The mushroom spent compost is found to be a good reserve of plant nutrients which are made available in a phased manner contributing to substantial yield increase which worked out to be 9.0 per cent than 125 per cent NPK alone. Also it had appreciable residual effect as evidenced by its contribution towards the build up of available nutrients as well as yield increase.

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BASIS FOR FERTILIZING RICE - GROUNDNUT PULSE SEQUENCE IN LBP AYACUT

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ABSTRACT

Linear polynomial model was employed to predict the soil test values of intervening soil samples in rice-groundnut-pulse cropping sequence utilising the soil test crop response data of these crops for LBP ayacut area. This model prediction was satisfactory and well within permissible limit of variation. A basis has been provided for making fertilizer recommendations for this crop sequence using the model predictions.

Fertilizing a cropping sequence posses problems because of one cannot always go for making a soil test on account of the shorter interval available between any two crops in the sequence.

Table 1. Quantity of fertilizers, (Kg/ha) applied to rice, groundnut and black gram

Levels	Rice	Groundnut	Blackgram
Nitrogen (as N)	0	0	0
N_0	34	14	7
N_1	74	125	13
N_3	110	35	18
N_4	146	45	23
N_5	187	56	29
Phosphorous (as P)			
P_0	0	0	0
P_1	4	4	3
P_2	15	15	12
P_3	25	25	20
P_4	35	35	28
P_5	46	46	37
Potassium (as K)			
K_0	0	0	0
K_1	6	6	3
K_2	24	24	12
K_3	40	40	20
K_4	56	56	28
K_5	74	74	27

Thus, providing a basis for assessing the fertilizer needs of all the crops in the sequence from the initial soil analysis will be of immense use to the farmers for ensuing scientific farming. In the past, researchers have made attempts to provide such basis for fertilizing cropping sequences (Gangwar, 1987). The paper attempts to propose a basis for rice - groundnut - blackgram sequence which is followed in the Lower Bhavani Project ayacut area of Tamil Nadu which constitutes 83,000 hectares.

Table 2. NR*, α* and β* for rice, groundnut and black gram

Nutrient and P Parameters	Rice	Groundnut	Black gram
Nitrogen			
NR	30.55	0.0682	0.04
α	0.05	0.9998	0.22
β	0.64	0.9613	0.21
Phosphorous			
NR	7.63	0.0093	0.004
α	0.95	0.9125	0.39
β	0.52	0.6308	0.02
Potassium			
NR	31.20	0.0459	0.013
α	0.41	0.6557	0.08
β	0.59	0.2813	0.08

* NR = Nutrient requirement α = Soil nutrient efficiency factor β = Fertilizer nutrient efficency factor.

Table 3. Fertilizer Prescription Equations for Rice, Groundnut and Blackgram

Rice	Groundnut	Blackgram
FN = 47.40T-0.89 $KMnO_4$-N	FN = 0.07 T - 1.04 $KMnO_4$ - N	FN = 0.19 T - 0.98 $KMnO_4$ - N
FN = 14.61 T - 1.82 Olsen - P	FN = 0.01 T - 1.45 Olsen - P	FN = 0.19 T - 20.33 Olsen - P
FK = 53.21 T - 0.70 NH4OAC-K	FK = 0.16 T - 2.33 NH4OAC - K	FK = 0.16 T - 1.00 0.1 N HNO_3 - K
T = Grain yield in Tonnes/ha	T = Pod yield in Kg/ha	T = Grain yield in Kg/ha

MATERIALS AND METHODS

Soil test crop response data of rice (September, 1988 - January, 1989) - groundnut (February - June, 1989) - blackgram (July - September, 1989) sequence were obtained from field experiments conducted on a sandy clay loam soil (Udic Ustropepts) and belonging to 'Ld' unit of fertility capability classification of Buol *et al.* (1975) of Agricultural Research Station, Bhavanisagar. The objective of these experiments was to investigate the soil test crop response relationships of these crops employing the inductive methodology outlined by Ramamoorthy (1968). Four fertility gradients with respect to soil available phosphorus and potassium were created at the experimental site by applying different amount of these nutrients based on these nutrients fixing capacity and by growing a fodder maize (Var. Co 1) to equilibriate these two butrient in the soil.

After harvesting fodder maize, each fertility block was subdivided into 39 plots (the size of each being 2.4 x 5 m). Thirty nine treatments consisting of 6 levels each of nitrogen, phosphorus and potassium (Table 1) in an experimental design adopted by the Bench mark soils project of University of Hawaii (Silva *et al.*, 1985) were randomly superimposed on each fertility gradient block.

Surface (0-15 cm) soil samples collected from the 156 plots before transplanting/sowing of each crop were analysed for alkaline $KMnO_4$- N (Subbiah and Asija, 1956), Olsen-P (Olsen *et al.*, 1954), neutral *N* NHO_4 Ac-K (Hanway and Heidal, 1952) and 0.1 N HNO_3K (Sobulo, 1973). Representative plant samples obtained from each crop and plot were analysed for nitrogen, phosphorus (Jackson, 1973) and potassium (Piper, 1966). From these nutrient contents and using the dry matter produced by the respective crops, uptake of nitrogen, phosphorus and potassium in each plot was computed.

The nutrient requirement (NR) and soil (α) and fertilizer (β) nutrient efficiencies were arrived at by the procedure outlined by Ramamoorthy *et al.* (1967).

RESULTS AND DISCUSSION

The NR and soil (α) and fertilizer (β) nutrient efficiencies estimated for all the three crops in the sequence are presented in Table 2 and the respective fertilizer prescription euqations

Table 4. Soil Test Prediction equations for intervening samples in Rice - Groundnut - Blackgram sequence.

	After Rice	
YPH $KMnO_4$ - N	= 48.53+0.13** F.N.+0.11 IS $KMnO_4$ - N-0.16 Grain Yield	0.7896**
YPH Olsen - P	= 4.87+0.09** F.N.-0.7 IS Olsen P - 0.06 Grain Yield	0.7204**
YPH NH_4OAC - K	= 67.14+0.34** F.K.+0.10 IS NH4 OAC-K-0.16 Grain Yield	0.6136**
	After Groundnut	
YPH $KMnO_4$ - N	= 57.50+0.10** F.N.+0.26**IS $KMnO_4$-N+0.01** Pod Yield	0.7451**
YPH Olsen - P	= 3.95+0.07** F.P+0.08 IS Olsen-P+0.011 Pod Yield	0.6690**
YPH NH_4OAC - K	= 68.46+0.11** F.K.+0.28 IS NH4OAC-K+0.0021** Pod Yield	0.5734**
	After Black gram	
YPH $KMnO_4$ - N	= 12.57+0.43** F.N.+0.71** IS $KMnO_4$-N+0.01** Grain Yield	0.7560**
YPH Olsen - P	= 2.84+0.12** F.P.+0.04 IS Olsen-P+0.002 Grain Yield	0.7538**
YPH 0.1 N HNO_3-K	= 1968+0.48** F.K. 0.74 IS HNO_3 - K+0.008** Grain Yield	0.8030**

* Significant P 0.01 PH = Post Harvest IS = Initial

Table 5. *Observed and * predicted soil test values (kg/ha) for selected treatment at the post harvest of maize.

Fertility gradient block	Treatment	After Rice						After Groundnut						After Blackgram					
		$KmnO_4$-N		Olsen-P		NH_4 OAC-K		$KmnO_4$-N		Olsen-P		NH_4 OAC-K		$KmnO_4$-N		Olsen-P		0.1N HNO_4-K	
		O*	P**	O	P	O	P	O	P	O	P	O	P	O	P	O	P	O	P
I	$N_1P_1K_1$	60	64	4.5	4.1	72	79	80	88	4.0	4.9	85	94	78	77	4.0	4.2	82	91
	$N_3P_3K_3$	72	73	7.5	5.6	84	91	90	98	7.0	6.8	96	103	90	90	8.0	6.3	115	109
	$N_5P_5K_5$	80	83	8.0	7.4	90	103	98	104	6.0	8.5	105	109	100	100	7.0	8.2	130	123
II	$N_1P_1K_1$	58	65	4.5	3.9	75	80	88	87	4.0	4.9	92	95	85	84	4.0	4.4	90	98
	$N_3P_3K_3$	74	73	7.5	5.4	90	91	108	101	6.5	6.9	105	105	106	104	7.0	6.6	115	117
	$N_5P_5K_5$	86	82	8.0	7.4	100	103	110	108	7.0	8.6	110	113	110	110	8.5	8.5	130	129
III	$N_1P_1K_1$	60	66	5.0	3.6	78	81	85	87	4.0	4.9	95	95	83	82	4.0	4.4	90	100
	$N_3P_3K_3$	76	73	8.5	5.1	95	93	108	101	6.5	6.9	108	106	106	106	7.5	6.9	128	120
	$N_5P_5K_5$	90	83	9.5	7.4	100	105	102	105	8.5	8.6	110	111	112	105	9.0	8.6	130	129
IV	$N_1P_1K_1$	66	65	5.5	3.7	80	80	85	89	4.5	4.9	100	96	82	83	5.0	4.6	98	105
	$N_3P_3K_3$	80	74	8.5	5.3	95	91	102	105	7.0	7.0	105	108	99	101	8.0	6.9	115	118
	$N_5P_5K_5$	100	85	10.0	6.9	110	105	100	114	9.0	8.8	105	116	102	103	10.0	8.7	135	125

* O = Observed *P = Predicted

Table 6. Fertiliser prescription for rice - groundnut - black gram sequence using fertilizer and soil test prediction equation

Soil Test Values (Kg/ha)				Rice for an yield target of (T) 5 tonnes/ha			Groundnt for an target of (T) 3 tonnes			Black gram for an yield target of 700 kg/ha.		
KMBo4	Olsen-P	NH4 AC-K	0.1N HNO3K									
90	5.0	95	70	157	64	200	116	23	259	45	32	17
100	6.0	105	80	148	62	193	106	21	235	35	12	7
110	7.0	115	90	139	60	186	96	20	212	25	-	-
120	8.0	125	100	130	58	179	18	18	189	15	-	-
130	9.0	135	110	121	56	172	17	17	165	5	-	-

developed in Table 3. The soil test prediction equations related to samples after the hargest of each crop in a linear polynomial model are presented in Table 4. These prediction equations showed more than 70 per cent predictability for $KMNO_4N$ in all the cases, for Oslen-P in all excepting the postharvest soil of groundnut. In the case of 0.1 N HNO_3-K the predictability was very high (R^2 = 0.8030**) for the post soil of blackgram, whereas in case of NH_4OAc-K the percentage of variation in the prediction explained the variables in the right hand side of the linear model was around 60 for the post harvest soil of rice and groundnut.

The observed and predicted soil test values in selected treatments at the harvest of each crop in the sequence are presented in Table 5. These values revealed that the variations between the predicted and observed soil test values in all cases are well within permissible limits. Thus, it is concluded that the soil test prediction equations presented in Table 4 could be successfully employed for assessing the nutrient status of the soil in between crops in a sequence. Such predicted soil nutrient levels can be substituted in the fertilizer prescription equations (Table 3) to arrive at the amounts of fertilizer applied to each crop in the sequence. Such recommendations for the crops in the sequence, viz., rice-groundnut-pulse for LBP ayacut area are presented in Table 6, could be adopted for a profitable farming.

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