Supplementary Information

Table S1. Summary of the RM-ANOVAs for the soil properties for the various amendments.

Index	Variables	*df*	*MS*	*F*	*P*
	Treatments	7	16.00	4.25	**<0.01**
Soil temperature	Time	10	8957.97	1339.30	**<0.01**
	Treatments×Time	70	139.44	2.98	**<0.01**
	Treatments	7	0.42	1.01	0.46
Soil salinity	Time	10	0.83	11.97	**<0.01**
	Treatments×Time	70	0.62	1.27	0.11
	Treatments	7	7882.77	2.03	0.11
Soil water content	Time	10	9427.20	23.19	**<0.01**
	Treatments×Time	70	6565.69	2.31	**<0.01**
	Treatments	7	31.42	110.28	**<0.01**
Soil pH	Time	10	22.77	80.85	**<0.01**
	Treatments×Time	70	80.60	40.88	**<0.01**
	Treatments	7	53.10	4.70	**<0.01**
Soil total Fe	Time	10	4588.56	262.65	**<0.01**
	Treatments×Time	70	1047.66	8.57	**<0.01**
	Treatments	7	2.87	4.99	**<0.01**
Soil Fe^{2+}	Time	10	83.82	129.24	**<0.01**
	Treatments×Time	70	33.44	7.37	**<0.01**
	Treatments	7	48.77	4.27	**<0.01**
Soil Fe^{3+}	Time	10	4344.16	247.48	**<0.01**
	Treatments×Time	70	802.17	6.53	**<0.01**

Table S2. Correlation among different soil physicochemical parameters (n=264).

Index	Soil temperature	Soil water content	Soil pH	Soil salinity
Soil total Fe	-0.765**	0.073	0.199**	-0.293**
Soil Fe^{2+}	-0.097	0.230**	0.140*	0.020
Soil Fe^{3+}	-0.781**	0.041	0.186**	-0.307**

*. Correlation is significant at the 0.05 level, **. Correlation is significant at the 0.01 level.

Table S3. Correlations of CO_2, CH_4 and N_2O gas emission with the different studied variables within control and different treatments.

					CO_2				
correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
CH_4	0.304	0.423*	0.155	0.381*	-0.063	0.130	-0.091	-0.059	0.045
N_2O	0.387*	0.045	0.322	0.130	0.297	0.420*	0.284	0.100	0.354*
temperature	0.617**	0.621**	0.778**	0.671**	0.728**	0.712**	0.789**	0.640**	0.646**
Salinity	0.364*	0.202	0.186	0.425*	0.219	0.185	-0.139	0.417*	0.387*
Water content	-0.414*	0.133	-0.540**	-0.215	-0.230	-0.166	-0.341	-0.340	-0.535**
pH	0.116	0.495**	-0.292	-0.229	-0.522**	-0.708**	-0.578**	-0.673**	-0.085
Total Fe	-0.536**	-0.413*	-0.737**	-0.502**	-0.513**	-0.670**	-0.731**	-0.661**	-0.545**
Fe^{2+}	-0.179	-0.115	-0.311	-0.299	-0.345*	-0.301	-0.285	-0.360*	-0.632**
Fe^{3+}	-0.531**	-0.427**	-0.743**	-0.494**	-0.499**	-0.678**	-0.748**	-0.654**	-0.546**

					CH_4				
correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
N_2O	0.086	-0.247	-0.087	-0.058	-0.131	0.177	-0.079	-0.531**	-0.035
temperature	0.110	0.273	0.226	0.387*	-0.301	0.270	0.046	-0.310	0.061
Salinity	-0.156	0.191	0.536**	0.119	-0.233	0.200	-0.075	-0.375*	0.509**
Water content	-0.087	0.188	-0.024	-0.397*	-0.176	0.022	0.144	-0.400*	0.021
pH	0.260	0.486**	0.037	-0.190	0.151	-0.310	0.114	0.143	0.015
Total Fe	-0.127	-0.223	-0.291	0.034	0.344	-0.342	-0.065	0.295	-0.075
Fe^{2+}	-0.011	-0.049	-0.092	0.058	0.137	-0.241	-0.155	0.010	-0.042
Fe^{3+}	-0.138	-0.248	-0.294	0.034	0.332	-0.337	-0.020	0.311	-0.073

					N_2O				
correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
temperature	0.442*	0.322	0.332	0.318	0.347*	0.604**	0.291	0.291	0.632**
Salinity	0.287	0.121	-0.112	0.072	-0.028	0.690**	0.175	0.014	0.050
Water content	-0.060	-0.353*	0.178	0.141	0.135	0.147	0.097	0.368*	0.116
pH	-0.439*	-0.115	-0.142	-0.013	-0.415**	-0.447**	-0.625**	-0.153	-0.597**
Total Fe	-0.346*	-0.486**	-0.383*	-0.364*	-0.358*	-0.433*	-0.321	-0.339	-0.650**
Fe^{2+}	-0.156	-0.359*	-0.127	-0.114	-0.189	-0.114	-0.117	-0.136	-0.085
Fe^{3+}	-0.332	-0.426*	-0.377*	-0.372*	-0.343	-0.444**	-0.323	-0.338	-0.445**

Total Fe

correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
temperature	-0.668**	-0.777**	-0.823*	-0.651**	-0.814**	-0.814**	-0.824**	-0.778**	-0.763**
Salinity	-0.427*	-0.267	-0.390*	-0.495**	-0.193	-0.369*	0.076	-0.523**	-0.596**
Water content	0.054	0.122	-0.217	-0.099	0.001	-0.121	0.434**	0.141	0.077
pH	0.034	-0.179	0.418*	0.172	0.287	0.882**	0.454**	0.408*	0.694**
Fe^{2+}	-0.257	-0.168	0.456**	0.607**	-0.157	0.567**	0.532**	0.395*	0.585**
Fe^{3+}	0.996**	0.994**	0.992**	0.986**	0.997**	0.985**	0.984**	0.992**	0.989**

Fe^{2+}

correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
temperature	-0.106	-0.088	-0.141	-0.170	-0.120	-0.144	-0.134	0.110	-0.091
Salinity	0.016	-0.051	-0.132	-0.191	0.047	0.020	0.087	-0.111	-0.055
Water content	0.446**	0.251	0.263	0.143	0.438*	0.169	0.294	0.407*	0.694**
pH	0.153	-0.063	-0.439*	0.159	0.190	0.405*	0.320	0.225	0.021
Fe^{3+}	-0.304	-0.229	0.353*	0.472**	-0.201	0.422*	0.385*	0.288	0.465**

Fe^{3+}

correlated with	Control (n=33)	HF (n=33)	SF (n=33)	DF (n=33)	Straw (n=33)	S+HF (n=33)	S+SF (n=33)	S+DF (n=33)	Total (n=264)
temperature	-0.649**	-0.761**	-0.842**	-0.682**	-0.809**	-0.858**	-0.873**	-0.816**	-0.780**
Salinity	-0.413*	-0.274	-0.398*	-0.515**	-0.210	-0.416*	0.085	-0.543**	-0.610**
Water content	0.015	0.084	0.201	-0.151	-0.027	-0.161	0.419*	0.098	0.044
pH	-0.006	-0.213	0.483**	0.177	0.291	0.886**	0.433*	0.417*	0.383*

*. Correlation is significant at the 0.05 level, **. Correlation is significant at the 0.01 level.

Table S4. Main effects of the variables in the GDA analysis. Statistics (Wilks' λ and P) of the discriminant functional analysis among treatments with soil salinity, pH, water content, total Fe concentration, Fe^{2+} concentration and Fe^{3+} concentration, soil temperature and CO_2, CH_4 and N_2O emissions as continuous independent variables and time of sampling (month) as categorical independent controlling variable. Significant effects of a variable in the model are highlighted in bold type ($P<0.05$).

Variables	Wilk's Lambda	F	P
CH_4 emissions	0.922	2.84	0.0074
CO_2 emissions	0.928	2.62	0.013
N_2O emissions	0.869	5.06	<0.0001
Temperature	0.928	2.60	0.013
Soil salinity	0.964	1.25	0.27
Soil water content	0.839	6.47	<0.0001
Plant height	0.828	7.00	<0.0001
Soil pH	0.751	11.2	<0.0001
Total Fe	0.926	2.71	0.010
Fe^{2+}	0.918	3.02	0.0047
Fe^{3+}	0.922	2.87	0.0068
Month	0.623	1.67	0.00057

Table S5. Test statistics for squared Mahalanobis distances among treatments and control with soil salinity, pH, water content, total Fe concentration, Fe^{2+} concentration and Fe^{3+} concentration, soil temperature and CO_2, CH_4 and N_2O emissions as continuous independent variables and time of sampling (month) as categorical independent controlling variable.

	Half Fertilization	Standard fertilization	Double fertilization	Straw	Straw + Half fertilization	Straw + Standard fertilization	Straw + Double fertilization
Control	M=1.34 F=0.97 P=0.50	M=4.30 F=3.68 P<0.0001	M=5.55 F=4.03 P<0.0001	M=1.72 F=1.25 P=0.21	M=2.73 F=1.98 P=0.0078	M=6.68 F=4.84 P<0.0001	M=4.77 F=3.46 P<0.0001
Half Fertilization		M=5.18 F=3.75 P<0.0001	M=6.98 F=5.05 P<0.0001	M=1.86 F=1.35 P=0.15	M=4.24 F=3.07 P<0.0001	M=6.08 F=4.41 P<0.0001	M=5.87 F=4.25 P<0.0001
Standard fertilization			M=2.38 F=1.72 P=0.028	M=2.31 F=1.67 P=0.036	M=2.93 F=2.12 P=0.0037	M=4.03 F=2.92 P<0.0001	M=3.32 F=2.40 P=0.0008
Double fertilization				M=4.60 F=3.33 P<0.0001	M=1.50 F=1.08 P=0.37	M=4.47 F=3.24 P<0.0001	M=1.32 F=0.95 P=0.52
Straw					M=2.931 F=2.12 P=0.0037	M=3.08 F=2.23 P=0.0020	M=4.11 F=2.98 P<0.0001
Straw + Half fertilization						M=5.72 F=4.14 P<0.0001	M=2.56 F=1.86 P=0.015
Straw + Standard fertilization							M=3.80 F=2.75

| | | P=0.00011 |
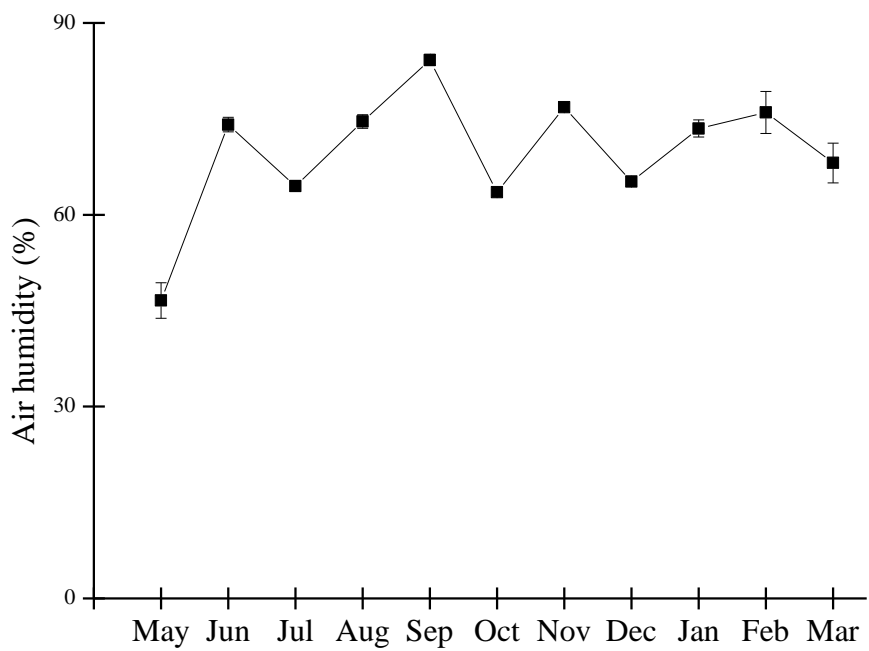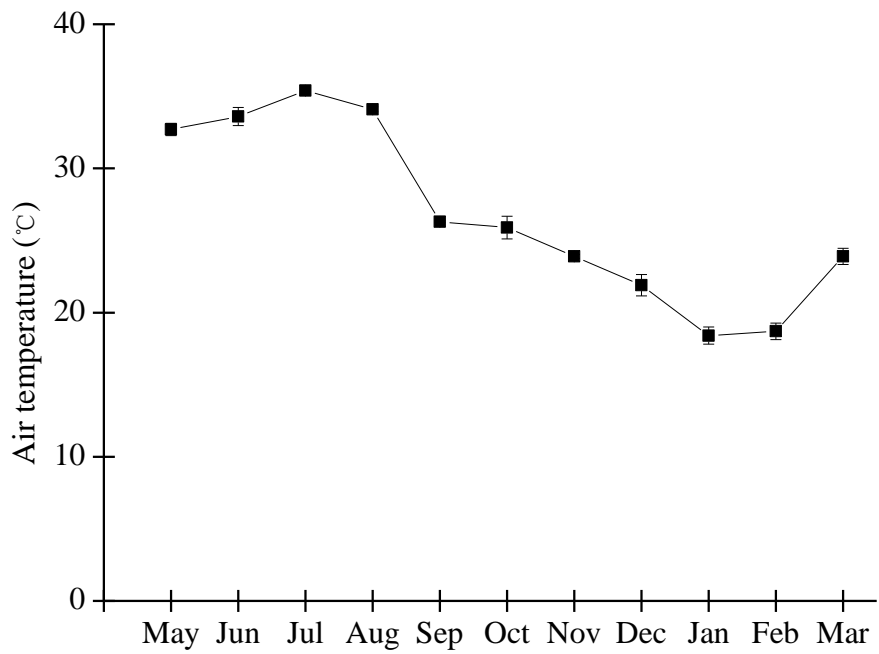
Figure S1. Temporal variation of air temperature and air humidity in the study area.

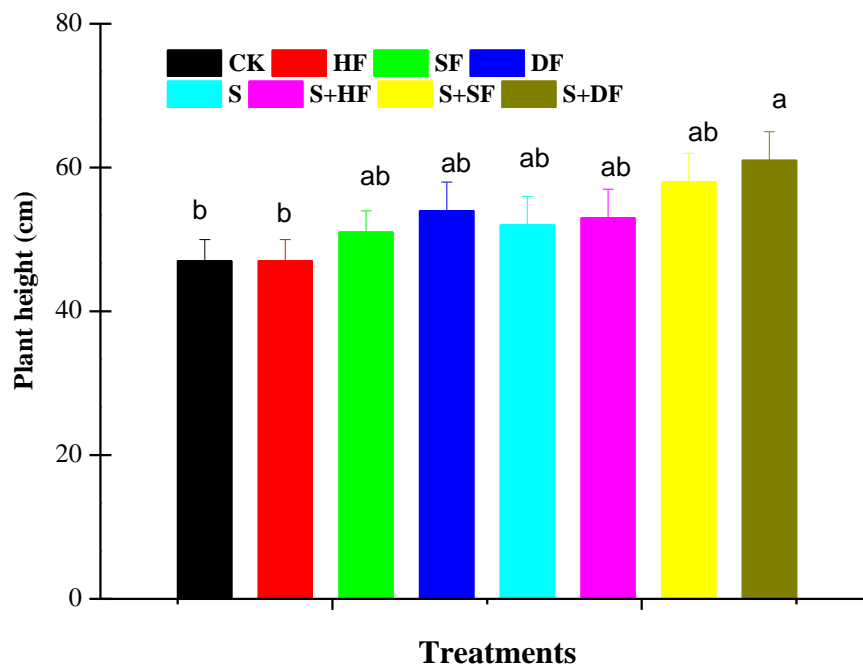Figure S2.   Final plant height (Mean ± S.E., average at the end of the studied period) in CK, HF, SF, DF, S, S+HF, S+SF and S+DF treatments. Bar above the lines represents standard errors. CK: control, HF: half fertilizer, SF: standard fertilizer, DF: double fertilizer, S: straw, S+HF: straw + half fertilizer, S+SF: straw + standard fertilizer, S+DF: straw + double fertilizer. Different letters indicate significant differences among treatments.