

Table S1. Relationship between indicators and quality score in the rape planting system.

Quality score	Indicators (Weight)					
	Surface soil texture (0.15)	Soil organic content (0.25) g kg ⁻¹	Tillage layer thickness (0.20) cm	pH (0.15)	Effective soil layer thickness (0.15) cm	Slope (0.10) °
100	loam	≥30	≥20	6.5–7.5	≥100	0–2
95		25–30				
90	silt loam /clay loam	20–25	18–20		80–100	2–6
80		15–20	15–18	5.5–6.5		
75	loamy clay /sandy loam					
70		10–15			60–80	
65			10–15			
60						6–15
50	sand	5–10				
45	clay					
40				4.5–5.5 /7.5–8.5	30–60	
35			< 10			
30				> 8.5		15–25
20		< 5		< 4.5	< 30	

Table S2. Relationship between indicators and quality score in the rice planting system.

Quality score	Indicators (Weight)					
	Soil basic fertility (0.25) %	Surface soil texture (0.10)	Soil organic content (0.20) g kg ⁻¹	Tillage layer thickness (0.10) cm	Irrigation guaranteed rate (0.20) %	Altitude (0.15) m
100	≥80	loam	≥30	≥20	≥70	≤10
95				18–20		10–50
90		silt loam /clay loam	25–30	15–18		50–150
85	70–80				50–70	
80		loamy clay /sandy loam	20–25			150–300
70	60–70		15–20	10–15		300–500
60		clay	10–15		30–50	
55	50–60					
50				< 10		500–800
40		sand	5–10			
35	40–50					
30					< 30	800–1000
20			< 5			
15	< 40					
10						> 1000

Table S3. Relationship between grade and grade index.

Cultivated land grade	Cultivated land grade index
1	5600–6000
2	5200–5600
3	4800–5200
4	4400–4800
5	4000–4400
6	3600–4000
7	3200–3600
8	2800–3200
9	2400–2800
10	2000–2400
11	1600–2000
12	1200–1600
13	800–1200
14	400–800
15	0–400

Table S4. Estimated communality and weight value of each soil quality in the total data set (TDS).

Soil indicator	Communality	Weight
Soil organic carbon	0.976	0.068
Particulate organic carbon	0.974	0.068
Particulate organic nitrogen	0.958	0.067
Labile organic carbon	0.799	0.056
Dissolved organic carbon	0.731	0.051
Dissolved organic nitrogen	0.892	0.062
Total nitrogen	0.961	0.067
Alkaline hydrolysis nitrogen	0.866	0.060
NH ₄ ⁺ -N	0.818	0.057
NO ₃ ⁻ -N	0.774	0.054
Available phosphorus	0.902	0.063
Available potassium	0.979	0.068
Urease activity	0.964	0.067
Sucrase activity	0.974	0.068
Neutral phosphatase activity	0.960	0.067
Cellulase activity	0.867	0.060