

Table S1 The sampling information

N0.	Name	Longitude(E)	Latitude(N)	Elevation	Sampling time	Sampling location
1	JL-1-1	126° 22' 59"	42° 18' 50"	681	1 October 2019	Huinan County, Tonghua City
2	JL-1-2	126° 22' 55"	42° 18' 20"	681		
3	JL-1-3	126° 22' 59"	42° 18' 2"	681		
4	JL-1-4	126° 25' 24"	42° 19' 6"	683		
5	JL-1-5	126° 25' 14"	42° 19' 8"	683		
6	JL-1-6	126° 25' 6"	42° 19' 2"	683		
7	JL-1-7	126° 22' 18"	42° 20' 48"	685		
8	JL-1-8	126° 22' 34"	42° 21' 11"	685		
9	JL-1-9	126° 21' 7"	42° 21' 42"	685		
10	SD-1-1	120° 50' 7"	37° 2' 2"	82	16 October 2019	Wendeng District, Weihai City
11	SD-1-2	120° 50' 28"	37° 2' 28"	82		
12	SD-1-3	120° 50' 9"	37° 2' 13"	82		
13	SD-1-4	121° 59' 24"	37° 21' 27"	41		
14	SD-1-5	121° 59' 23"	37° 21' 14"	41		
15	SD-1-6	121° 59' 22"	37° 21' 37"	41		
16	SD-1-7	122° 14' 3"	37° 13' 45"	30		
17	SD-1-8	122° 14' 9"	37° 13' 48"	30		
18	SD-1-9	122° 14' 6"	37° 13' 56"	30		
19	SX-1-1	106° 43' 55"	37° 13' 56"	1086	8 October 2019	Liuba county in Hanzhong, Shaanxi
20	SX-1-2	106° 44' 46"	33° 38' 44"	1086		
21	SX-1-3	106° 43' 40"	33° 38' 35"	1086		
22	SX-1-4	106° 43' 2"	33° 36' 44"	1091		
23	SX-1-5	106° 42' 36"	33° 36' 14"	1091		
24	SX-1-6	106° 43' 8"	33° 36' 23"	1091		
25	SX-1-7	106° 45' 44"	33° 37' 50"	1089		
26	SX-1-8	106° 46' 11"	33° 37' 46"	1089		
27	SX-1-9	106° 46' 11"	33° 37' 33"	1089		
28	SC-1-1	106° 8' 9"	27° 48' 39"	1135	8 December 2019	Gulin County, Luzhou City
29	SC-1-2	106° 8' 6"	27° 48' 43"	1135		
30	SC-1-3	106° 8' 1"	27° 48' 36"	1135		
31	SC-1-4	106° 8' 3"	27° 48' 45"	1133		
32	SC-1-5	106° 8' 12"	27° 48' 44"	1133		
33	SC-1-6	106° 8' 18"	27° 48' 48"	1133		
34	SC-1-7	106° 8' 48"	27° 49' 3"	1134		
35	SC-1-8	106° 8' 44"	27° 49' 3"	1134		
36	SC-1-9	106° 8' 48"	27° 49' 6"	1134		

Table S2 Soil background values for validation trial

pH	SOM(g/kg)	AN(mg/kg)	AP(mg/kg)	AK(mg/kg)	AMg(mg/kg)	p(g/cm ³)
6.14 ± 0.07	57.92 ± 1.02	99.67 ± 2.03	62.67 ± 7.11	208.47 ± 7.33	188.22 ± 3.51	1.25 ± 0.03

Table S3 Correlation coefficients between maximum Norm and other indicators in each group

Soil factors	Group	Indicators of maximum Norm value in each group			
		SOM	AK	AMg	ACa
SOM	1	1			
TK	1	0.986**			
AP	1	-0.936**			
TCa	1	0.923**			
TCu	1	0.87**			
AN	1	0.892**			
TN	1	0.806**			
TZn	2		-0.698**		
TMn	2		-0.763**		
AK	2		1		
TP	2		-0.291**		
AMg	3			1	
ACa	4				1

Note: * correlation is significant at $p < 0.05$, ** correlation is significant at $p < 0.01$.

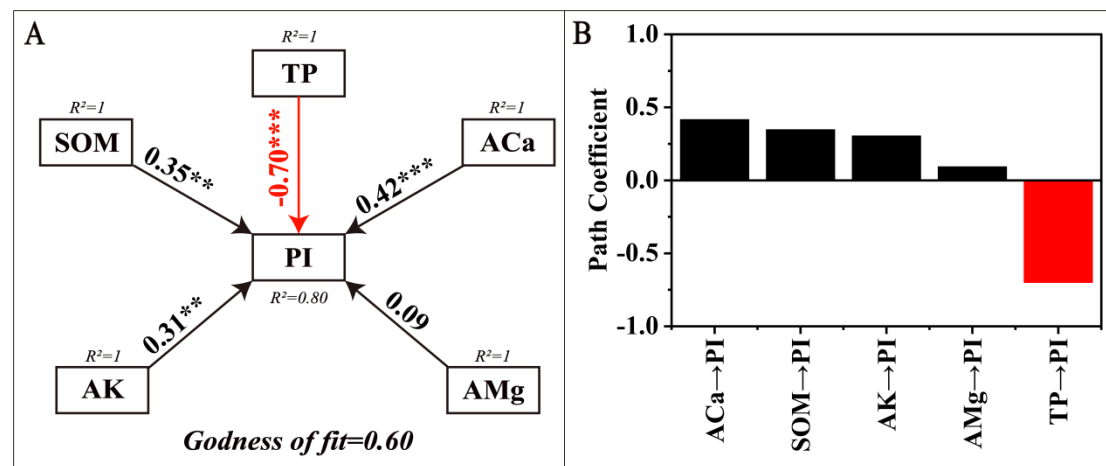


Figure S1. Determine the type of each indicator in MDS. (A)PLS-PM analysis among the five indicators in the MDS and the productivity index (DW and AQI). (B)path coefficient.

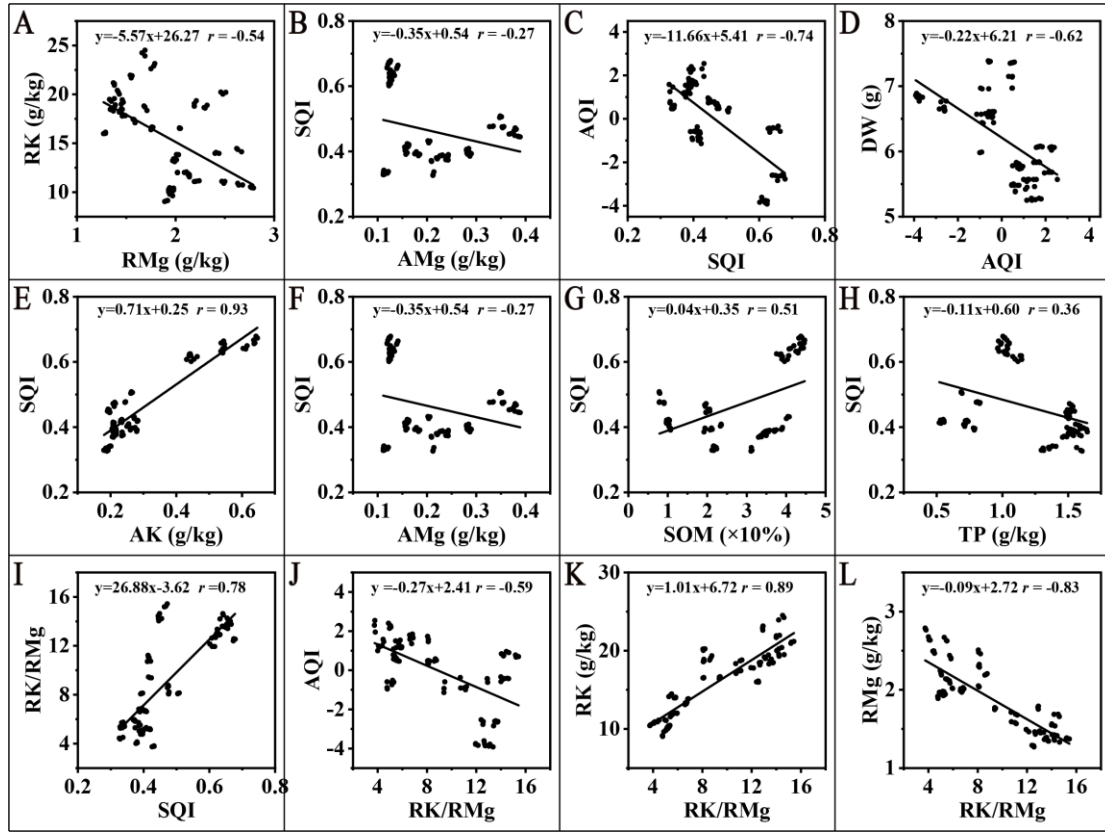


Figure S2 Linear fitting curve.