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SOIL FERTILITY STATUS AND FERTILISER PRESCRIPTION THROUGH TARGETED YEILD APPROACH FOR FARM SOILS OF TAMILNADU AGRICULTURAL UNIVERSITY,COIMBATORE

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ABSTRACT

Soil fertility status of Tamil Nadu Agricultural University (TNAU) farm,Coimbatore was evaluated. Almost all the blocks recorded low available N status. Available P status was high in Paddy Breeding Station,medium to high in wetlands field, No.62-77 and New Area of Eastern Block and Cotton Breeding Station; low to medium in Millet Breeding Station and New Area;low in field No.36 and 37 of Eastern Block. With regard to available K,almost all the blocks recorded high status. Based on targeted yield approach (STCR), fertiliser recommendations are given for various crops grown in different blocks of Tamil Nadu Agricultural University Farm, Coimbatore.

KEY WORDS: Fertility Status, TNAU Farm, STRC fertiliser recommendation

The capability of a soil for sustaining production depends on fertility of that soil. A comprehensive knowledge on soil fertility status is quite imperative for efficient use of any production input. Balanced fertilisation is a must for realising higher efficiency and economy in fertiliser use. The concept of yield targeting (Ramamooorthy et.al., 1967), provides ample scope for the practice of balanced fertilisation and guides in the maintenance of the soil fertility status which is a key factor for sustained crop productivity. Hence the study was undertaken to evaluate the fertility status of soils of TNAU Farm, Coimbatore and to provide soil test based fertiliser recommendation for specific yield targets (STCR) in an effort to improve the fertiliser use efficiency.

MATERIALS AND METHODS

Representative surface soil samples (0-15 cm) were collected fieldwise from different blocks of TNAU farm,Coimbatore (Wetlands, Eastern Block and New Area,Millets Breeding Station and New Area Cotton Breeding Station and Paddy,Breeding Station). The samples were processed and analysed for KMnO4-N (Subbiah and Asija,1956). Oslen - P (Oslen et al., 1954) and NH_4OAc-K (Hanway and Heidal,1952). Based on the fertility status of the soil,fertiliser prescription for average yields of various crops grown in different blocks of TNAU Farm, Coimbatore were given using the fertiliser prescription equation developed in the All India Co-ordinated Research Project on Soil Test Crop Response Correlation.

RESULTS AND DISCUSSION

A. Fertility Status

Eastern Block and New Area

The KMnO4 - N in the soil of different blocks ranged from 145-292kg/ha. In general,the N status was found to be low (<280 kg/ha). In respect Oslen-P, the range was 5.6 - 26.9kg/ha. Almost all the soils in field No.36 and 37 recorded values lesser than 11.2kg/ha)while the status was found to be medium to high (>11.2 kg/ha) in New Area.In respect of NH4OAc-K, the range was 336 - 952kg/ha thereby revealing the high available K status of the soils (Table 1).

WetLands

All the 14 blocks in wetlands (Table 2) recorded low N(151 - 298kg/ha); with regard to Oslen-P,the status was medium to high (19.8 - 58.2kg/ha). The available K status was found to be high in all the blocks (414-980kg/ha).

Table 1. Eastern Block

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
1.	36A	185	9.0	538
2.	36B	194	9.7	459
3.	36C	198	5.6	515
4.	36B	185	6.7	560
5.	36C	195	9.0	459
6.	37A	176	6.7	358
7.	37B	163	10.1	515
8.	37C	198	10.8	582
9.	37D	229	11.2	616
10.	37E	145	11.2	672
11.	37F	164	10.1	459
12.	62	182	11.2	392
13.	87B	191	24.6	515
14.	68	179	17.9	616
15.	69	257	18.8	448
16.	70	208	14.6	338
17.	71	285	10.1	459
18.	72	260	17.9	448
19.	73	207	13.6	538
20.	74	245	13.4	616
21.	75	241	19.0	459
22.	76	245	25.8	896
23.	77	245	26.9	414
24.	NA1	182	19.8	896
25.	NA2	195	16.1	750
26.	NA3	189	21.9	918
27.	NA4	190	18.6	952
28.	NA5	230	16.2	896
29.	NA6	292	20.9	806
30.	NA7	213	21.9	750
31.	NA8	208	20.6	829
32.	NA9	230	20.9	952

Millet Breeding Station

The available N,P and K status was found to be low (142-213 kg/ha),low to medium (7.8-20.2kg/ha) and medium to high (202 - 423kg/ha) respectively (Table 3).

Table 2. Wetlands

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
1.	A1	220	43.7	493
2.	A2	223	47.0	638
3.	A3	184	35.8	616
4.	A4	248	21.8	672
5.	A5	241	28.2	694
6.	A6	193	31.3	560
7.	A7	191	21.3	515
8.	A8	232	30.0	520
9.	B1	151	30.2	515
10.	B2	173	29.5	560
11.	B3	189	32.1	58
812.	B4	192	30.9	638
13.	B5	198	30.2	498
14.	B6	192	31.4	484
15.	B7	180	30.9	498
16.	B8	209	32.8	521
17.	B9	182	35.8	784
18.	C1	184	37.0	717
19.	C2	176	35.8	515
20.	C3	190	37.0	521
21.	C4	245	28.4	582
22.	C5	245	32.3	584
23.	C6	191	41.5	582
24.	C7	188	39.2	524
25.	C8	191	38.1	672
26.	D1	209	51.4	616
27.	D2	280	51.5	694
28.	D3	241	38.1	717
29.	D4	298	32.3	672
30.	D5	245	37.0	584
31.	D6	195	39.2	829
32.	E1	276	3[illegible]	628
33.	E2	238	22.[illegible]	717
34.	E3	198	25.8	694
35.	E4	254	26.7	892
36.	E5	258	21.3	1829
37.	E6	201	26.7	[illegible]2
38.	F1	258	33.6	58
39.	F2	267	20.2	560
40.	F3	232	33.4	638
41.	F4	226	39.2	672

Table 2. Contd.,

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
42.	F5	276	34.9	560
43.	F6	276	33.4	493
44.	F7	226	39.2	560
45.	G1	219	30.8	628
46.	G2	257	40.2	543
47.	G3	229	36.2	543
48.	G4	257	42.6	493
49.	G5	280	44.2	515
50.	G6	229	42.6	493
51.	G7	254	56.6	582
52.	G8	217	40.9	560
53.	G9	232	44.2	538
54.	G10	282	30.9	626
55.	G11	229	40.9	515
56.	G12	241	40.9	616
57.	G13	198	42.6	638
58.	G14	238	33.4	538
59.	G15	257	34.7	448
60.	H1	257	56.6	560
61.	H2	213	39.8	694
62.	H3	267	37.5	616
63.	H4	241	54.3	638
64.	H5	241	58.2	616
65.	H6	295	44.2	672
66.	H7	248	49.3	582
67.	J1	193	49.3	560
68.	J2	163	49.3	694
69	J3	208	44.2	582
70.	J4	204	37.5	534
71.	J5	195	42.6	616
72.	J6	216	51.0	543
73	J7	204	58.2	672
74	J8	223	54.3	534
75.	K1	198	47.6	515
76	K2	236	36.2	443
77.	K3	260	49.3	515
78	K4	239	50.1	515
79.	K5	249	39.2	493
80	K6	281	48.6	414

Table 2. Contd.,

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
81.	K7	185	40.9	448
82.	K8	272	49.3	582
83.	K9	235	45.9	534
84.	K10	295	40.9	523
85.	K11	182	50.1	580
86.	K12	247	45.9	515
87.	K13	229	39.2	414
88.	L1	248	36.2	515
89.	L2	236	37.1	528
90.	L3	241	32.8	510
91.	L4	198	34.1	515
92.	L5	202	32.8	523
93.	L6	201	40.9	580
94.	M1	189	26.7	990
95.	M2	267	36.2	980
96.	M3	201	20.9	968
97.	M4	220	23.4	858
98.	M5	207	22.4	784
99.	M6	231	20.2	862
100.	M7	190	19.8	862
101.	M8	198	20.1	918
102.	M9	209	21.3	784
103.	M10	211	26.9	694
104.	N1	169	27.8	717
105.	N2	171	39.2	750
106.	N3	159	45.9	784
107.	N4	160	51.0	750
108.	01	187	43.5	896
109.	02	194	31.9	750
110.	03	226	39.2	717
111.	04	223	33.4	560
112.	05	221	45.9	515
113.	06	201	40.9	560
114.	07	189	54.3	750
115.	08	245	58.2	784

New Area

All the fields in New Area (Table 3) were found to be low in available N status (153 - 220kg/ha)

Table 3. Millet Breeding Stations and New Area

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
Millet Breeding Station				
1.	1E	160	9.0	202
2.	1W	160	20.2	269
3.	7E	157	7.8	324
4.	7W	169	14.6	423
5.	8	154	6.7	202
6.	9	166	12.3	243
7.	10	183	11.2	323
8.	11	142	13.4	334
9.	12	213	9.0	269
New Area				
1.	1B	205	12.4	280
2.	1C	185	6.7	493
3.	2A	160	9.0	448
4.	2B	163	6.7	459
5.	2C	182	8.5	448
6.	2D	184	5.6	515
7.	2E	182	9.0	538
8.	2F	188	13.4	448
9.	2G	172	8.9	616
10.	3A	160	10.8	538
11.	3B	153	9.0	462
12.	3C	176	9.0	560
13.	3D	167	16.7	538
14.	3E	159	16.7	560
15.	4A	179	6.7	693
16.	4B	160	6.7	638
17.	4C	168	11.3	492
18.	4D	220	12.4	694
19.	4E	160	6.7	569

while the available P status was found to be low to medium (5.6 - 16.7kg/ha). With regard to available K,all the fields recorded high status(280 - 694kg/ha).

Cotton Breeding Station

The status of N,P and K were low (164 - 254kg/ha),medium to high (12.2 - 39.2kg/ha) and high (358 - 672kg/ha) respectively (Table 4).

Table 4. Cotton Breeding Station

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
1.	A1	188	26.3	470
2.	A2W	198	21.1	358
3.	A2E	201	20.9	420
4.	2A	198	17.4	515
5.	2B	181	23.5	403
6.	3A	220	14.9	493
7.	3B	187	18.6	392
8.	4A	184	22.3	515
9.	4B	254	22.3	448
10.	5A	188	16.1	427
11.	5B	207	16.1	381
12.	6A	210	39.2	492
13.	6B	223	13.7	427
14.	C1	226	29.1	672
15.	C2	169	19.8	616
16.	C3	176	21.1	582
17.	C4	204	27.8	548
18.	R1	164	12.2	392
19.	R2	176	34.7	414

Paddy Breeding Station

All the eleven blocks recorded low N(160 - 683kg/ha) status (Table 5).

Table 5. Paddy Breeding Station

S.No.	Fd. No.	Available Nutrients (Kg/ha)		
		N	P	K
1.	A	160	26.3	392
2.	B	267	45.9	650
3.	C	201	40.9	448
4.	D	185	47.6	459
5.	E	254	51.0	683
6.	F	194	42.6	594
7.	G	267	37.5	498
8.	H	260	31.9	482
9.	K	198	33.4	582
10.	L	216	52.6	672
11.	M	263	30.7	470

Table 6. Block : Wetlands

Soil : Alfisol
Crop : Rice
Season : Kharif Season : Rabi
Target : 6 t ha^{-1} Target : 5 t ha^{-1}

	Soil test values (kg ha^{-1})				Fertiliser prescription Kg ha^{-1}					
S.No.	Block	$KMnO_4$-N	Olsen-P	NH_4OAc-K	N	P_2O_5	K_2O	N	P_2O_5	K_2O
1	A	206	41	587	156	0	0	112	0	0
2	B	183	36	494	168	3	0	124	0	0
3	C	178	38	551	171	0	0	127	0	0
4	D	247	38	642	135	0	0	91	0	0
5	E	207	34	818	156	10	0	112	0	0
6	F	247	36	595	135	0	0	91	0	0
7	G	243	46	611	137	0	0	93	0	0
8	I	252	43	647	132	0	0	89	0	0
9	J	166	47	564	177	0	0	133	0	0
10	K	237	47	515	140	0	0	96	0	0
11	L	221	36	563	149	3	0	105	0	0
12	M	209	33	879	155	13	0	111	0	0
13	N	163	41	750	179	0	0	135	0	0
14	0	199	41	750	160	0	0	116	0	0

Table 7. Block : Paddy Breeding Station

Soil : Alfisol
Crop : Rice
Season : Kharif Season : Rabi
Target : 6 t ha^{-1} Target : 5 t ha^{-1}

	Soil test values (kg ha^{-1})				Fertiliser prescription Kg ha^{-1}					
S.No	Block	$KMnO_4$-N	Olsen-P	NH_4OAc-K	N	P_2O_5	K_2O	N	P_2O_5	K.O
1	A	190	30	392	165	24	0	121	0	0
2	B	207	46	650	156	0	0	112	0	0
3	C	201	41	448	159	0	0	115	0	0
4	D	185	48	459	167	0	0	123	0	0
5	E	210	51	683	154	0	0	110	0	0
6	F	194	43	594	163	0	0	119	0	0
7	G	207	38	448	156	0	0	112	0	0
8	I	204	32	482	167	17	0	113	0	0
9	J	198	33	582	160	13	0	117	0	0
10	K	216	53	672	151	0	0	107	0	0
11	L	207	32	470	156	17	0	112	0	0

Table 8. Block : Eastern Block

Soil : Inceptisol
Target: 4 t ha

	Soil test values (kg ha^{-1})			Crop : Sorghum Fertiliser prescription Kg ha^{-1}			Crop : Maize		
Block	$KMnO_4$-N	Olsen-P	NH_4OAc-K	N	P_2O_5	K_2O	N	P_2O_5	K_2O
36	185	6	469	92	64	0	142	75	0
37	175	11	489	100	48	0	145	69	0
62 - 70	190	13	510	88	42	0	140	66	0
71 - 77	202	14	489	78	38	0	135	65	0
NA	184	18	861	93	26	0	142	60	0

A. Fertiliser recommendations

Fertiliser recommendations based on targeted yield approach could be followed for various crops that are grown in different blocks. Blockwise fertiliser prescription were worked out for some important crops and furnished in (Tables-6-10).

For those blocks which are high in available nutrients status, there is reduction in the fertiliser doses to be applied (preferably for P and K). If the fertility status is poor,relatively higher doses are recommended (preferably N) to improve the fertility status and to sustain soil productivity.Similar recommendations could be given for individual fields also.

In the targeted yield approach,fertiliser doses are optimised based on the soil fertility status. Fertiliser saving in the soil of high fertility is achieved. Fertility maintenance is also possible since the recommended doses is a balanced dose, where balance means the balanced ratio of not only the fertiliser nutrients but that of fertiliser and soil available nutrients (Velayutham,1979). Thus,the fertiliser dose rationalised through targeted yield approach would take care of the soil fertility status also and no undue depletion of nutrients would

Table 9. Block : Millet Breeding Station

Soil : Inceptisol
Target: 4 tha

	Soil test values (kg ha^{-1})			Crop : Rice Fertiliser prescription Kg ha^{-1}		Crop : Maize
Block	$KMnO_4$-N	Olsen-P	NH_4OAc-K	N	P_2O_5	K_2O
MBS	169	10	287	105	57	13
New Area						
A	173	8	481	103	58	0
B	169	8	496	105	58	0
C	183	7	617	97	59	0
D	185	7	493	96	59	0

Table 10. Block : Cotton Breeding Station

Soil : Inceptisol
Target: 3 t ha^{-1}

Crop : Cotton (Varieties)

Soil test values (kg ha^{-1})				Fertiliser prescription Kg ha^{-1}		
Block	$KMnO_4$-N	Olsen-P	NH_4OAc-K	N	P_2O_5	K_2O
A	189	24	467	149	19	0
B	196	29	410	146	2	0
C	196	24	545	146	19	0
D	198	24	644	145	19	0
R	160	23	403	161	22	0
2	180	24	428	153	19	0
3	192	26	468	147	12	0
4	198	25	510	145	15	0
5	190	28	492	148	5	0
6	178	26	480	154	12	0

occur on account of crop growth. Addition of organics viz., Farm Yard Manure/Green Manure/ Green leaf manure depending on their availability and biofertilisers will improve the fertility status besides reducing the inorganic fertilisers to be applied. The quantities of inorganic fertilisers that could be reduced due to the addition of organics and biofertilisers are furnished below.

i) If GM is applied at 6.25 t ha^{-1}, 15kgha^{-1}, 38,13 and 33 kg ha^{-1} of N.P_2O_5 and K_2O could be reduced from the recommended dose of fertilisers for rice.

ii) If azospirillum is applied at 2 kg ha^{-1} , 15 kg ha^{-1} of fertilisers N could be reduced from the recommended dose of N.

iii) If phosphobacteria is applied at 2 kg ha^{-1} , 10 kg ha^{-1} of fertiliser P_2O_5 could be reduced from the recommended dose of P_2O_5.

iv) If FYM is applied at 12.5 t ha^{-1}, 40 kg ha^{-1} of N.P_2O_5 and K_2O could be reduced from the recommended dose of fertilisers for short duration crops like cotton, sugarcane and tapioca, 65, 35 and 65 kg/ha^{-1} of N,P_2O_5 and K_2O could be reduced from the recommended dose of fertilisers.

The targeted yield approach (STCR) coupled with integrated plant nutrition system which regulates fertiliser use for increasing the fertiliser use efficiency and maintaining the fertility status could be followed for TNAU Farm soils.

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