Appendix A The proportion of carbon (C), nitrogen (N), phosphorus (P_2O_5), and potassium (K_2O) in different fertilizers types.

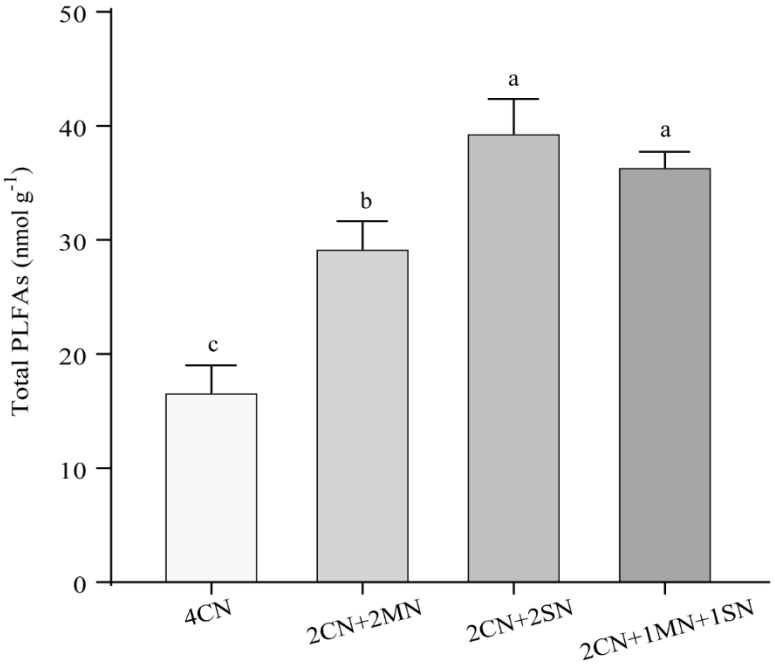
Fertilizer type	C	N	P_2O_5	K_2O
Urea	-	46.0	-	-
Calcium superphosphate	-	-	12.0	-
Diammonium phosphate	-	18.0	46.0	-
Potassium chloride	-	-	-	60.0
Monopotassium phosphate		-	52.0	34.0
Pig manure	21.8	2.17	1.39	1.63
Corn straw	42.7	1.04	0.32	1.69

Note: The contents of carbon and nutrients in organic fertilizers were calculated by dry weight; the water contents of pig manure and corn straw were 28.9 and 64.9%, respectively.

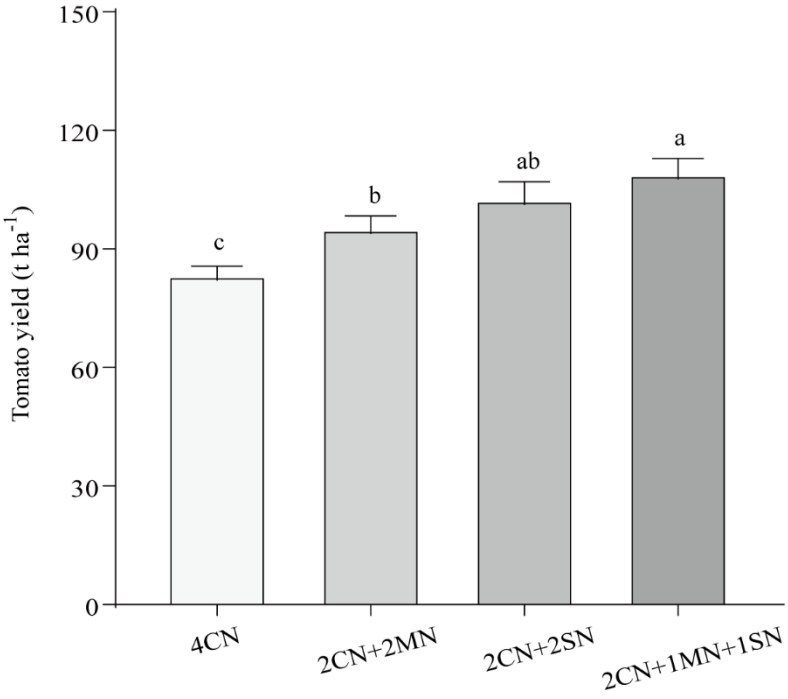
Appendix B The standard regression coefficient and *p* value of partial least squares (PLS) modeling.

		Bacteria	Fungi	Actinomycetes	AMF	G^+	G^-
ALP	Sta.	0.080	0.156	0.047	0.215	0.112	0.107
	p value	0.316	0.091	0.794	0.001	0.005	0.003
ACP	Sta.	0.195	0.267	-0.224	0.489	0.059	0.043
	p value	0.003	0.002	0.055	0.005	0.947	0.665
PDE	Sta.	0.148	0.133	0.143	0.115	0.151	0.136
	p value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PhT	Sta.	0.116	0.135	0.104	0.136	0.115	0.087
	p value	0.380	0.003	0.258	0.029	0.250	0.375
PyP	Sta.	0.080	0.074	0.066	0.083	0.070	0.067
	p value	0.040	0.029	0.080	0.028	0.062	0.038

Note: Sta., standard regression coefficient; ALP, alkaline phosphomonoesterase; ACP, acid phosphomonoesterase; PDE, phosphodiesterase; PhT, phytase; PyP, pyrophosphatase; AMF, arbuscular mycorrhizal fungi; G^+, Gram-positive bacteria; G^-, Gram-negative bacteria.



Appendix C The biomass (nmol g^{-1} dry soil) of total PLFAs in different treatments. 4CN, 100% chemical N; 2CN+2MN, 50% chemical N and 50% manure N; 2CN+2SN, 50% chemical N and 50% straw N; 2CN+1MN+1SN, 50% chemical N and 25% manure N plus 25% straw N. Error bars indicate the standard deviation (n=3). Different letters represent significant (P<0.05 level) differences among different treatments.

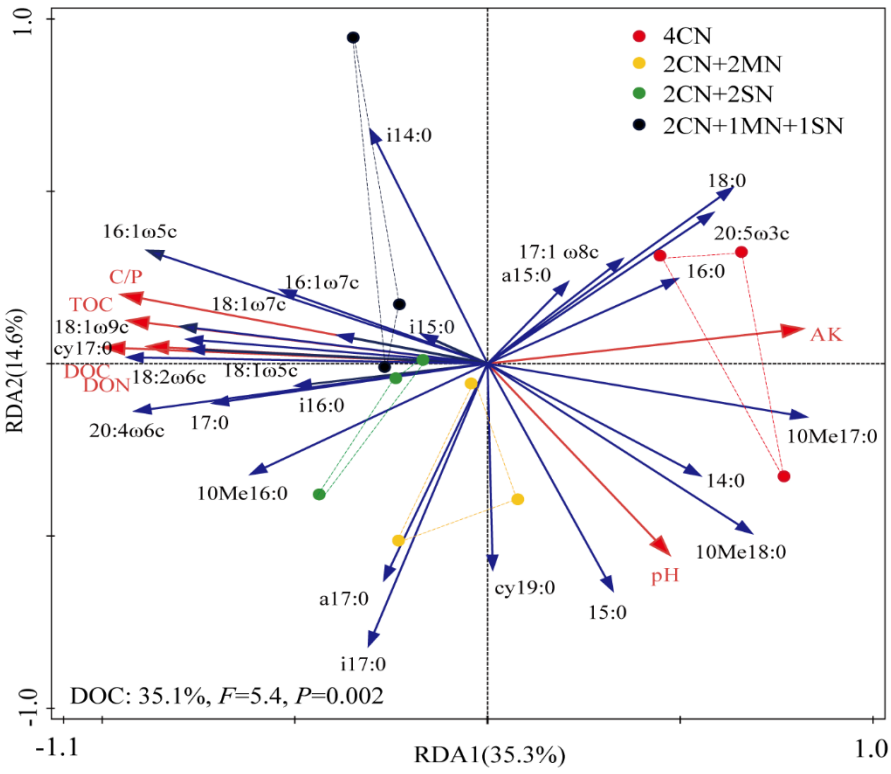


Appendix D Spring tomato yield after 10-year fertilization experiment in the 20th-season vegetable. 4CN, 100% chemical N; 2CN+2MN, 50% chemical N and 50% manure N; 2CN+2SN, 50% chemical N and 50% straw N; 2CN+1MN+1SN, 50% chemical N and 25% manure N plus 25% straw N. Error bars indicate the standard deviation (n=3). Different letters represent significant (P<0.05 level) differences among different treatments.

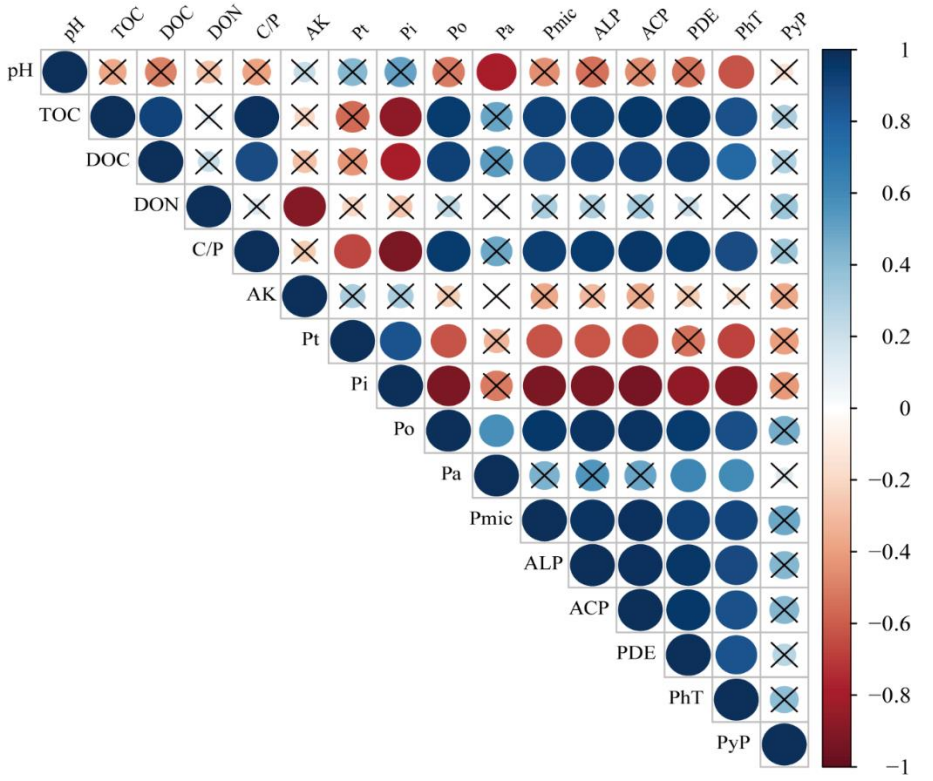
Appendix E The direct and indirect effects results of partial least squares path modeling (PLS-PM).

Relationship		Effect			*P* value
		Total	Direct	Indirect	
C/P	Total PLFAs	0.948	0.948	0.000	<0.001
	Phosphatase	0.968	0.663	0.305	0.022
	P pools	0.926	-0.038	0.964	0.919
	Yield	0.918	0.310	0.608	0.292
Total PLFAs	Phosphatase	0.322	0.322	0.000	0.216
Phosphatase	P pools	0.970	0.970	0.000	0.024
P pools	Yield	0.656	0.656	0.000	0.042

Note: The *P* value was test result of direct effect.



Appendix F Redundancy analysis (RDA) plot reveals the relationship between soil properties and microbial community structure (relative concentration of individual PLFA molecules). 4CN, 100% chemical N; 2CN+2MN, 50% chemical N and 50% manure N; 2CN+2SN, 50% chemical N and 50% straw N; 2CN+1MN+1SN, 50% chemical N and 25% manure N plus 25% straw N. TOC, total organic carbon; DOC, dissolved organic carbon; DON, dissolved organic nitrogen; AK, available potassium; C/P, TOC to total phosphorus ratio.



Appendix G The correlation coefficients show the ralationship between soil properties and phosphatase by Pearson correlation analysis. Blue and red circles indicate positive and negative correlation, respectively. Circle sizes from small to large represent low to high correlation. The "×" in the circles represent no significant correlation (P>0.05) between two variables. TOC, total organic carbon; DOC, dissolved organic carbon; DON, dissolved organic nitrogen; AK, available potassium; C/P, TOC to total P ratio. Pt, total P; Pi, inorganic P; Po, organic P; Pa, available P; Pmic, microbial biomass P. ALP, alkaline phosphomonoesterase; ACP, acid phosphomonoesterase; PDE, phosphodiesterase; PhT, phytase; PyP, pyrophosphatase.