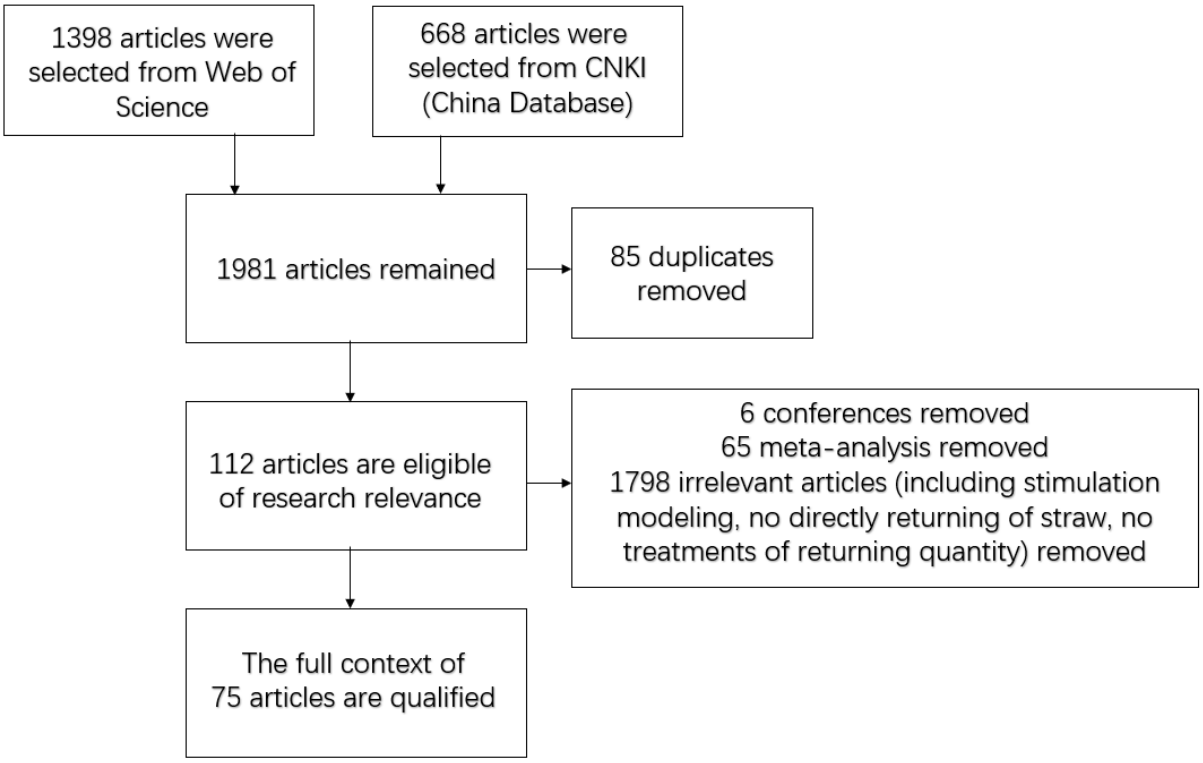
Supplementary

Figure S1. The flow chart of article selection regarding straw returning

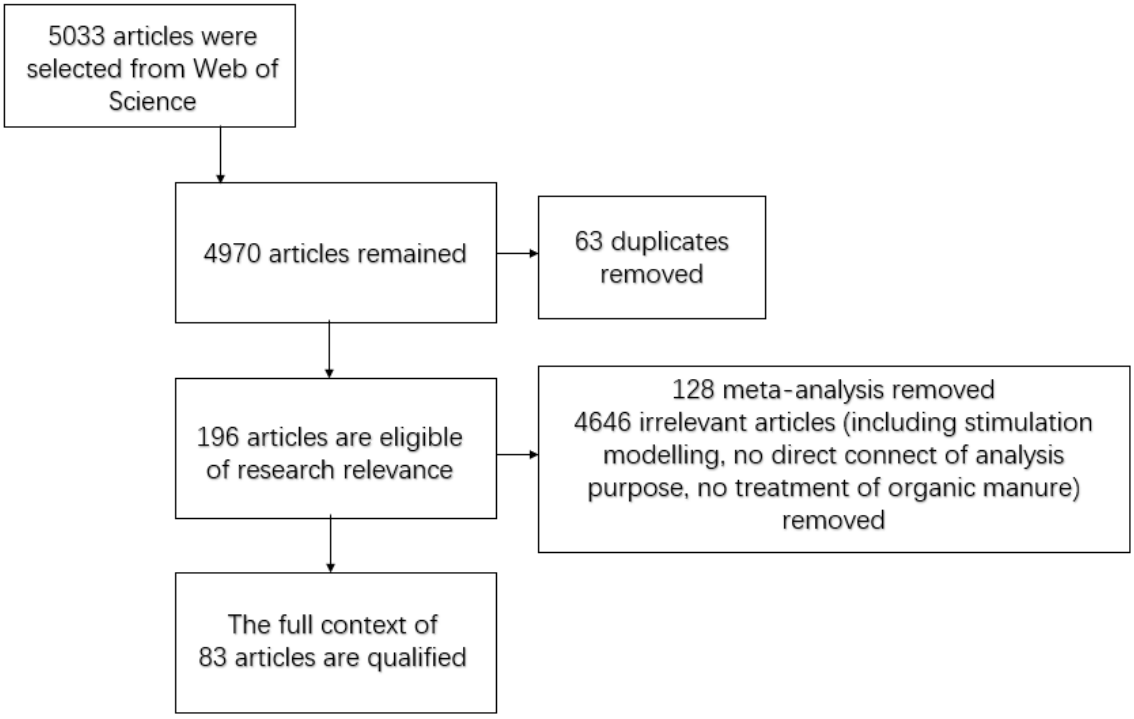


Note: Yield: Toward the impacts of respective factors of duration, quantity, category and form for crop yield, we selected 58 articles from 75 eligible articles again, which totally embodied 367 data. The whole processing procedure was identical as the foregoing statement. Under the yield sort, we drew forest plot of total, additionally, we classified 3 subordinate groups depended on the cultivation crop, namely, maize, rice, wheat.

SOC: Toward the impacts of respective factors of duration, quantity, category and form for SOC storage, we selected 37 articles from 75 eligible articles again, which totally embodied 211 data. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.

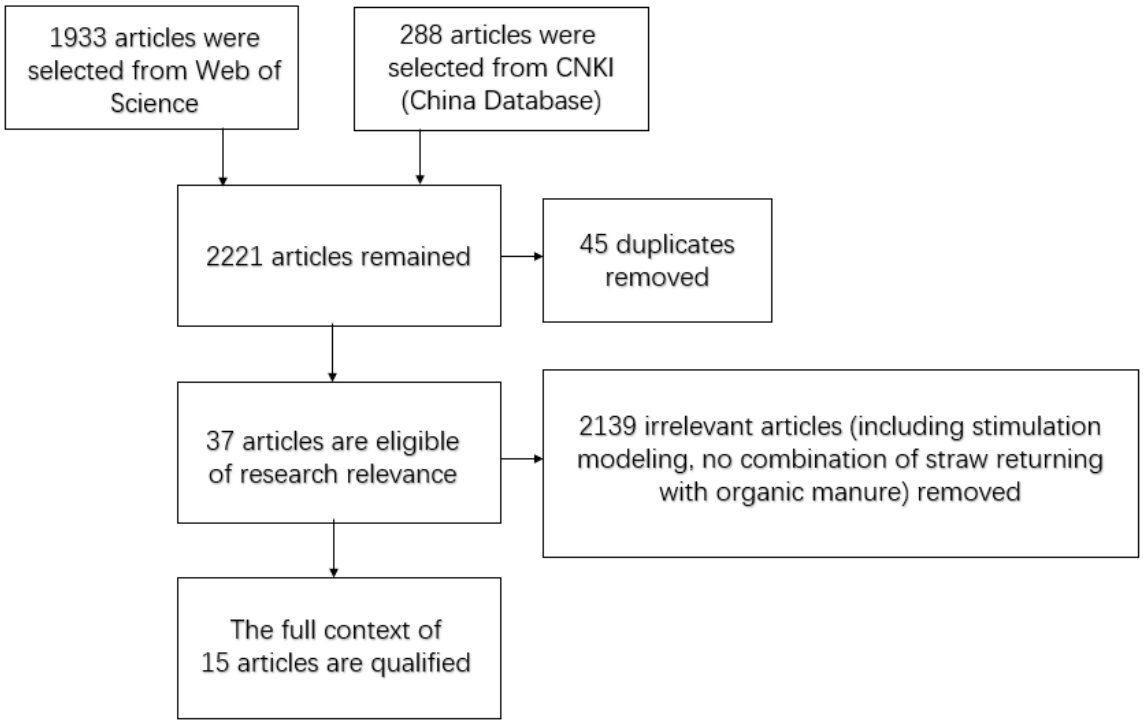
Soil Nutrient: We tested the total nitrogen (TN), available phosphorus (AP), available potassium (AK) as the repertoire of soil nutrients. Amid, we selected 27 articles from 75 eligible articles again, which completely included 140 data for TN, 28 articles from 75 eligible articles again, with 149 data for AP, 22 articles from 75 eligible articles again, with 90 data for AK respectively. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.

Figure S2. The flow chart of article selection regarding organic manure



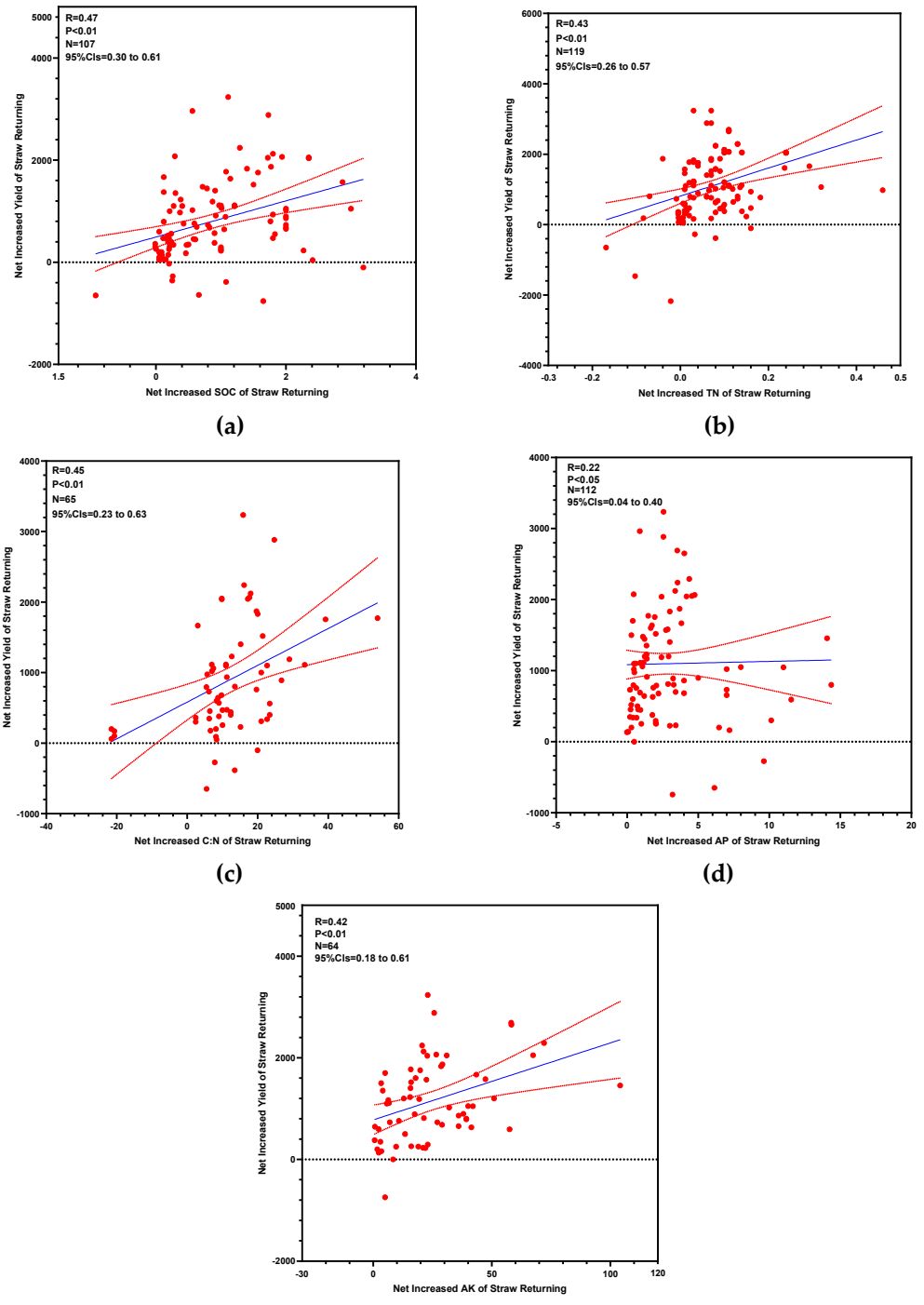
Note: Yield: Toward the impacts of respective factors of substitute, duration, and source for crop yield, we selected 63 articles from 83 eligible articles again, which totally embodied 731 data. The whole processing procedure was identical as the foregoing statement. Under the yield sort, we drew forest plot of total, additionally, we classified 3 subordinate groups depended on the cultivation crop, namely, maize, rice, wheat.
SOC: Toward the impacts of respective factors of substitute, duration, and source for SOC storage, we selected 50 articles from 83 eligible articles again, which totally embodied 440 data. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.
Soil Nutrient: We tested the total nitrogen (TN), available phosphorus (AP), available potassium (AK) as the repertoire of soil nutrients. Amid, we selected 44 articles from 83 eligible articles again, which completely included 259 data for TN, 20 articles from 83 eligible articles again, with 86 data for AP, 17 articles from 83 eligible articles again, with 78 data for AK respectively. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.

Figure S3. The flow chart of article selection regarding straw returning plus organic manure



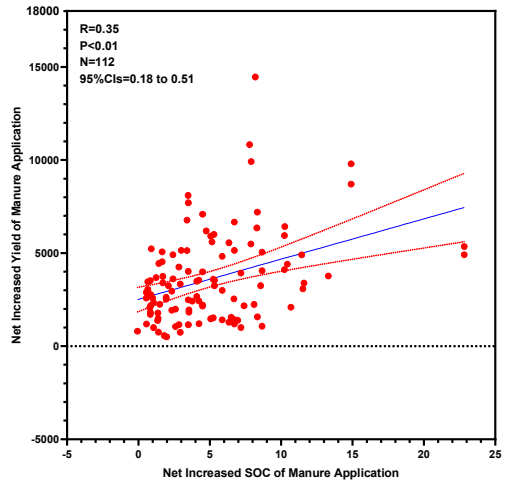
Note: Yield: Toward the impacts of respective factors of straw returning, organic manure, and straw returning plus organic manure for crop yield, we selected 8 articles from 15 eligible articles again, which totally embodied 28 data. The whole processing procedure was identical as the foregoing statement. Under the yield sort, we drew forest plot of total, additionally, we classified 3 subordinate groups depended on the cultivation crop, namely, maize, rice, wheat.
SOC: Toward the impacts of respective factors of straw returning, organic manure, and straw returning plus organic manure for SOC storage, we selected 10 articles from 15 eligible articles again, which totally embodied 21 data. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.
Soil Nutrient: We tested the total nitrogen (TN), available phosphorus (AP), available potassium (AK) as the repertoire of soil nutrients. Amid, we selected 8 articles from 15 eligible articles again, which completely included 17 data for TN, 7 articles from 15 eligible articles again, with 15 data for AP, 7 articles from 15 eligible articles again, with 15 data for AK respectively. The whole processing procedure was identical as the foregoing statement, the soil layer of 0-20cm will be considered as a necessary premise.

Figure S4. The correlation between yield and other variables of straw returning.

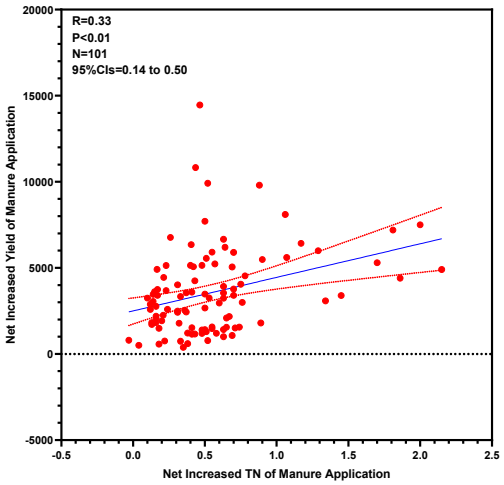


Note: The correlation figures between yield and SOC,TN,C:N,AP,AK were displayed respectively. In the process of computation, the net increased values were collected and computed because of preventing yield disparity of different crops. Amid, R means correlation coefficient, P<0.05 means significant correlation, N means sample number, 95%CIs means 95% confidence interval.

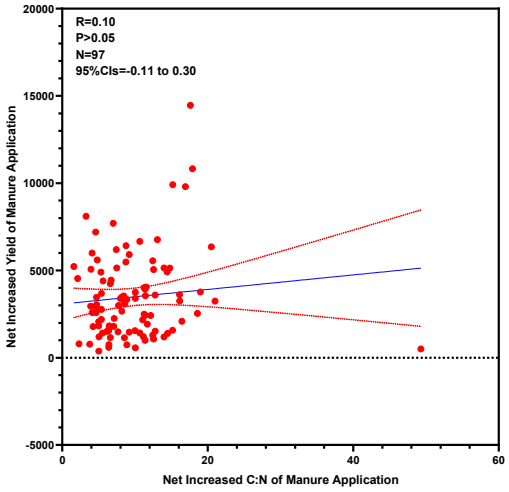
Figure S5. The correlation between yield and other variables of manure application.



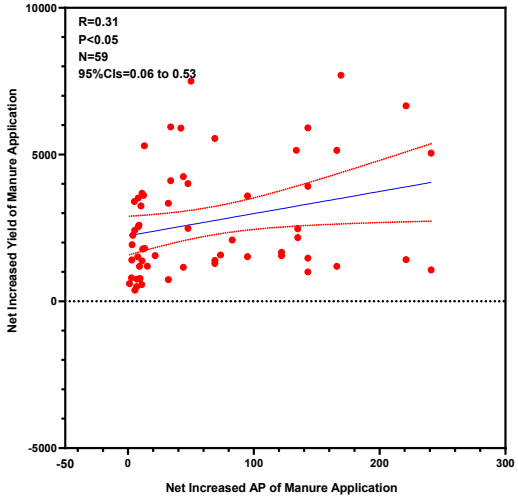
(a)



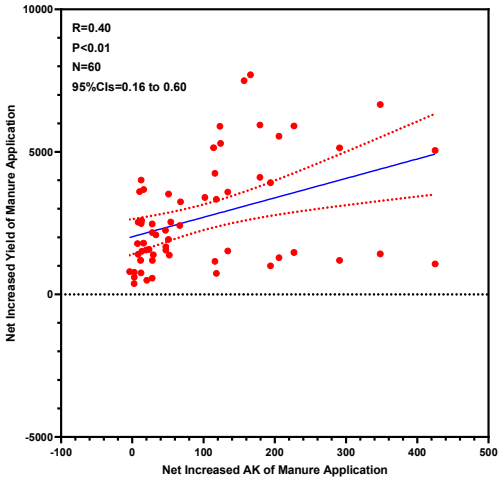
(b)



(c)



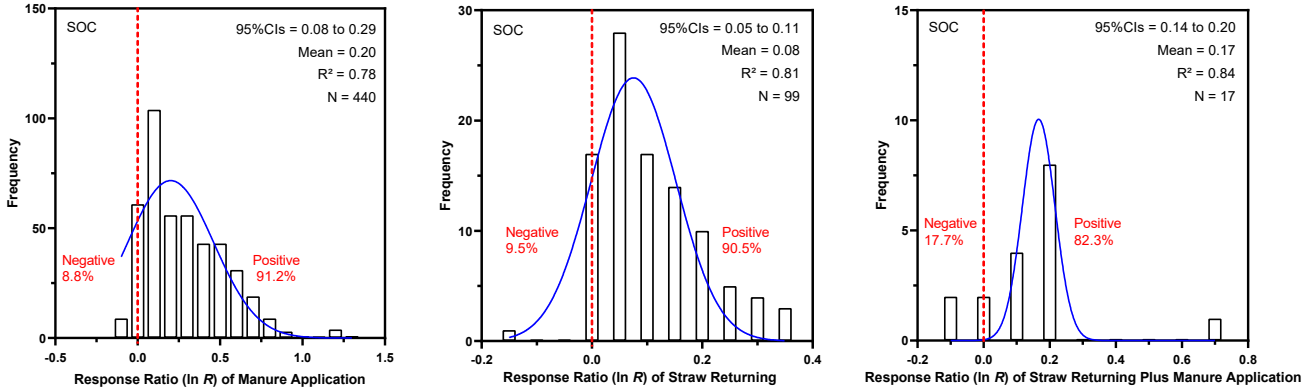
(d)



(e)

Note: The correlation figures between yield and SOC,TN,C:N,AP,AK were displayed respectively. In the process of computation, the net increased values were collected and computed because of preventing yield disparity of different crops. Amid, R means correlation coefficient, P<0.05 means significant correlation, N means sample number, 95%CIs means 95% confidence interval.

Figure S6. The frequency distribution diagrams of different organic amendments to SOC



(a) **(b)** **(c)**

Note: (a) The frequency distribution diagram of manure application to SOC; (b) the frequency distribution diagram of straw returning to SOC; (c) the frequency distribution diagram of straw returning plus manure application to SOC; amid, 95%CIs mean 95% confidence intervals, N means sample number, R means correlation coefficient.

Table S1. Brief circumstance of annual crop residues production between China and global aggregate

Area	Crop Residue Production	Prime Contribution (Proportional Rank)	Source
China	1040(MT)	1.Maize 2.Rice 3.Wheat	(Kumar et al., 2023) [1] (Chen et al., 2019) [2] (Fu et al., 2021) [3]
World	2445(MT)	1.Maize 2.Wheat 3.Rice	

Table S2. Succinct profile of annual livestock manure production in China

Area	Livestock Manure Production	Prime Contribution (Proportional Rank)	Source
China	3980(MT)	1.Cattle 1001(MT) 2.Chicken 415(MT) 3.Swine 414(MT)	(He et al., 2016) [4] (Su et al., 2022) [5]

Table S3. The selection qualification of articles in this meta-analysis

Number		Straw Returning	Organic Manure	Straw Plus Manure
1.	Time Limitation	Recent 10 years	Recent 10 years	Recent 10 years
2.	Experimental Country	China	China	China
3.	Research Outcome	At least including one of following indicators: Crop yield(Maize, Wheat, Rice), Soil organic carbon, soil nutrients (TN,AP,AK)	At least including one of following indicators: Crop yield(Maize, Wheat, Rice), Soil organic carbon, soil nutrients (TN,AP,AK)	At least including one of following indicators: Crop yield(Maize, Wheat, Rice), Soil organic carbon, soil nutrients (TN,AP,AK)
4.	Replication Number	At least outweigh or equal 2	At least outweigh or equal 2	At least outweigh or equal 2
5.	Experimental Setting	Field (No other accessory devices, For example plastic film or greenhouse)	Field (No other accessory devices, For example plastic film or greenhouse)	Field (No other accessory devices, For example plastic film or greenhouse)
6.	Soil Organic Carbon Sampling	0-20CM	0-20CM	0-20CM
7.	Soil Nutrients Sampling	0-20CM	0-20CM	0-20CM
8.	Yield Sampling	Only Maize or Rice or Wheat	Only Maize or Rice or Wheat	Only Maize or Rice or Wheat
9.	Straw Category	Only Maize or Rice or Wheat		No limitation (Because of the lack of articles)

10. Manure Category		Only Cattle or Pig or Chicken	No limitation (Because of the lack of articles)
11. Additional Requirement	Only sole kind of straw, mixed will be precluded (For example Maize+Rice)	Only sole kind of source, mixed will be precluded (For example Cattle+Pig)	No limitation (Because of the lack of articles)
12. Variable Control	No other variables which may interfere analysis Except demanded	No other variables which may interfere analysis Except demanded	No other variables which may interfere analysis Except demanded

Table S4. Data grouping of the management strategies in this meta-analysis.

Groups	1	2	3	4	5	6	7
			Straw return				
Duration (Year)	Long (T≥5)	Short (T<5)					
Quantity (kg/hm²)	Lower (SA<3000)	Low (3000≤SA<6000)	Middle (6000≤SA<9000)	High (9000≤SA<12000)	Higher (12000≤SA)		
Category	Maize Straw	Wheat Straw	Rice Straw				
Form	Biochar	Pelletized	Mulching	Incorporation	Deep Burial		
			Organic manure				
Source	Cattle	Pig	Chicken	Chemical			
Substitute Ratio (t/hm²)/(%)	Addition(H) (30t/hm²≤AR)	Addition(L) (AR<30t/hm²)	Extreme (80%<SP≤ 100%)	High (50%< SP≤ 80%)	Middle (30%< SP≤ 50%)	Low (0%< SP≤ 30%)	Nil (0%= SP)
Duration (Year)	Long (T ≥ 20)	Moderate (10 ≤ T < 20)	Short (T < 10)				
			Straw return plus Organic manure				
Modality	S+M (Straw + Manure)						

Table S5. The Rosenberg's fail-safe number (Nfs)

	Yield	SOC	TN	AP	AK
			Straw Returning		
Quantity	**Nfs: 28204**	**Nfs: 8103**	**Nfs: 16540**	**Nfs: 4695**	**Nfs: 4351**
	N: 212	**N: 96**	**N: 68**	**N: 92**	**N: 57**
Category	**Nfs: 30165**	**Nfs: 6494**	**Nfs: 16702**	**Nfs: 5959**	**Nfs: 8110**
	N: 212	**N: 96**	**N: 68**	**N: 92**	**N: 57**
Form	**Nfs: 15894**	**Nfs: 17006**	**Nfs: 37107**	**Nfs: 9554**	**Nfs: 6171**
	N: 200	**N: 225**	**N: 131**	**N: 122**	**N: 85**
Duration	**Nfs: 30477**	**Nfs: 5991**	**Nfs: 16642**	**Nfs: 5060**	**Nfs: 4696**
	N: 212	**N: 96**	**N: 68**	**N: 92**	**N: 57**
			Organic Manure		
Duration	**Nfs: 578855**	**Nfs: 107244**	**Nfs: 24821**	**Nfs: 23369**	**Nfs: 4613**
	N: 731	**N: 440**	**N: 259**	**N: 86**	**N: 78**
Source	**Nfs: 484965**	**Nfs: 83204**	**Nfs: 27386**	**Nfs: 8876**	**Nfs: 2652**
	N: 731	**N: 440**	**N: 259**	**N: 86**	**N: 78**
Substitute Ratio	**Nfs: 537448**	**Nfs: 100397**	**Nfs: 25943**	**Nfs: 13790**	**Nfs: 3298**
	N: 731	**N: 440**	**N: 259**	**N: 86**	**N: 78**
			Straw Returning Plus Organic Manure		
Modality	**Nfs: 1098**	**Nfs: 559**	**Nfs: 189**	**Nfs: 122**	**Nfs: 157**
	N: 26	**N: 17**	**N: 13**	**N: 13**	**N: 13**

Note: If Nfs was greater than 5N+10 (N was the amount of data), there was no publication bias.

Table S6. The correlation between crop yield and other variables in two different groups

Straw Returning	Correlation Coefficient (R)	Significance (P)	Sample Number	95% CIs
SOC	R=0.47	P<0.01**	N=107	0.30 to 0.61
TN	R=0.43	P<0.01**	N=119	0.26 to 0.57
C:N	R=0.45	P<0.01**	N=65	0.23 to 0.63
AP	R=0.22	P<0.05*	N=112	0.04 to 0.40
AK	R=0.42	P<0.01**	N=64	0.18 to 0.61
Manure Application				

SOC	R=0.35	P<0.01**	N=112	0.18 to 0.51
TN	R=0.33	P<0.01**	N=101	0.14 to 0.50
C:N	R=0.10	P>0.05	N=97	-0.11 to 0.30
AP	R=0.31	P<0.05*	N=59	0.06 to 0.53
AK	R=0.40	P<0.01**	N=60	0.16 to 0.60

Note: P>0.05, no significance; P<0.05, significance; P<0.01, high significance.

References

1. Kumar, N.; Chaudhary, A.; Ahlawat, O.P.; Naorem, A.; Upadhyay, G.; Chhokar, R.S.; Gill, S.C.; Khippal, A.; Tripathi, S.C.; Singh, G.P. Crop Residue Management Challenges, Opportunities and Way Forward for Sustainable Food-Energy Security in India: A Review. *Soil Till. Res.* **2023**, *228*.
2. Chen, J.H.; Gong, Y.Z.; Wang, S.Q.; Guan, B.Z.; Balkovic, J.; Kraxner, F. To Burn or Retain Crop Residues on Croplands? An Integrated Analysis of Crop Residue Management in China. *Sci. Total Environ.* **2019**, *662*, 141-150.
3. Fu, B.; Chen, L.; Huang, H.Y.; Qu, P.; Wei, Z.G. Impacts of Crop Residues on Soil Health: A Review. *Env. Pollut. Bioavail.* **2021**, *33*, 164-173.
4. He, Z.Q.; Pagliari, P.H.; Waldrip, H.M. Applied and Environmental Chemistry of Animal Manure: A Review. *Pedosphere* **2016**, *26*, 779-816.
5. Su, G.C.; Ong, H.C.; Zulkifli, N.W.M.; Ibrahim, S.; Chen, W.H.; Chong, C.T.; Ok, Y.S. Valorization of Animal Manure via Pyrolysis for Bioenergy: A Review. *J. Clean. Prod.* **2022**, *343*.