Supporting Information

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SI Materials and Methods

Soil Sampling. The soil samples collected from the designated sampling sites used a process of composite sampling. At each sampling site, five soil subsamples (one was exactly coincided with the designated location, and the other four were at a distance of 5 m from the designated location in a shape of cross) were taken using a soil-sampling spade, and then fully mixed. After quartering, about 1 kg of the composite sample was obtained and placed into a plastic bag and taken back for laboratory analyses.

Bootstrapping Estimates of Area-Weighted Mean SOC Stock and Its Change. To obtain a robust estimate of SOC stock and its change, bootstraps with 10,000 times of repeat sampling were first applied to the samples of each county in 1980 and 2011, respectively, and then the area-weighted mean SOC stocks for each county in the two dates were calculated 10,000 times using the bootstrapped samples, respectively. Changes in the SOC stock were estimated by random subtraction of the 10,000 SOC stock estimates in 1980 and 10,000 estimates in 2011. The median (50% percentile) of the 10,000 estimates was used to represent the area-weighted mean of SOC stock and its change in the county, and the 2.5% and 97.5% percentile were used to derive the 95% confidence interval of the estimates. For each region, area-weighted SOC stock and its changes were calculated 10,000 times, based on the random permutation of 10,000 SOC estimates for each county within the region and the soil areas of each corresponding county. The 50%, 2.5%, and 97.5% percentiles were used to represent the mean, and 95% confidence interval of SOC stock and its change, respectively.

Estimates of C Input from Crop Resides (Root Plus Straw/Stover). For a given year of a county, the C input from root (C_r) and straw/stover (C_s) of a given crop was estimated from the following equations, respectively:

$$C_s = \text{Yield} \times (1 - \text{WC}) / \text{GSratio} \times \text{StrawReturn} \times 0.45 \quad [1]$$

$$C_r = \text{Yield} \times (1 - \text{WC}) / \text{GSratio} \times \text{RSratio} \times 0.45, \quad [2]$$

where Yield (t) represents economic yield of the crop as recorded in agricultural census yearbook of the county at the given year, WC represents water content of the economic yield, expressed as a mass fraction (Table S3), and 0.45 is the conversion factor for converting crop biomass to C content (49). GSratio and RSratio represent grain:straw and root:straw of the crop, respectively. The GSratio and RSratio used in this study were estimated from the measurements of dry weight for crop root, straw/stover, and grain of 333 sampled plots across the 58 investigated counties in the sampling campaign in 2011 (Table S4). StrawReturn represents the average return ratio of the crop straw/stover in the county. The average return ratio of straw/stover was estimated from the crop residue management investigation (including beginning year of straw/stover return, duration, area percentage with straw/stover return, and mass percentage of straw/stover return, and so forth) at each corresponding soil sampling site during the sampling campaign in 2011.

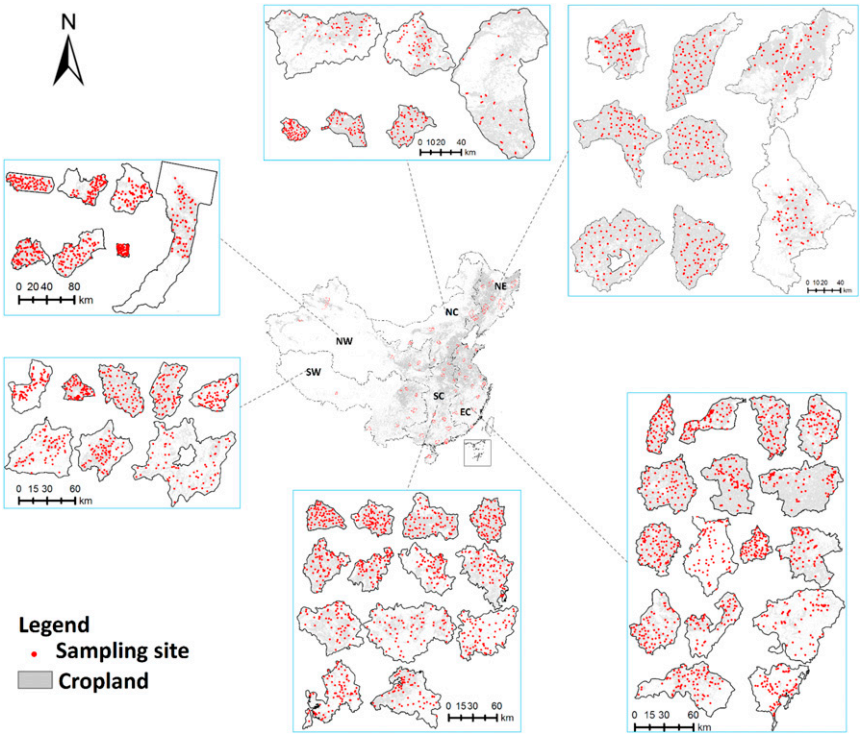

Fig. S1. The field sites for soil sampling and crop residue management investigations for the 58 counties across China (EC, East China; NC, North China; NE, Northeast China; NW, Northwest China; SC, South Central China; and SW, Southwest China).

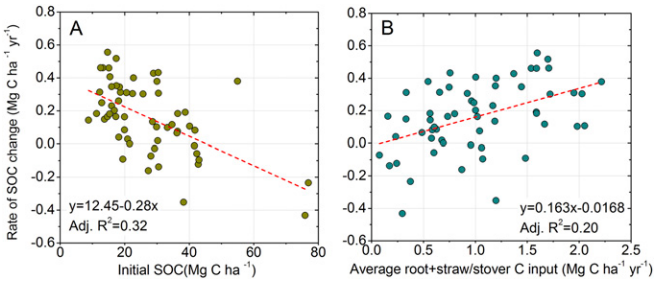

Fig. S2. Relationships between the initial SOC (*A*) or crop residue C inputs (*B*) and rates of the SOC change in Chinese croplands.

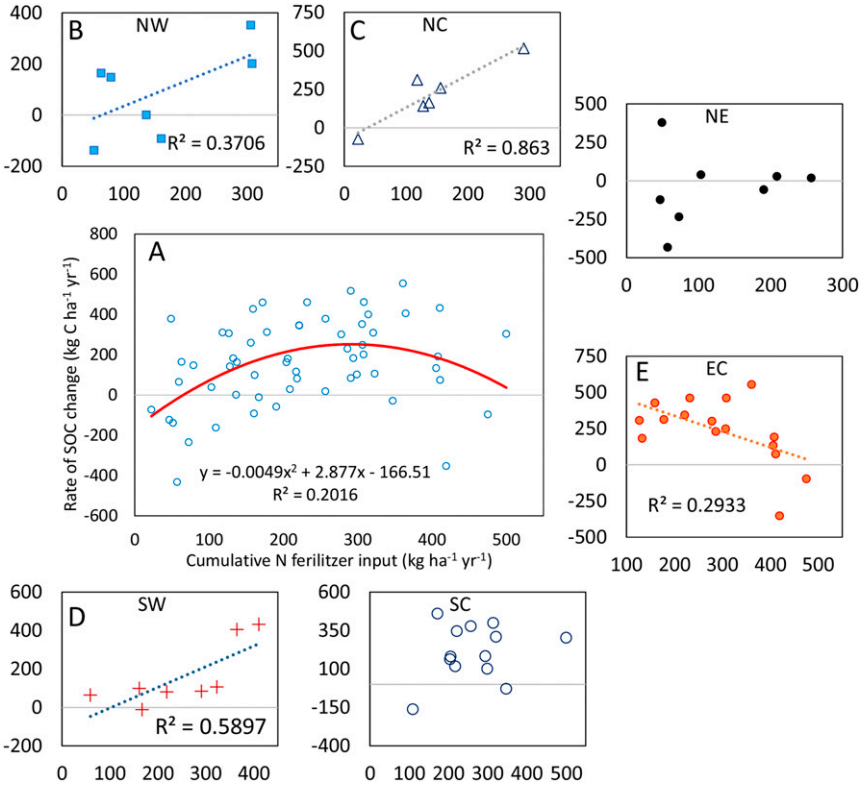

Fig. S3. (*A–E*) Impacts of cumulative N fertilzer inputs on county-level rates of SOC change in cropland soils of China's different regions (EC, East China; NC, North China; NE, Northeast China; NW, Northwest China; SC, South Central China; and SW, Southwest China).

Table S1. SOC stocks and changes in SOC stocks (*t* C ha^{-1}) for the 58 investigated counties across China

		SOC in 1980 (Mg C ha^{-1})			SOC in 2011 (Mg C ha^{-1})			Changes in SOC (Mg C ha^{-1})		
County	Predominant cropping system	Lower	Median	Upper	Lower	Median	Upper	Lower	Median	Upper
East China										
Kenli	W-M; W/C	8.73	11.31	13.50	14.95	16.93	19.04	2.60	5.66	8.88
Laiyang	W-M; W-P	11.75	12.89	13.80	19.29	20.58	21.88	6.11	7.72	9.44
Pingyi	W-M; W-P	11.42	12.28	13.10	20.30	21.97	23.67	7.83	9.70	11.59
Yucheng	W-M; W/C	9.80	12.58	15.37	25.37	26.89	28.40	11.12	14.30	17.48
Mengcheng	W-M; W-S; W/C	16.60	18.44	20.14	27.10	29.12	31.11	8.03	10.69	13.40
Dingyuan	W-R; W-M	11.10	13.26	15.64	25.39	27.57	29.70	11.07	14.29	17.37
Xuancheng	W-R; R-R; W/C	23.31	25.67	28.46	32.60	35.06	37.59	5.61	9.35	12.88
Rugao	W-R; W-M; W-S	14.37	15.98	17.56	21.85	23.10	24.42	5.07	7.13	9.19
Shuyang	W-R; W-M; W-S	12.91	14.70	16.54	29.58	31.91	34.18	14.25	17.20	20.08
Qingpu	W-R; Rap-R	37.98	43.02	48.24	37.12	40.07	43.03	−9.10	−2.98	2.86
Jinhua	R-R; Rap-R	26.41	28.67	31.15	30.47	32.85	35.00	0.73	4.15	7.27
Tongxiang	R-R; Rap-R	32.83	38.26	43.97	25.17	27.32	29.58	−17.10	−10.92	−5.04
JinXian	R-R; Rap-R	26.17	28.94	32.18	38.95	42.29	44.93	8.86	13.26	17.24
Taihe	R-R; Rap-R	25.28	30.47	35.75	37.20	39.95	42.80	3.58	9.49	15.34
Jianou	R-R; Rap-R	30.91	38.78	46.52	42.10	44.65	47.18	−2.71	5.93	14.58
Zhangpu	R-R; Rap-R	30.85	36.41	43.29	35.83	38.82	41.62	−5.06	2.32	8.64
North China										
Naiman	M	7.16	8.81	10.47	11.35	13.22	15.12	1.89	4.42	6.92
Wuchuan	W; Rap	22.38	28.13	34.28	24.15	25.93	27.68	−8.47	−2.25	3.82
Luancheng	W-M	16.19	17.39	18.43	31.62	33.43	35.20	13.96	16.04	18.16
Nanpi	W-M; W/C	15.33	17.27	19.47	20.86	22.35	23.92	2.43	5.09	7.57
Xiangfen	W-M; M	13.55	18.16	23.50	23.45	26.23	29.05	2.09	8.06	13.51
Yuanping	M	14.89	18.69	22.99	23.82	28.33	33.42	3.40	9.65	15.93
Northeast China										
Baoqing	S; M; R	47.66	54.97	63.70	58.93	66.88	75.00	0.12	11.76	23.07
Hailun	S; M; R	69.46	75.90	82.55	59.74	62.52	65.26	−20.58	−13.40	−6.52
Lindian	M; S; R	39.38	42.80	46.62	37.52	39.00	40.58	−7.91	−3.81	−0.06
Dunhua	S; M; R	67.57	76.94	86.12	65.35	69.60	73.96	−17.37	−7.26	2.93
Gongzhuling	M	27.46	30.26	32.91	28.51	30.82	33.36	−2.92	0.58	4.26
Yushu	M; S; R	39.48	42.35	45.26	37.88	40.52	43.51	−5.63	−1.79	2.23
Changtu	M	19.09	20.93	23.02	20.51	21.83	23.20	−1.54	0.90	3.25
Fuxin	M	16.41	18.18	19.95	18.11	19.40	20.72	−0.95	1.23	3.43
Northwest China										
Manasi	C	18.25	21.52	24.62	19.17	21.52	24.22	−3.95	0.04	4.21
Tabei	C	16.76	19.42	21.71	14.83	16.56	18.23	−5.75	−2.83	0.27
Ningxian	W; M; S	12.76	13.75	14.79	17.61	18.36	19.07	3.35	4.60	5.84
Zhuanglang	W; Rap; M	13.80	14.64	15.51	18.79	19.73	20.67	3.81	5.10	6.36
Ledu	W; Rap	23.21	30.54	39.16	24.04	26.28	28.75	−13.00	−4.27	3.50
Pingluo	W; M; R	16.12	16.82	17.50	21.69	23.06	24.41	4.69	6.25	7.79
Wugong	W-M; M	16.58	17.47	18.34	27.49	28.38	29.29	9.66	10.92	12.18
South Central China										
Fangcheng	W-M; W/C	13.91	15.32	16.64	19.64	20.92	22.24	3.77	5.61	7.53
Fengqiu	W-M; W/C	14.98	15.98	17.04	24.57	26.73	29.07	8.32	10.75	13.30
Huangchuan	W-R; Rap-R	18.41	19.96	21.51	22.59	24.99	27.55	2.17	5.06	7.98
Yuzhou	W-M; W/C	12.16	15.11	18.62	27.43	29.39	31.36	10.25	14.27	17.82
Xishui	R-R; Rap-R; W/C	18.80	20.57	22.35	27.71	30.18	32.78	6.51	9.59	12.81
Guiyang	R-R; Rap-R	33.29	36.43	39.76	38.14	42.13	46.20	0.49	5.68	10.75
Wugang	R-R	26.50	29.99	33.77	38.93	41.72	44.50	7.11	11.73	16.14
Wuming	R-R; M-R	20.52	22.75	25.00	31.13	35.17	38.70	7.81	12.41	16.71
Xingan	R-R	30.65	34.70	38.46	34.01	38.26	45.12	−2.43	3.62	11.42
Gaozhou	R-R	19.83	22.43	24.80	29.85	31.83	34.13	6.31	9.42	12.82
Taishan	R-R	24.97	29.93	34.45	30.70	33.03	35.37	−2.00	3.17	8.47
Yingde	R-R	26.06	29.30	32.43	25.95	28.40	31.01	−4.98	−0.87	3.16
Danzhou	R-R	22.35	27.35	32.58	19.17	22.40	25.37	−11.13	−5.01	0.85
Southwest China										
Dazi	W	32.21	36.21	40.22	36.04	38.17	40.47	−2.64	2.01	6.55
Guanghan	W-R	39.12	40.12	41.15	41.07	43.42	45.82	0.72	3.30	5.84
Yanting	W-R; W-M; W/M	13.80	15.48	17.18	26.24	28.05	29.89	10.09	12.59	15.13
Dianjiang	W-R; W-M; W/M	18.35	19.94	21.62	20.75	22.55	24.52	0.11	2.62	5.12
Puding	Rap-R; W/M	38.28	41.80	45.37	40.63	44.31	48.25	−2.59	2.53	7.76
Zunyi	Rap-R; W/M	28.61	33.24	37.40	32.75	36.23	40.02	−2.49	3.06	8.93
Luliang	W-R; W-M	29.32	30.39	31.47	40.26	43.80	47.58	9.64	13.41	17.24
Luxi	W-R; W-M	37.54	41.65	45.57	37.99	41.29	44.83	−5.59	−0.35	5.19

The "Lower" and "Upper" of SOC stock refer to the 95% confidence intervals of the bootstrap estimates. "-" Represents sequential cropping, and "/" means relay intercropping; C, cotton; M, maize; P, peanut; R, rice; Rap, rapeseeds; S, soybean; W, wheat. If there are multiple crop sequences in a county, they are separated by semicolon and the first crop sequence is the most predominant.

Table S2. Cropland SOC (0–20 cm) estimates using legacy soil/inventory data

Region	SOC (Mg C ha^{-1})	Source of SOC data	Source
Europe	40.2*	Areas from United Nations Statistical Commission/Economic Commission for Europe, and SOC figures calculated from SOM map of Europe.	Smith et al. (50)
Belgium	38	Soil survey data between 1950 and 1970 to reflect the situation in 1960.	Lettens et al. (28)
	39	Soil inventory data in the late 1980s (1989, 1990, and 1991) to reflect the situation in 1990.	
	37	Soil profile and horizon data collected between 1997 and 2002 to reflect the situation in 2000.	
United States	43.67 (24.66–66.14)	Soil survey data of The State Soil Geographic Database.	Guo et al. (51)
China	28.4 (±4.3)*	Soil database based on the second National Soil Survey of China in 1980.	Qin et al. (52)
	26.63 (±23.97)*	The second National Soil Survey of China in 1980.	Song et al. (20)
	28.56 (year 1980)	Detailed soil inventory data of 58 counties collected from the second National Soil Survey of China in 1980 and a new sampling campaign in 2011.	Present study
	32.90 (year 2011)		

*SOC was converted to a depth of the upper 20 cm according to the proportion of vertical distribution used by Qin et al. (52).

Table S3. Water content of the economic yield

Crop	Water content (mass fraction)	Sources
Paddy rice	0.06	Niu and Liu (53)
Soybean	0.103	
Wheat	0.125	Fang et al. (49)
Corn	0.135	
Cotton	0.083	
Rapeseeds	0.09	

Table S4. Grain:straw ratio and root:straw ratio

		Grain:straw		Root:straw	
Crop	*n*	Mean	SD	Mean	SD
Northeast China					
Soybean	9	0.524	0.147	0.196	0.072
Paddy	18	1.120	0.224	0.324	0.074
Corn	24	0.917	0.189	0.182	0.106
North China					
Wheat	9	0.846	0.108	0.200	0.078
Rapeseeds	3	0.962	0.021	0.132	0.030
Corn	15	0.955	0.231	0.280	0.215
East China					
Cotton	3	0.645	0.064	0.236	0.027
Paddy	45	1.212	0.409	0.430	0.212
Wheat	27	0.926	0.304	0.369	0.168
Rapeseeds	9	0.589	0.147	0.363	0.133
Corn	15	1.055	0.192	0.274	0.092
Northwest China					
Cotton	6	0.988	0.176	0.361	0.193
Paddy	5	0.944	0.133	0.399	0.132
Wheat	18	0.986	0.473	0.359	0.213
Corn	14	0.956	0.180	0.265	0.150
Southwest China					
Paddy	15	1.306	0.330	0.389	0.256
Wheat	15	0.647	0.252	0.249	0.190
Rapeseeds	12	0.303	0.051	0.196	0.076
Corn	6	1.366	0.521	0.078	0.013
South Central China					
Paddy	48	0.980	0.273	0.267	0.067
Wheat	12	0.666	0.064	0.202	0.023
Corn	9	1.012	0.234	0.261	0.044
National average					
Soybean	9	0.524	0.147	0.196	0.072
Cotton	9	0.874	0.224	0.320	0.165
Paddy	131	1.115	0.343	0.350	0.174
Wheat	81	0.840	0.331	0.301	0.177
Rapeseeds	24	0.493	0.245	0.251	0.132
Corn	83	0.998	0.256	0.231	0.141