Table S1. The substrate and butter pH of enzyme assay.

Enzyme	EC	Substrate	Buffer pH
β-glucosidase BG	3.2.1.21	p-nitrophenyl-β-glucopyranoside	6.0
β-N-acetyl glucosaminidase NAG	3.2.1.52	p-nitrophenyl-2-acetyl-β-D-glucopyranoside	5.5
leucine aminopeptidase LAP	3.4.11.2	L-Leucine-p-nitroanilide	8.0
alkaline phosphatase ALP	3.1.3.1	p-nitrophenyl-phosphate disodium salt hexahydrate	9.5

Table S2. Soil water-stable aggregates size under different treatments of application manure. Mean value ± standard deviations in the same column and depth followed by the different letters indicate significant difference at the 0.05 level (n = 4).

Soil depth/cm	Treatments	Soil aggregates size/mm				
		<0.25	0.25-0.50	0.50-1.00	1.00-2.00	>2.00
0-20	CK	98.12±0.39 a	0.53±0.08 b	0.53±0.13 c	0.31±0.10 c	0.51±0.23 b
	11a	60.44±1.57 c	12.30±0.40 a	13.64±0.83 a	9.08±1.50 a	4.55±2.00 a
	16a	73.43±4.73 b	9.11±3.39 a	9.04±2.51 b	5.73±1.54 b	2.70±0.36 ab
	22a	67.85±7.25 bc	10.38±2.82 a	10.90±4.93 ab	5.28±0.91 b	5.59±2.07 a
	27a	69.91±7.47 b	9.61±0.55 a	9.55±2.65 ab	5.19±2.40 b	5.74±3.21 a
20-40	CK	98.66±0.42 a	0.56±0.12 c	0.43±0.19 c	0.26±0.12 c	0.09±0.03 c
	11a	62.61±4.34 c	13.36±1.96 a	12.65±1.71 a	8.57±1.73 a	2.81±1.37 a
	16a	80.02±4.32 b	6.86±1.64 b	8.53±2.00 b	4.22±2.00 b	0.38±0.15 bc
	22a	76.35±4.44 b	9.00±1.40 b	9.29±4.03 ab	4.79±1.47 b	0.57±0.11 bc
	27a	75.82±4.08 b	7.84±1.46 b	9.81±1.47 ab	5.39±1.04 b	1.14±0.29 b

Table S3. The soil physical properties under different treatments of application manure. Mean value ± standard deviations in the same column and depth followed by the different letters indicate significant difference at the 0.05 level (n = 4).

Soil depth/cm	Treatments	ρ_b (g cm^{-3})	FC (%)	ρ_d (g cm^{-3})	f_t (%)
0-20	CK	1.49±0.01 a	0.25±0.01 d	2.39±0.04 a	37.61±0.79 b
	11a	1.21±0.05 b	0.39±0.04 a	2.23±0.07 b	50.58±6.89 a
	16a	1.24±0.09 b	0.35±0.03 ab	2.22±0.08 b	48.28±2.61 a
	22a	1.2±0.03 b	0.33±0.02 bc	2.19±0.09 b	47.03±1.17 a
	27a	1.19±0.12 b	0.30±0.01 c	2.12±0.12 b	47.59±1.70 a
20-40	CK	1.49±0.04 a	0.25±0.00 c	2.35±0.04 a	37.10±3.33 c
	11a	1.29±0.02 bc	0.33±0.02 a	2.28±0.03 bc	43.12±3.58 ab
	16a	1.38±0.02 b	0.29±0.02 b	2.32±0.06 ab	39.83±1.22 bc
	22a	1.22±0.03 c	0.30±0.01 b	2.23±0.04 c	46.62±1.21 a
	27a	1.27±0.03 c	0.29±0.02 b	2.23±0.03 c	42.4±1.52 ab

Table S4. Soil saline-sodic properties under different treatments of application manure. Mean value ± standard deviations in the same column and depth followed by the different letters indicate significant difference at the 0.05 level (n = 4).

Soil depth/cm	Treatments	pH	$EC_{1:5}$ (dS m^{-1})	ESP (%)	$SAR_{1:5}$ ((mmol L^{-1})$^{1/2}$)
0-20	CK	10.38±0.04 a	2.69±0.73 a	23.07±3.59 a	26.51±5.18 a
	11a	8.31±0.06 b	0.37±0.05 b	3.29±1.39 b	3.00±0.75 b
	16a	8.13±0.09 c	0.27±0.10 b	0.56±0.01 b	1.25±0.15 b
	22a	7.95±0.01 d	0.31±0.09 b	0.52±0.01 b	1.27±0.30 b
	27a	7.79±0.16 d	0.28±0.05 b	0.53±0.01 b	0.90±0.36 b
20-40	CK	10.21±0.04 a	1.90±0.16 a	19.63±1.49 a	25.08±4.54 a
	11a	8.33±0.13 b	0.43±0.09 b	3.78±1.42 b	3.17±1.05 b
	16a	8.15±0.01 c	0.30±0.05 b	0.58±0.03 c	0.83±0.09 b
	22a	7.86±0.08 d	0.31±0.02 b	1.11±0.04 c	0.86±0.22 b
	27a	7.80±0.09 d	0.37±0.14 b	0.82±0.34 c	0.76±0.21 b

Table S5. The relationship between soil physical-chemical properties and EEAs. Stepwise multiple linear regression models (SMLR) used to identify the relationship between EEAs and soil physical-chemical properties. TN, total nitrogen; FC, field capacity; SC:N, soil C:N radio; SAR, sodium adsorption ratio. BG, β-glucosidase; NAG, β-N-acetyl glucosaminidase; LAP, leucine aminopeptidase; ALP, alkaline phosphatase. The value of enzyme activity was expressed with logarithm.

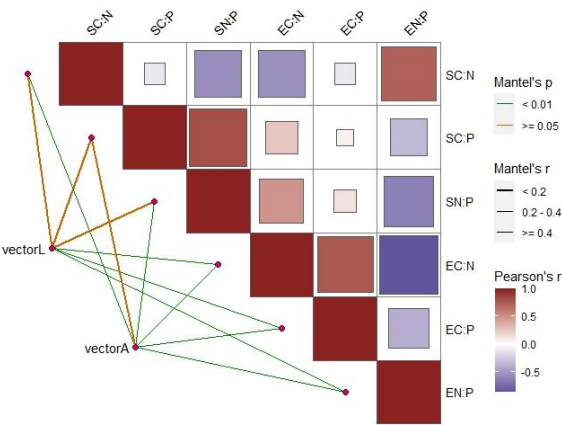| Stepwise multiple linear regression equations	R^2	P
BG=5.136+1.385TN-5.270FC	0.865	p<0.01
NAG+LAP=7.032+1.099TN+0.134SC:N	0.735	p<0.01
ALP=4.813+0.674TN-0.059SAR+0.107SC:N	0.680	p<0.01

Figure S1. The relationship between soil C:N:P and enzymatic stoichiometry. SC:N, soil C:N radio; SC:P, C:P radio; SN:P, N:P radio; EC:N, lnBG:ln(NAG+LAP); EC:P, lnBG:lnALP; EN:P, ln(NAG+LAP):lnALP; vector L, vector length; vector A, vector angle.