Crop Response

Soil fertility holds key to productivity of crops. In these days of increasing cost of fertiliser, there is urgent need to find ways and means to economise the schedule of nutrients to be applied to crops without sacrificing the yield potential and monetary return to the farmers. The approach of initial soil fertility based fertiliser application will be very useful in this context where the crop is supplied with the required level of nutrients to obtain economic optimum yield. With this objective, field experiments were conducted at the Regional Research Station, Vridhachalam to find out the response of groundnut to applied nutrients and develop crop response equations which could be used for determining the fertiliser schedule for the said crop under irrigated conditions.

MATERIALS AND METHODS

Field experiments were conducted in the red lateritic soil of the Regional Research Station, Vridhachalam. The soil had the following chemical and physio-chemical properties.

Available nitrogen (Alkaline permangenate method) = 145 kg/ha (low)

Available phosphorus (Olson's P) = 40 kg/ha (high)

Available potassium (Ammonium acetate method) = 90 kg/ha (low)
pH = 6.6
EC = 0.2 dsm^{-1}
P fixing capacity = 90 kg/ha
K fixing capacity = 125 kg/ha

Kharif 1988

During this season a fertility gradient was created by application of incremental levels of fertilisers as shown below

Treatments	Fertiliser level			Fertiliser dose (kg/ha)		
	N	P	K	N	P	K
Strip I	0	0	0	0	0	0
Strip II	1/2	1/2	1/2	75	45	62.5
Strip III	1	1	1	150	90	125
Strip IV	2	2	2	300	180	250

A gradient crop of Co 26 sorghum was raised in plots of 144m^2. After the harvest of crop, the yields of grain and straw were recorded, and furnished in Table 1.

Summer 1989

There are four strips in the fertility gradient from No Po Ko to N2 P2 K2. Each strip was further subdivided into 24 plots, each having the size of 20m^2.

Initial pre-sowing soil samples were collected plot-wise (96 in all) and analysed for available NPK by standard methods Subbiah and Asija, 1956; Olsen *et al.*, 1954. The analytical data are furnished in Table 2 and 3.

The following treatment combinations were superimposed in each strip by adopting the design of randomised blocks with incomplete factorials confounding certain treatments in each strip.

VRI 1 groundnut was raised as test crop in plots adopting a spacing of 30 x 10 cm. The data on yield of dry pod and haulm were recorded.

Table 1. Gradient crop sorghum Co.26 yield (kg/ha).

Treatment	Grain	Straw
$N_0 P_0 K_0$	1619	5690
$N_{1/2} P_{1/2} K_{1/2}$	1822	8999
$N_1 P_1 K_1$	1935	9976
$N_2 P_2 K_2$	2309	10879

(Table 3). Plotwise post harvest soil and plant samples were also collected and analysed for NPK. Yield target equations were drawn based on yield and soil and plant analysis data.

A field trial was conducted during *kharif* 1990, in randomised block design with four treatments to test verify the yield target equations already developed. The treatments include: T1 to T3 represented NPK application with a target yield of 20, 25 and 30 q/ha, T4 shows NPK application as per blanket recommendation. The initial soil test values of the experimental field were available N 204 kg/ha, available P 26 kg/ha and available K 85

Treatments	Nutrient level (kg/ha)		
	N	P*	K*
No Po Ko (T_1)	0	0	0
No Po Ko (T_2)	0	0	0
No Po Ko (T_3)	0	0	0
No Po Ko (T_4)	0	0	0
N1 Po Ko (T_5)	20	0	0
N1 Po K1 (T_6)	20	0	40
N1 P1 K1 (T_7)	20	18	40
N2 Po Ko (T_8)	40	0	0
N2 Po K1 (T_9)	40	0	40
N2 P1 Ko (T_{10})	40	18	0
N2 P1 K1 (T_{11})	40	18	40
N2 Po K2 (T_{12})	40	0	80
N2 P1 K2 (T_{13})	40	18	80
N2 P2 K2 (T_{14})	40	36	80
N3 Po Ko (T_{15})	60	0	0
N3 P1 K1 (T_{16})	60	18	40
N3 P2 K1 (T_{17})	60	36	40
N3 Po K3 (T_{18})	60	0	120
N3 P2 K2 (T_{19})	60	36	80
N3 P2 K3 (T_{20})	60	36	120
N4 P1 K2 (T_{21})	80	18	80
N4 P1 K3 (T_{22})	80	18	120
N4 P2 K3 (T_{23})	80	36	80
N4 P2 K3 (T_{24})	80	36	120

* As P and K and not P_2O_5 and K_2O

Table 2. Summer 1989 Pre-sowing stage soil analytical data (kg/ha)

Treatment	Available nitrogen	Available phosphorus		Available potassium	
	Alkaline permanganate method	Olsen's method	Bray I method	NH_4 O A C method	0.1 N HNO_3 method
T_1	176	24.4	86	90	85
T_2	174	22.5	110	94	85
T_3	175	26.8	104	83	79
T_4	178	25.5	114	90	86
T_5	181	22.4	79	98	84
T_6	186	25.3	70	84	92
T_7	183	21.8	102	90	93
T_8	185	25.6	92	88	95
T_9	185	23.8	72	69	86
T_{10}	186	24.6	95	88	85
T_{11}	185	22.3	97	98	85
T_{12}	175	21.9	99	89	88
T_{13}	180	23.0	84	131	75
T_{14}	186	24.0	81	78	83
T_{15}	186	27.8	84	90	90
T_{16}	184	27.8	85	93	96
T_{17}	184	25.6	79	78	91
T_{18}	185	21.6	75	79	91
T_{19}	181	25.9	91	96	88
T_{20}	181	26.6	83	78	95
T_{21}	188	23.5	99	79	84
T_{22}	186	22.9	87	78	83
T_{23}	183	23.8	72	91	85
T_{24}	181	25.1	83	96	88

kg/ha, as per the equations. VRI 2 groundnut was raised as test crop. The yield data are furnished in Table 4.

RESULTS AND DISCUSSION

Sorghum

The grain yield of the gradient crop of Co.26 sorghum during *kharif* 1988, increased from 1619 kg/ha (No Po Ko) to 2309 kg/ha when the applied nutrient level was increased to N2 P2 K2 (Table 1). The mean straw yield ranged from 5690 kg/ha (No Po Ko) to 10879 kg/ha in N2 P2 K2 level. straw yield increased with progressive increase in the level of application of NPK.

The data collected during Summer, 1989 on pod and haulm yield of groundnut as well as available NPK content in soil and uptake of NPK by groundnut were computerised and the following basic informations and yield target (fertiliser prescription) equations were obtained.

Yield target (fertiliser prescription) equation:

Basic Data	N (Alkaline perman ganate)	P (Olsen)	K (0.1 N HNO3)
Nutrient requirement (kg/ha)	4.502	0.5122	1.0810
Soil efficiency (%)	0.3412	0.3622	0.1022
Fertilizer efficiency (%)	0.7539	0.1022	0.1390

FN = 5.97 T - 0.45 SN
FP = 5.01 T - 3.55 SP
FK = 7.78 T - 1.28 SK

Where T = Yield target in q/ha

FN, FP FK = Fertiliser NPK to be applied in kg/ha.

SN, SP, SK = Soil test values for available NPK in kg/ha.

These equations reflect the efficiencies of soil and fertiliser nutrients and nutrient requirement of crop.

The pod yield of the test verification during *kharif* 1990, of the yield target equations revealed that at lower level of target higher percentage of targetted yield has been obtained. The potentiality of the crop to yield reduces with increase in the level of fertilization. The soil test crop response equations hold good at the targeted yield of 20 q/ha of groundnut pod. Beyond this the yield obtained is less as against the targetted yields. Rani Perumal *et al* (1988) conducted soil test crop response studies in red soil - Irugur series with groundnut and found that the yield target equations developed were found to hold good to other allied soils and groundnut varieties.

Therefore, it is evident that fertiliser recommendation to irrigated groundnut grown in red lateritic soils of Vridhachalam tract can be given based on the initial soil test values and the fertiliser prescription equations.

Table 3. Data on groundnut yield and soil analysis (Kg/ha)

Treatment	Pod	Haulm	Available nitrogen at harvest stage Alkaline permanganate method
T_1	1970	1800	134
T_2	1750	1750	130
T_3	1710	1550	134
T_4	1815	1600	133
T_5	1945	1850	144
T_6	1990	2000	148
T_7	1735	1700	147
T_8	1845	1750	144
T_9	1840	1750	147
T_{10}	2000	1800	148
T_{11}	1915	1950	146
T_{12}	1945	1900	144
T_{13}	1995	1750	145
T_{14}	2485	2150	147
T_{15}	1920	1950	144
T_{16}	2075	2200	144
T_{17}	1890	1950	143
T_{18}	2225	2300	143
T_{19}	2020	1950	146
T_{20}	2095	1950	145
T_{21}	1920	1800	152
T_{22}	2185	2050	151
T_{23}	1890	2050	151
T_{24}	1820	2250	154

Table 4. Test verification trial on groundnut *kharif* 1990.

Treatment	Nutrients applied (kg/ha) N	P	K	Dry pod yield (kg/ha)	Variation over targetted yield (kg)	Percentage achievement
STCR 20 q/ha	27.6	7.9	12.6	1920	-80	96
STCR 25 q/ha	57.5	32.9	42.9	2225	-275	89
STCR 30 q/ha	87.3	58.0	73.3	2430	-570	81
Blanket recommendation	17	14.8	44.8	2080		

REFERENCES

OLSEN, S.R., COLE, C.V. WATANBE, F.S. and DEAN, L.A. (1954). Estimation of available phosphorus in soil with sodium bicarbonate. **USDA Cir. 939**

RANIPERUMAL., DURAISAMY, P., JAYARAMAN,C. and MANI, S. (1988) Rationalised fertilizer prescription for groundnut based on soil test crop response studies. **Madras agric. J 76**: 164 - 172

SUBBIAH, B.V. and ASIJA, G.L. (1958). A rapid procedure for the estimation of available nitrogen in soil.**Curr.Sci.25**: 259 - 60