

Supplementary Materials

Table S1. Field locations, initial soil and irrigation water quality status of selected sites (FPT-I).

Range		Village	Latitude	Longitude	Soil pH	RSC _{iw} (me L ⁻¹)
Soil pH	RSC _{iw} (me L ⁻¹)					
2016–2017						
<8.25	<2.5	Mundri	29°46.220' N	76°30.056' E	7.84	2.1
		Mundri	29°46.456' N	76°31.127' E	7.92	1.7
		Sampli Kheri	29°47.013' N	76°29.008' E	8.09	2.5
8.25–8.50	2.5–3.5	Geong	29°48.002' N	76°27.907' E	8.32	3.4
		Kathwar	29°48.833' N	76°29.247' E	8.33	3.2
		Geong	29°48.850' N	76°27.853' E	8.39	3.2
8.50–8.75	3.5–4.5	Geong	29°48.250' N	76°27.887' E	8.57	3.6
		Bhaini Majra	29°47.014' N	76°26.009' E	8.61	4.4
		Bhaini Majra	29°47.008' N	76°27.012' E	8.68	4.2
8.75–9.00	4.5–5.5	Sampli Kheri	29°47.009' N	76°29.007' E	8.78	5.4
		Mundri	29°46.923' N	76°29.015' E	8.81	4.7
		Sampli Kheri	29°47.246' N	76°29.124' E	8.81	5.1
9.00–9.25	5.5–6.5	Kathwar	29°48.792' N	76°30.579' E	9.06	5.5
		Mundri	29°47.181' N	76°31.040' E	9.10	6.4
		Sampli Kheri	29°47.650' N	76°29.007' E	9.10	5.9
>9.25	>6.5	Sampli Kheri	29°47.006' N	76°28.014' E	9.28	6.6
		Sampli Kheri	29°47.347' N	76°29.570' E	9.31	7.5
		Bhaini Majra	29°48.098' N	76°27.002' E	9.24	6.6
2017–2018						
<8.25	<2.5	Bhaini Majra	29°48.142' N	76°26.655' E	8.17	2.6
		Mundri	29°46.024' N	76°29.678' E	8.20	2.8
		Kathwar	29°48.009' N	76°29.008' E	8.21	2.4
8.25–8.50	2.5–3.5	Kathwar	29°50.303' N	76°29.795' E	8.40	3.4
		Bhaini Majra	29°48.412' N	76°26.849' E	8.41	2.9
		Mundri	29°48.082' N	76°29.971' E	8.42	3.4
8.50–8.75	3.5–4.5	Kathwar	29°48.014' N	76°29.013' E	8.71	4.5
		Sampli Kheri	29°47.014' N	76°29.005' E	8.72	4.1
		Bhaini Majra	29°47.013' N	76°26.009' E	8.72	3.8
8.75–9.00	4.5–5.5	Mundri	29°46.971' N	76°29.016' E	8.91	4.6
		Bhaini Majra	29°48.001' N	76°26.002' E	8.91	5.5
		Kathwar	29°49.550' N	76°29.879' E	8.94	5.0
9.00–9.25	5.5–6.5	Bhaini Majra	29°48.004' N	76°26.007' E	9.12	5.9
		Geong	29°48.458' N	76°27.329' E	9.16	5.5
		Geong	29°48.846' N	76°27.568' E	9.17	6.2
>9.25	>6.5	Sampli Kheri	29°47.006' N	76°28.014' E	9.28	6.6
		Sampli Kheri	29°47.347' N	76°29.570' E	9.31	6.5
		Bhaini Majra	29°48.098' N	76°27.002' E	9.24	6.6
2018–2019						
<8.25	<2.5	Bhaini Majra	29°48.000' N	76°26.003' E	8.21	2.1
		Kathwar	29°49.615' N	76°29.378' E	8.22	2.7
		Geong	29°49.504' N	76°28.303' E	8.23	1.8
8.25–8.50	2.5–3.5	Geong	29°49.579' N	76°27.442' E	8.46	2.9
		Mundri	29°46.961' N	76°29.767' E	8.48	3.2

8.50–8.75	3.5–4.5	Bhaini Majra	29°48.001' N	76°29.002' E	8.49	3.4
		Mundri	29°46.579' N	76°30.186' E	8.73	4.3
		Geong	29°48.416' N	76°27.956' E	8.64	4.2
		Kathwar	29°49.753' N	76°30.307' E	8.74	4.4
8.75–9.00	4.5–5.5	Geong	29°49.487' N	76°27.680' E	8.96	5.4
		Geong	29°48.458' N	76°28.040' E	8.99	5.4
		Sampli Kheri	29°47.288' N	76°29.020' E	8.99	5.3
9.00–9.25	5.5–6.5	Sampli Kheri	29°47.006' N	76°29.001' E	9.18	6.2
		Bhaini Majra	29°47.960' N	76°26.586' E	9.19	5.6
		Sampli Kheri	29°48.000' N	76°29.002' E	9.20	5.8
>9.25	>6.5	Bhaini Majra	29°49.013' N	76°26.009' E	9.36	6.8
		Bhaini Majra	29°48.002' N	76°27.006' E	9.39	7.1
		Bhaini Majra	29°47.014' N	76°26.010' E	9.52	6.8

Table S2. Farmers' perception towards wheat management practices in sodicity affected areas.

% Response, N = 308 Farmers			
Sowing Time		Sowing Technique	
Last week of October	14.0%	Direct seeding with Happy Seeder	3.9%
First week of November	46.1%	Direct seeding with Zero drill machine	78.9%
Second week of November	36.1%	Broadcasting fb rotavator	17.2%
Third week of November	3.8%		
Seed Rate		Row Spacing	
100 kg ha ⁻¹	10.7%	18–22.5 cm	5.8%
100–112.5 kg ha ⁻¹	47.1%	22.5–25 cm	76.9%
112.5–125 kg ha ⁻¹	42.2%	Broadcasting	17.2%
Nitrogen Application (Urea, 46% N)		Phosphorus Application (Di-ammonium Phosphate, 18% N and 46% P ₂ O ₅)	
125–150 kg ha ⁻¹	10.7%	No P application	4.5%
150–175 kg ha ⁻¹	70.7%	30–40 kg P ₂ O ₅ ha ⁻¹	13.6%
175–200 kg ha ⁻¹	15.9%	40–50 kg P ₂ O ₅ ha ⁻¹	81.8%
>200 kg ha ⁻¹	2.6%		
Potassium Application (Muriate of Potash, 60% K ₂ O)			
No K application	31.8%		
30–40 kg K ₂ O ha ⁻¹	58.8%		
40–50 kg K ₂ O ha ⁻¹	9.4%		

Table S3. Pearson correlation (*r*) between important physiological and yield-related traits of wheat grown on RSC water irrigated sodic soils.

	RWC	MII	Pn	gS	E	NaK_S	NaK_R	P	ET	SS	GE	GW	Yield
RWC													
MII	-0.815 **												
Pn	0.872 **	-0.818 **											
gS	0.880 **	-0.874 **	0.931 **										
E	0.880 **	-0.792 **	0.966 **	0.920 **									
NaK_S	-0.856 **	0.924 **	-0.874 **	-0.929 **	-0.858 **								
NaK_R	-0.860 **	0.902 **	-0.922 **	-0.947 **	-0.915 **	0.965 **							
P	-0.889 **	0.879 **	-0.943 **	-0.970 **	-0.918 **	0.919 **	0.941 **						
ET	0.867 **	-0.670 **	0.800 **	0.772 **	0.748 **	-0.757 **	-0.763 **	-0.791 **					
SS	0.747 **	-0.512 **	0.672 **	0.625 **	0.611 **	-0.588 **	-0.591 **	-0.645 **	0.955 **				
GE	0.877 **	-0.722 **	0.835 **	0.822 **	0.786 **	-0.795 **	-0.808 **	-0.851 **	0.979 **	0.930 **			
GW	0.658 **	-0.428 **	0.590 **	0.547 **	0.510 **	-0.518 **	-0.510 **	-0.584 **	0.919 **	0.970 **	0.899 **		
Yield	0.914 **	-0.701 **	0.833 **	0.803 **	0.807 **	-0.788 **	-0.809 **	-0.803 **	0.938 **	0.835 **	0.902 **	0.759 **	

RWC: Relative water content; MII: Membrane injury index; Pn; Photosynthetic rate; gS: Stomatal conductance; E: Transpiration rate; NaK_S: Na⁺/K⁺ ratio in shoot; NaK_R: Na⁺/K⁺ ratio in root; P: Proline; ET: Effective tillers; SS: Spikelets spike⁻¹; GE: Grains earhead⁻¹; GW: 1000-grain weight. ** values significant at 5% level of significance.

Table S4. Test of significance of wheat varieties (KRL 210 and HD 2967) in response to variable soil sodicity (FPT-II).

Soil pH	Sample Size (N)	Grain Yield (t ha ⁻¹)		Pr (>t)
		KRL 210	HD 2967	
≤8.10	21	5.04	5.28	0.020
8.11–8.20	21	4.82	5.01	0.234
8.21–8.30	25	4.59	4.68	0.586
8.31–8.40	25	4.46	4.50	0.744
8.41–8.50	35	4.33	4.36	0.776
8.51–8.60	30	4.29	4.32	0.835
8.61–8.70	33	4.27	4.15	0.193
8.71–8.80	21	4.23	4.05	0.016
8.81–8.90	20	4.17	3.90	0.017
8.91–9.00	16	4.11	3.81	0.018
9.01–9.10	14	3.99	3.65	0.007
9.11–9.20	19	3.82	3.52	0.015
≥9.21–9.52	18	3.67	3.34	0.005

Table S5. Test of significance of wheat varieties (KRL 210 and HD 2967) irrigated with water having residual alkalinity (FPT-II).

RSC _{iw} (me L ⁻¹)	Sample Size (N)	Grain Yield (t ha ⁻¹)		Pr (>t)
		KRL 210	HD 2967	
≤2.5	20	4.96	5.22	0.054
2.51–3.0	27	4.75	4.86	0.949
3.01–3.0	22	4.63	4.58	0.739
3.51–4.0	39	4.40	4.25	0.082
4.01–4.5	33	4.32	4.13	0.033
4.51–5.0	27	4.15	3.88	0.013
5.01–5.5	22	4.01	3.76	0.003
5.51–6.0	30	3.80	3.52	0.000
6.01–6.5	24	3.66	3.37	0.002
≥6.51–7.5	14	3.57	3.25	0.007

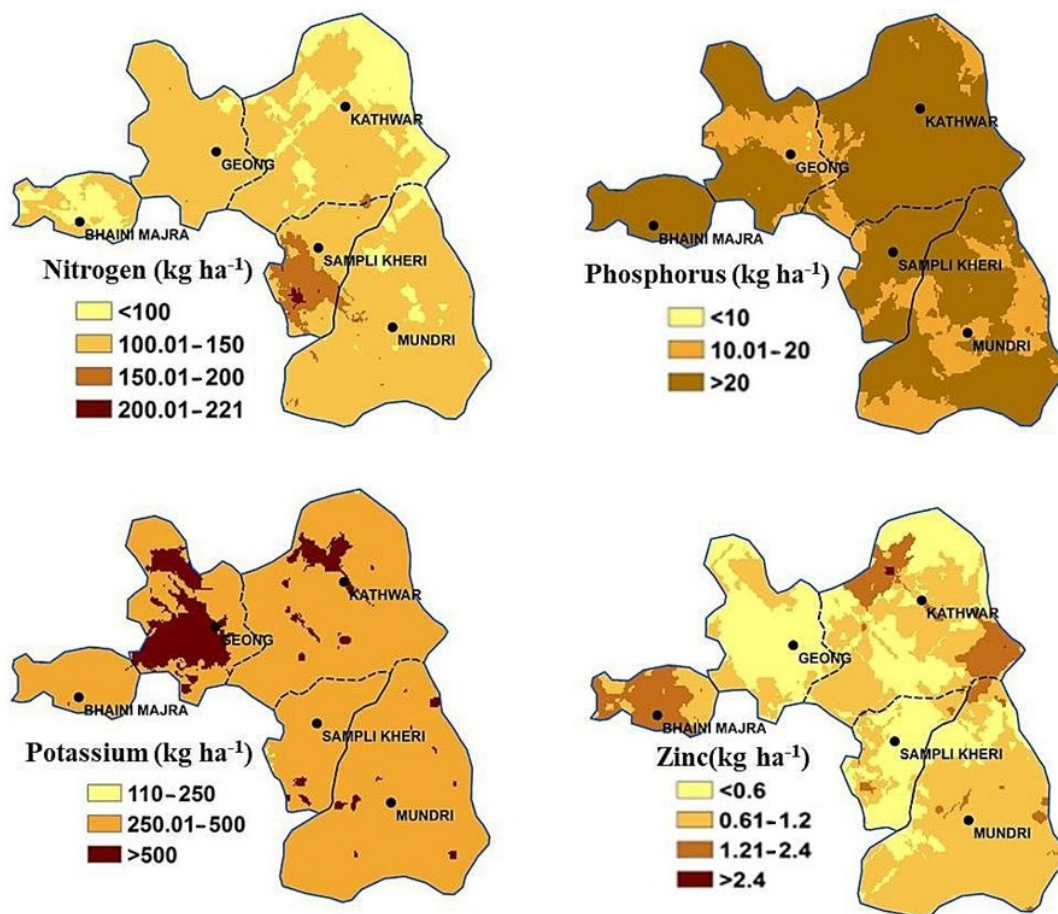


Figure S1. Maps showing the extent and distribution of available N, P, K, and Zn status in the study area.

Table S6. Critical limits depicting the soil fertility status.

Nutrient		Category		
Nitrogen (kg ha ⁻¹)	Low: <250	Medium: 250–500	High: >500	
Phosphorus (kg ha ⁻¹)	Low: <10	Medium: 10–20	High: >20	
Potassium (kg ha ⁻¹)	Low: <110	Medium: 110–250	High: >250	
Zinc (ppm)	Low: 0.6	Medium: 0.6–1.2	Sufficient: 1.2–2.4;	High: >2.4