

Table S1. Emission factors of different carbon emission sources.

Carbon Emission	Sources	Emission Factors	Reference
Carbon emission from land use	Agricultural fertilizer	0.8956 kg(C)/kg	ORNL
	Pesticide	4.9341 kg(C)/kg	ORNL
	Agricultural plastic films	5.18 kg(C)/kg	IREEA
	Agricultural diesel oil	0.5927 kg(C)/kg	IPCC
	Sowing	266.48 kg(C)/hm ²	CAB
	Irrigation	3.126 kg(C)/hm ²	Dubey
Carbon emission from farming	Crops	N₂O Emission Factors	Reference
	Rice	17.33 kg(C)/hm ²	Min & Hu (2012)
	Wheat	148.02 kg(C)/hm ²	
	Soybeans	55.6 kg(C)/hm ²	
	Maize	182.83 kg(C)/hm ²	
	Cotton	34.69 kg(C)/hm ²	
	Vegetables	304 kg(C)/hm ²	
	Crops	CH₄ Emission Factors	Reference
	Rice	Appendix Table S2	Wang, Liao, & Jiang (2020)
	Crops	Straw Burning Emission Factors	Reference
	Rice	420.11 g(C)/kg	Zheng, Ge, & Yu, (2022)
	Wheat	421.48 g(C)/kg	
	Maize	198.29 g(C)/kg	
Carbon emission from livestock	Ruminant Animal	Emission Factors of Intestinal Fermentation	References
	Cattle	395.56 kg(C)/unit/year	IPCC
	Horses	122.76 kg(C)/unit/year	
	Donkeys	68.21 kg(C)/unit/year	
	Mules	68.21 kg(C)/unit/year	
	Pig	6.82 kg(C)/unit/year	
	Goat	34.11 kg(C)/unit/year	
	Sheep	32.11 kg(C)/unit/year	
	Poultry	0	
	Ruminant Animal	CH₄ Emission Factors of Manure Treatment	Reference
	Cattle	24.55 kg(C)/unit/year	IPCC
	Horses	11.18 kg(C)/unit/year	
	Donkeys	6.14 kg(C)/unit/year	

	Mules	6.14 kg(C)/unit/year	
	Pig	27.28 kg(C)/unit/year	
	Goat	1.16 kg(C)/unit/year	
	Sheep	1.02 kg(C)/unit/year	
	Poultry	0.02 kg(C)/unit/year	
Ruminant Animal	<i>N₂O</i> Emission Factors of Manure Treatment		Reference
Cattle	96.76 kg(C)/unit/year		
Horses	100.37 kg(C)/unit/year		
Donkeys	100.37 kg(C)/unit/year		
Mules	100.37 kg(C)/unit/year		
Pig	38.27 kg(C)/unit/year		IPCC
Goat	23.83 kg(C)/unit/year		
Sheep	23.83 kg(C)/unit/year		
Poultry	1.44 kg(C)/unit/year		

Table S2. Carbon emission factors of rice cultivation in different provinces (kg(C)/hm²).

Province	Emission Factors	Province	Emission Factors	Province	Emission Factors
Beijing	1009.37	Zhejiang	2710.17	Hainan	2925.61
Tianjin	865.17	Anhui	2429.26	Chongqing	1287.33
Hebei	1167.05	Fujian	2635.56	Sichuan	1287.33
Shanxi	504.00	Jiangxi	3212.62	Guizhou	1277.19
Inner Mongolia	679.83	Shandong	1600.22	Yunnan	436.22
Liaoning	703.43	Henan	1358.89	Shaanxi	952.37
Jilin	424.03	Hubei	2910.39	Gansu	519.96
Heilongjiang	632.63	Hunan	2665.25	Qinghai	0
Shanghai	2379.77	Guangdong	3138.01	Ningxia	559.54
Jiangsu	2466.56	Guangxi	2774.12	Xinjiang	800.87

Table S3. Coupling and coupling coordination of agricultural carbon emissions with agricultural modernization in 2010, 2015 and 2020.

Province	2010				2015				2020			
	C1	D1	C2	D2	C1	D1	C2	D2	C1	D1	C2	D2
Beijing	0.874	0.757	0.923	0.711	0.956	0.852	0.978	0.814	0.997	0.958	1.000	0.910
Tianjin	0.511	0.515	0.580	0.478	0.762	0.669	0.847	0.612	0.928	0.810	0.993	0.705
Hebei	0.952	0.617	0.908	0.659	0.995	0.677	0.975	0.721	0.999	0.738	0.998	0.742
Shanxi	0.603	0.528	0.748	0.455	0.831	0.657	0.945	0.568	0.881	0.696	0.977	0.600
Inner Mongolia	0.998	0.747	0.977	0.804	0.999	0.749	0.993	0.813	0.997	0.767	0.998	0.828
Liaoning	0.815	0.608	0.831	0.598	0.921	0.680	0.937	0.665	0.932	0.707	0.967	0.667
Jilin	0.945	0.702	0.972	0.668	0.993	0.750	1.000	0.700	0.999	0.802	0.986	0.723
Heilongjiang	0.995	0.736	0.981	0.701	0.936	0.738	0.915	0.717	0.937	0.770	0.904	0.735
Shanghai	0.717	0.639	0.934	0.500	0.876	0.756	1.000	0.582	0.969	0.869	0.950	0.651
Jiangsu	0.987	0.584	0.981	0.488	0.980	0.681	0.844	0.559	0.958	0.728	0.746	0.565
Zhejiang	0.800	0.621	0.939	0.525	0.909	0.716	0.989	0.618	0.971	0.797	0.994	0.668
Anhui	0.953	0.515	0.999	0.429	0.991	0.551	0.918	0.478	0.965	0.623	0.781	0.494
Fujian	0.737	0.594	0.880	0.510	0.920	0.732	0.985	0.649	0.980	0.827	0.996	0.715
Jiangxi	0.835	0.461	0.877	0.261	0.972	0.532	0.748	0.316	1.000	0.626	0.387	0.280
Shandong	1.000	0.549	0.951	0.647	0.966	0.593	0.997	0.702	0.974	0.651	0.998	0.706
Henan	0.795	0.358	0.946	0.603	0.308	0.252	0.997	0.659	0.786	0.492	0.991	0.660
Hubei	0.852	0.494	0.915	0.457	0.992	0.576	0.999	0.531	0.999	0.679	0.935	0.577
Hunan	1.000	0.398	0.994	0.373	0.909	0.418	0.927	0.428	0.877	0.516	0.820	0.484
Guangdong	0.891	0.569	0.991	0.477	0.978	0.656	0.995	0.562	0.998	0.725	0.920	0.571
Guangxi	0.722	0.475	0.831	0.425	0.895	0.572	0.956	0.524	0.983	0.687	0.998	0.607
Hainan	0.700	0.609	0.863	0.514	0.894	0.749	0.983	0.646	0.979	0.868	0.988	0.724
Chongqing	0.551	0.506	0.667	0.448	0.797	0.649	0.895	0.581	0.895	0.729	0.979	0.636
Sichuan	0.838	0.462	0.744	0.509	0.976	0.554	0.917	0.613	0.999	0.640	0.988	0.674
Guizhou	0.464	0.439	0.480	0.430	0.717	0.572	0.741	0.558	0.920	0.723	0.943	0.699
Yunnan	0.878	0.609	0.847	0.631	0.933	0.633	0.897	0.664	0.993	0.718	0.978	0.754
Shaanxi	0.624	0.530	0.673	0.505	0.822	0.643	0.856	0.619	0.936	0.741	0.963	0.709
Gansu	0.460	0.436	0.442	0.445	0.812	0.617	0.783	0.636	0.960	0.756	0.949	0.771
Qinghai	0.210	0.307	0.199	0.315	0.710	0.606	0.682	0.624	0.924	0.761	0.899	0.787
Ningxia	0.716	0.629	0.783	0.587	0.841	0.712	0.894	0.669	0.942	0.806	0.969	0.767
Xinjiang	0.972	0.749	0.947	0.784	0.999	0.803	0.993	0.870	0.990	0.832	0.999	0.912
Average	0.780	0.558	0.827	0.531	0.886	0.645	0.920	0.623	0.956	0.735	0.933	0.677