

Soil Fertility
&
Soil Test Based Fertilizer Recommendations
For Sunflower and Castor
at
IIOR Research farm - Rajendranagar (Alfisols)
2021

ANNEXURE I

Soil Fertility of Rajendranagar farm – Plot wise (Alfisols) for 2021

Block/ Plot No	pH	E.C (dS/m)	O.C. (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)	Av S (mg/kg)	Ex. Ca (%)	Zn (ppm)	Fe (ppm)	Cu (ppm)	Mn (ppm)	Boron (ppm)
A1	7.5	0.18	0.36	112	19.6	339	4.1	0.28	1	2.4	1.5	4.6	0.09
A2	7.9	0.12	0.37	117	21	216	3.3	0.29	0.64	3.4	1.4	3.4	0.05
A3	8.1	0.08	0.34	147	23	404	3.5	0.25	0.55	3.7	1.6	4.4	0.06
A4	8	0.13	0.4	136	27	457	3.3	0.3	0.81	3.7	1.9	6.7	0.02
A5	8.2	0.15	0.35	164	28	188	6.3	0.17	0.88	4.8	1.7	7.5	0.05
A6	8	0.11	0.29	134	26	298	2.5	0.19	0.89	3.3	1.4	5.3	0.06
A7	8.1	0.2	0.35	151	25	300	3.4	0.36	0.66	1.4	1.3	3.7	0.08
A8	8.3	0.14	0.38	142	26	212	2	0.27	0.67	2.2	1.3	5.6	0.06
A9	8.1	0.15	0.29	130	20	177	2	0.28	0.44	1.7	0.6	3.7	0.05
A10	8	0.12	0.35	147	19	175	1.5	0.38	0.29	3.8	1	3.4	0.03
A11	8.2	0.1	0.35	152	22	202	1.4	0.49	0.34	5.5	1.3	3.2	0.08
B2	8.2	0.12	0.44	157	26	307	2.2	0.22	1.3	3.4	1.8	9.8	0.08
B3	8.1	0.15	0.43	160	30	460	2.2	0.31	0.64	3.7	1.8	9.1	0.11
B5	8.1	0.35	0.38	161	30	205	15	0.21	1.67	2.3	1.6	10.6	0.09
B6	7.9	0.14	0.37	148	27	191	3.3	0.12	1.17	4.2	0.9	6.9	0.09
B7	8	0.11	0.38	169	26	212	7.5	0.22	0.78	3.1	1.4	5.8	0.06
B9	7.8	0.47	0.3	189	23	256	12.2	0.25	0.74	3.3	1.6	7.9	0.02
B10	7.7	0.09	0.41	156	23	181	6.3	0.15	0.64	5.1	1.2	5.4	0.09
B11	8	0.14	0.46	191	20	203	9.3	0.52	0.65	6.6	1.4	3.9	0.06

C1	7.9	0.28	0.36	151	27	200	14.6	0.31	0.72	3.4	1.7	5.3	0.1
C2	8.1	0.18	0.26	154	22	181	13.8	0.23	0.46	3.2	1.5	3.7	0.13
C3	7.9	0.17	0.38	135	18	169	9	0.2	0.49	2.5	1.1	3.9	0.09
C4	8	0.13	0.32	152	16	243	13	0.21	0.39	2.9	1.9	3.5	0.08
D1	8.2	0.18	0.44	181	18	551	4.8	0.33	1.1	3.5	1.7	4.7	0.08
D2	8	0.15	0.28	149	13	212	16.3	0.25	0.56	2.7	1.3	4.1	0.11
D3	8.1	0.14	0.37	109	15	188	9.7	0.17	0.43	2.3	1.1	2.4	0.03
D4	8.2	0.09	0.2	89	27	273	10.1	0.16	1	3.3	1.2	2.9	0.04
E1	8.2	0.11	0.41	180	27	589	5	0.38	0.58	3.6	1.2	4.7	0.06
E2	7.8	0.19	0.34	225	19	481	3.7	0.24	0.97	3.2	2.5	7.2	0.16
E3	7.9	0.19	0.32	180	22	470	5.9	0.22	1	3.5	1.7	9.3	0.06
E4	8.1	0.18	0.36	165	30	158	11.2	0.05	0.87	3.3	1.7	6.7	0.08
E5	8.1	0.16	0.5	175	29	564	10.4	0.29	0.96	3.5	1.7	6.4	0.11
F1	8	0.13	0.44	177	17	555	2	0.37	0.44	2.9	1.8	3.5	0.05
F2	7.6	0.11	0.36	179	18	384	1.2	0.19	1	7.4	0.9	10.5	0.08
F3	7.9	0.14	0.43	175	32	382	6.7	0.19	0.52	3.1	1.6	4.6	0.1
F4	8	0.2	0.4	189	23	348	13	0.21	0.56	3.6	1.6	5.1	0.05
F7	8.1	0.36	0.46	169	24	548	15.6	0.57	0.82	4.2	2.2	8.9	0.12
F8	8.1	0.38	0.43	189	27	568	14.9	0.68	0.57	4.4	2.6	9.5	0.03
F9	8.2	0.17	0.48	181	6	519	5.9	0.11	1.3	7.3	1.4	10.6	0.13
G1	8.1	0.1	0.44	150	30	470	11.9	0.2	0.76	4.8	1.7	5.8	0.16
G2	8	0.09	0.44	200	33	389	13.1	0.22	0.73	5.6	1.7	7.7	0.05
G3	7.9	0.11	0.36	179	27	455	11.9	0.25	0.68	4.4	1.8	4.5	0.05
G4	7.9	0.18	0.53	203	20	499	15.2	0.31	0.92	2.6	1.8	10.4	0.05
G5	8	0.2	0.46	203	27	480	14.6	0.52	0.97	3.3	2.2	10.5	0.02
H1	8.1	0.16	0.51	175	14	508	3.3	0.61	0.33	3.3	1.8	8.6	0.03

K1	7.9	0.07	0.37	130	24	186	2	0.1	0.65	3.6	1.2	7.4	0.03
L1	8.1	0.14	0.41	193	15	515	10.4	0.57	0.72	2.7	1.1	6.8	0.05
M1	8.2	0.46	0.5	182	19	175	18.6	0.86	0.4	3.5	1.9	4	0.08
M2	8.1	0.33	0.54	177	22	482	18.2	0.58	0.51	4.6	2.4	4.4	0.1
N1	8.2	0.19	0.36	167	19	508	9.7	0.39	0.55	2.9	2	3.3	0.03
N2	8.1	0.16	0.45	168	17	219	11.9	0.44	0.74	4.6	2	3.8	0.09
N3	8	0.13	0.52	154	7	158	3.7	0.29	0.45	3	1	2.2	0.06
N4	7.9	0.18	0.38	114	9	206	4.8	0.62	0.39	3.6	1.4	3.1	0.06
N5	7.7	0.2	0.28	162	10	362	4.8	0.49	0.6	3.9	1	3.4	0.06
N6	8.1	0.24	0.3	189	13	522	8.6	0.55	0.64	3.9	1.9	6.6	0.09

Fertility rating values for OC, N, P, K is indicated 3 colours: Red= Low; Blue= medium; Green= high
Fertility rating Values for S, Ca & Micronutrients is indicated with 2 colours: Red= deficient; Green= sufficient

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ANNEXURE II

Soil test based fertilizer recommendations for Sunflower and Castor crops for Rajendranagar farm soils (Alfisols) for 2021

STCR Equation for <u>Sunflower</u> Alfisols - Target 15q/ha	STCR Equation for <u>Castor</u> Alfisols - Target 20q/ha
$F N = 11.44 \times T - 0.41 \times \text{Soil N}$	$F N = 8.35 \times T - 0.40 \text{ SN}$
$F P_2O_5 = 7.49 \times T - 2.10 \times \text{Soil P}$	$F P_2O_5 = 7.17 \times T - 2.88 \text{ SP}$
$F K_2O = 3.80 \times T - 0.10 \times \text{Soil K}$	$F K_2O = 3.02 T - 0.10 \text{ SK}$
Where, FN = Fertilizer N required/ha; T = Target yield in q/ha; Soil N = Value of Soil N kg/ha F P2O5 = Fertilizer P required/ha; T = Target yield in q/ha; Soil P = Value of soil P kg/ha F K2O = Fertilizer K required/ha; T = Target yield in q/ha; Soil K = Value of soil K kg/ha	

Plot-wise fertilizer requirement as per the STCR recommendation for the target yield

Block/ Plot No	Sunflower (15q/ha target)			Castor (20q/ha target)		
	Soil test target yield based recommended N:P2O5:K2O kg/ha			Soil test target yield based recommended N:P2O5:K2O kg/ha		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
A1	126	71	23	122	87	27
A2	124	68	35	120	83	39
A3	111	64	17	108	77	20
A4	116	56	11	113	66	15
A5	104	54	38	101	63	42
A6	117	58	27	113	69	31
A7	110	60	27	107	71	30
A8	113	58	36	110	69	39
A9	118	70	39	115	86	43
A10	111	72	40	108	89	43
A11	109	66	37	106	80	40
B2	107	58	26	104	69	30
B3	106	49	11	103	57	14
B5	106	49	37	103	57	40
B6	111	56	38	108	66	41
B7	102	58	36	99	69	39
B9	94	64	31	91	77	35
B10	108	64	39	105	77	42
B11	93	70	37	91	86	40
C1	110	56	37	107	66	40
C2	108	66	39	105	80	42
C3	116	75	40	113	92	44
C4	109	79	33	106	97	36
D1	97	75	2	95	92	5
D2	111	85	36	107	106	39
D3	127	81	38	123	100	42

D4	135	56	30	131	66	33
E1	98	56	-2	95	66	1
E2	79	72	9	77	89	12
E3	98	66	10	95	80	13
E4	104	49	41	101	57	45
E5	100	51	1	97	60	4
F1	99	77	2	96	94	5
F2	98	75	19	95	92	22
F3	100	45	19	97	51	22
F4	94	64	22	91	77	26
F7	102	62	2	99	74	6
F8	94	56	0	91	66	4
F9	97	100	5	95	126	8
G1	110	49	10	107	57	13
G2	90	43	18	87	48	22
G3	98	56	12	95	66	15
G4	88	70	7	86	86	11
G5	88	56	9	86	66	12
H1	100	83	6	97	103	10
K1	118	62	38	115	74	42
L1	92	81	6	90	100	9
M1	97	72	40	94	89	43
M2	99	66	9	96	80	12
N1	103	72	6	100	89	10
N2	103	77	35	100	94	39
N3	108	98	41	105	123	45
N4	125	93	36	121	117	40
N5	105	91	21	102	115	24
N6	94	85	5	91	106	8

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ANNEXURE III

Soil test based fertilizer recommendations (*Modified*) for Sunflower and Castor crops in Rajendranagar farm (Alfisols) for 2021

Block/ Plot No	Sunflower (15q/ha target)			Castor (20q/ha target)		
	Soil test target yield based recommended N:P2O5:K2O kg/ha			Soil test target yield based recommended N:P2O5:K2O kg/ha		
	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
A1	126	71	23	122	87	27
A2	124	68	35	120	83	39
A3	111	64	20	108	77	20
A4	116	56	20	113	66	20
A5	104	54	38	101	63	42
A6	117	58	27	113	69	31
A7	110	60	27	107	71	30
A8	113	58	36	110	69	39
A9	118	70	39	115	86	43
A10	111	72	40	108	89	43
A11	109	66	37	106	80	40
B2	107	58	26	104	69	30
B3	106	49	20	103	57	20
B5	106	49	37	103	57	40
B6	111	56	38	108	66	41
B7	102	58	36	99	69	39
B9	94	64	31	91	77	35
B10	108	64	39	105	77	42
B11	93	70	37	91	86	40
C1	110	56	37	107	66	40
C2	108	66	39	105	80	42
C3	116	75	40	113	92	44
C4	109	79	33	106	97	36
D1	97	75	20	95	92	20
D2	111	85	36	107	106	39
D3	127	81	38	123	100	42
D4	135	56	30	131	66	33
E1	98	56	20	95	66	20
E2	79	72	20	77	89	20
E3	98	66	20	95	80	20
E4	104	49	41	101	57	45
E5	100	51	20	97	60	20
F1	99	77	20	96	94	20
F2	98	75	20	95	92	22
F3	100	45	20	97	51	22
F4	94	64	22	91	77	26
F7	102	62	20	99	74	20
F8	94	56	20	91	66	20
F9	97	100	20	95	126	20
G1	110	49	20	107	57	20
G2	90	43	20	87	48	22

G3	98	56	20	95	66	20
G4	88	70	20	86	86	20
G5	88	56	20	86	66	20
H1	100	83	20	97	103	20
K1	118	62	38	115	74	42
L1	92	81	20	90	100	20
M1	97	72	40	94	89	43
M2	99	66	20	96	80	20
N1	103	72	20	100	89	20
N2	103	77	35	100	94	39
N3	108	98	41	105	123	45
N4	125	93	36	121	117	40
N5	105	91	20	102	115	24
N6	94	85	20	91	106	20

STCR Equation for <u>Sunflower</u> Alfisols - Target 15q/ha	STCR Equation for <u>Castor</u> Alfisols - Target 20q/ha
$F N = 11.44 \times T - 0.41 \times S N$	$F N = 8.35 \times T - 0.40 \times S N$
$F P_2O_5 = 7.49 \times T - 2.10 \times S P$	$F P_2O_5 = 7.17 \times T - 2.88 \times S P$
$F K_2O = 3.80 \times T - 0.10 \times S K$	$F K_2O = 3.02 T - 0.10 \times S K$
Where, FN = Fertilizer N required/ha; T = Target yield in q/ha; Soil N = Value of Soil N kg/ha F P2O5 = Fertilizer P required/ha; T = Target yield in q/ha; Soil P = Value of soil P kg/ha F K2O = Fertilizer K required/ha; T = Target yield in q/ha; Soil K = Value of soil K kg/ha	

NOTE

- The soil test values of Rajendranagar farm show a high status of available P and some for K (Annexure I).
- A uniform dose PSB @ 1 kg /ac is suggested to be used as furrow or spot application along with seed at sowing. PSB can also be used as seed dressing.
- For initial soil K with high values, a uniform maintainer dose of 20kg K₂O/ha is suggested (bold) rest plots require more K to meet yield target.
- Though Sulphur status is not currently estimated, based on earlier reports of wide spread S deficiency in the region, it is desirable to apply S @ 30kg/ha for increasing yield and oil content. Elemental S (GROMOR 90% S) is available in the farm section.
- Along with soil test based balanced nutrient management, clean cultivation, split application of N, applying N in moist soil and covering with soil, spot application of P are better practices for achieving higher nutrient use efficiency.
- **Since soils are deficient in boron, soil based or foliar application may be followed for B loving crops**