

Supplementary Table 1 Fertilizer treatments and treatment abbreviation used for the validation trial of maize crop (2019–2021)

Treatment	Fertilizer rate (kg/ha)			Quantity of organics added (t/ha)		Target yield (t/ha)
	N	P ₂ O ₅	K ₂ O	FYM	<i>Sesbania</i>	
T ₁ , Control (no fertilizers)	-	-	-	-	-	-
T ₂ , RDF (N-150, P ₂ O ₅ -60, K ₂ O-40 kg/ha)	150	60	40	-	-	-
T ₃ , STCR (inorganic mode)	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	-	5.5
T ₄ , STCR Integrated nutrient management (INM) mode	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			10	-	5.5
T ₅ , 75% STCR dose of N (inorganic mode) + full P and K + Green manure	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	4.77	5.5
T ₆ , 50% STCR dose of N (inorganic mode) + full P and K + Green manure	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	4.44	5.5
T ₇ , 75% RDN + full P and K + Green manure	113	60	40	-	4.59	-
T ₈ , 50% RDN + full P and K + Green manure	75	60	40	-	4.37	-
T ₉ , FYM + Green manure + Urd intercropping	-	-	-	10	4.34	-

RDF, Recommended dose of fertilizer; STCR, Soil test crop response; RDN, Recommended dose of nitrogen.

Supplementary Table 2 Fertilizer treatments and treatment abbreviation used for the validation trial of wheat crop (2019–2021)

Treatment	Fertilizer rate (kg/ha)			Quantity of organics added (t/ha)	Target yield (t/ha)
	N	P ₂ O ₅	K ₂ O	FYM	
T ₁ , Control (no fertilizers)	-	-	-	-	-
T ₂ , RDF (N-150, P ₂ O ₅ -60, K ₂ O-40 kg/ha)	150	60	40	-	-
T ₃ , STCR (inorganic mode) (TY: 50 q/ha)	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	5.0
T ₄ , STCR INM mode (TY: 50 q/ha)	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			10	5.0
T ₅ , 75% STCR dose of N (inorganic mode) + full P and K	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	5.0
T ₆ , 50% STCR dose of N (inorganic mode) + full P and K	Fertilizer rate of N, P ₂ O ₅ and K ₂ O was calculated using the STCR fertilizer equations.			-	5.0
T ₇ , 75% RDN + full P and K	113	60	40	-	-
T ₈ , 50% RDN + full P and K	75	60	40	-	-
T ₉ , FYM	-	-	-	10	-

RDF, Recommended dose of fertilizer; STCR, Soil test crop response; RDN, Recommended dose of nitrogen.



Supplementary Table 3 Nutrient content in organics added

Name of organic material added	2019–20			2020–21		
	N (%)	P (%)	K (%)	N (%)	P (%)	K (%)
Sesbania	2.59	0.15	1.67	2.73	0.15	1.71
FYM	0.49	0.21	0.54	0.53	0.19	0.46

Supplementary Table 4 Quantity of organics added

Treatment	2019–20		2020–21	
	<i>Sesbania</i>	FYM	<i>Sesbania</i>	FYM
T ₄	--	10	--	10
T ₅	4.57	--	4.96	--
T ₆	4.42	--	4.46	--
T ₇	4.54	--	4.64	--
T ₈	4.66	--	4.08	--
T ₉	4.22	10	4.46	10

Treatment details are given under Materials and Methods.

Supplementary Table 5 Soil test-based fertilizer adjustment equations for targeted yield of maize.

Fertilizer dose (kg/ha)	Equation without FYM	Equation with FYM
Nitrogen	$F N = 3.6 T - 0.565 SN$	$F N = 3.36 T - 0.535 SN - 0.72 FYM$
Phosphorus	$F P_2O_5 = 0.71 T - 0.975 SP$	$F P_2O_5 = 0.70 T - 0.965 SP - 0.52 FYM$
Potassium	$F K_2O = 0.64 T - 0.065 SK$	$F K_2O = 0.63 T - 0.065 SK - 0.11 FYM$

F N, F P₂O₅ and F K₂O are fertilizer N, P₂O₅ and K₂O (kg/ha) respectively. T is the yield targeted (q/ha); SN, SP and SK are soil available N, P and K (kg/ha), respectively.

Supplementary Table 6 Soil test-based fertilizer adjustment equations for targeted yield of wheat.

Fertilizer dose (kg/ha)	Equation without FYM	Equation with FYM
Nitrogen	$F N = 7.96 T - 0.965 SN$	$F N = 7.96 T - 0.965 SN - 1.04 FYM$
Phosphorus	$F P_2O_5 = 1.25 T - 0.805 SP$	$F P_2O_5 = 1.25 T - 0.805 SP - 0.39 FYM$
Potassium	$F K_2O = 1.99 T - 0.44 SK$	$F K_2O = 1.99 T - 0.44 SK - 0.53 FYM$

F N, F P₂O₅ and F K₂O are fertilizer N, P₂O₅ and K₂O (kg/ha), respectively. T is the yield targeted (q/ha); SN, SP and SK are soil available N, P and K (kg/ha), respectively.



Supplementary Table 7 Nutrient content in grain of maize and wheat crop

Treatment	Maize						Wheat					
	<i>Kharif 2019</i>			<i>Kharif 2020</i>			<i>Rabi 2019–20</i>			<i>Rabi 2020–21</i>		
	%N	%P	%K	%N	%P	%K	%N	%P	%K	%N	%P	%K
T ₁	1.07	0.29	0.31	1.17	0.32	0.38	1.14	0.28	0.30	1.12	0.29	0.28
T ₂	1.40	0.39	0.46	1.52	0.47	0.51	1.26	0.31	0.53	1.27	0.33	0.60
T ₃	1.28	0.27	0.35	1.35	0.35	0.40	1.28	0.38	0.58	1.30	0.39	0.63
T ₄	1.26	0.34	0.43	1.38	0.43	0.48	1.33	0.42	0.52	1.35	0.43	0.53
T ₅	1.47	0.29	0.29	1.54	0.36	0.34	1.59	0.36	0.58	1.63	0.37	0.61
T ₆	1.54	0.33	0.40	1.61	0.40	0.48	1.42	0.39	0.57	1.44	0.41	0.57
T ₇	1.89	0.43	0.45	1.94	0.48	0.56	1.40	0.34	0.60	1.41	0.36	0.64
T ₈	1.77	0.42	0.46	1.77	0.46	0.51	1.35	0.33	0.58	1.32	0.35	0.59
T ₉	1.45	0.32	0.42	1.49	0.34	0.48	1.26	0.33	0.52	1.29	0.34	0.52
SEm±	0.064	0.024	0.019	0.102	0.042	0.039	0.043	0.027	0.036	0.072	0.017	0.023
CD (<i>P</i> =0.05)	0.194	0.072	0.057	0.308	NS	0.117	0.131	0.081	0.108	0.217	0.053	0.068

Treatment details are given under Materials and Methods.

Supplementary Table 8 Nutrient content in straw/stover of maize and wheat crop

Treatment	Maize						Wheat					
	<i>Kharif 2019</i>			<i>Kharif 2020</i>			<i>Rabi 2019–20</i>			<i>Rabi 2020–21</i>		
	%N	%P	%K	%N	%P	%K	%N	%P	%K	%N	%P	%K
T ₁	0.33	0.21	0.76	0.37	0.27	0.81	0.47	0.16	0.96	0.44	0.17	0.98
T ₂	0.54	0.27	1.25	0.56	0.34	1.34	0.63	0.21	1.14	0.62	0.23	1.12
T ₃	0.49	0.25	0.75	0.58	0.38	0.86	0.68	0.22	1.21	0.69	0.23	1.25
T ₄	0.47	0.32	1.13	0.49	0.38	1.19	0.72	0.27	1.12	0.75	0.28	1.23
T ₅	0.75	0.25	0.82	0.79	0.29	0.86	0.70	0.23	1.25	0.72	0.24	1.29
T ₆	0.70	0.24	0.97	0.77	0.32	1.05	0.77	0.23	1.24	0.79	0.23	1.28
T ₇	0.84	0.28	1.31	0.86	0.33	1.37	0.72	0.21	1.28	0.74	0.22	1.32
T ₈	0.82	0.31	1.19	0.84	0.35	1.23	0.65	0.20	1.13	0.68	0.21	1.14
T ₉	0.65	0.25	1.23	0.68	0.30	1.22	0.58	0.19	1.07	0.61	0.21	1.04
SEm±	0.036	0.017	0.024	0.044	0.026	0.045	0.040	0.009	0.037	0.029	0.014	0.032
CD (<i>P</i> =0.05)	0.11	0.053	0.072	0.134	NS	0.137	0.122	0.028	0.112	0.089	0.043	0.097

Treatment details are given under Materials and Methods.

