

Table S1. Observations used in the meta-analysis with corresponding values and subgroups.

Dataset Nr.	Measurement Duration (d)	Nr. of Replicates	Mean		SD		Type of Crop Residue	Application Type of Crop Residues	C/N Ratio	Residue Amount (Mg DM ha ⁻¹)	Reference
			N ₂ O Control (kg N ₂ O-N ha ⁻¹)	N ₂ O Treatment (kg N ₂ O-N ha ⁻¹)	Control (kg N ₂ O-N ha ⁻¹)	SD Treatment (kg N ₂ O-N ha ⁻¹)					
1	202	3	0.15	0.00	0.02 [§]	0.01 [§]	Maize	RT	> 100	-	Abalos et al. [1]
2	202	3	1.30	0.67	0.59 [§]	0.24 [§]	Maize	RT	> 100	-	Abalos et al. [1]
3	202	3	0.77	0.41	0.19 [§]	0.10 [§]	Maize	RT	> 100	-	Abalos et al. [1]
4	146	2	0.77	0.75	0.21	0.03	Maize	RT	50–75 [¶]	-	Baker et al. [2]
5	134	4	1.30	1.25	0.10	0.42	Maize	RT	50–75 [¶]	-	Baker et al. [2]
6	180	2	0.92	1.68	0.08 &	0.08 &	Maize	CT	50–75 [¶]	> 6	Congreves et al. [3]
7	180	2	0.97	1.13	1.24 &	1.41 &	Maize	NT	50–75 [¶]	> 6	Congreves et al. [3]
8	120	2	0.50	0.80	0.02 #	0.00 #	Soybean	CT	50–75 [¶]	-	Congreves et al. [3]
9	120	2	0.65	0.70	0.01 #	0.00 #	Soybean	NT	50–75 [¶]	-	Congreves et al. [3]
10	443	2	0.98	0.83	0.03	0.01	Maize, Wheat	CT	-	-	Dendooven et al. [4]
11	443	2	0.93	0.70	0.04	0.03	Maize, Wheat	NT	-	-	Dendooven et al. [4]
12	367	2	2.25	2.19	0.28 &	0.28 &	Wheat, Maize	NT	-	-	Dendooven et al. [5]
13	120	4	2.24	0.12	0.95	0.01	Sugar beet	CT	< 25 [¶]	4–6	Essich et al. [6]
14	365	3	0.54 [§]	0.40 [§]	0.02 §	0.02 §	Maize	CT	50–75 [¶]	-	Fan et al. [7]
15	365	3	0.52 [§]	0.49 [§]	0.06 §	0.03 §	Maize	NT	50–75 [¶]	-	Fan et al. [7]
16	365	3	0.74 [§]	0.55 [§]	0.05 §	0.01 §	Maize	CT	50–75 [¶]	-	Fan et al. [7]
17	365	3	0.60 [§]	0.48 [§]	0.05 §	0.05 §	Maize	NT	50–75 [¶]	-	Fan et al. [7]
18	183	3	1.04	0.71	0.19	0.08	Maize	NT	50–75 [¶]	-	Franco-Luesma et al. [8]
19	183	3	0.97	1.06	0.19	0.34	Maize	NT	50–75 [¶]	-	Franco-Luesma et al. [8]
20	365	3	0.48	0.70	0.48 #	0.58#	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
21	365	3	2.67	1.78	0.39 &	0.39 &	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
22	365	3	4.17	4.33	0.10 #	0.02 #	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
23	365	3	0.53	0.39	0.46 #	0.09 #	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
24	365	3	2.21	1.66	0.29 #	0.31 #	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
25	365	3	4.25	3.63	0.27 &	0.27 &	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
26	365	3	0.64	0.70	0.57 #	1.13 #	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
27	365	3	2.45	1.78	0.29 &	0.29 &	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
28	365	3	3.38	4.33	0.42 &	0.42 &	Maize	CT	50–75 [¶]	-	Guzman et al. [9]
29	365	3	0.52	0.39	0.04 #	0.42 #	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
30	365	3	1.71	1.66	0.06 #	0.09 #	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
31	365	3	3.26	3.63	1.28 #	1.33 #	Maize	NT	50–75 [¶]	-	Guzman et al. [9]
32	208	4	1.46	1.11	0.03	0.12	Wheat	CT	75–100	< 4	Guzman-Bustamante [10]

33	223	4	1.09	0.92	0.26	0.27	Wheat	CT	25–50	4–6	Guzman-Bustamante [10]
34	307	4	2.61	4.78	1.14 *	1.86 *	Wheat	CT	75–100 [¶]	-	Hao et al. [11]
35	307	4	0.76	1.40	0.33 *	0.55 *	Wheat	CT	75–100 [¶]	-	Hao et al. [11]
36	307	4	1.32	2.89	0.57 *	1.13 *	Wheat	CT	75–100 [¶]	-	Hao et al. [11]
37	365	3	0.94	0.77	0.09 #	0.02 #	Maize	RT, NT	25–50	-	Heller et al. [12]
38	117	3	2.05	1.89	0.78	0.43	Wheat	CT	50–75	4–6	Hu et al. [13]
39	254	3	0.51	0.49	0.49	0.02	Maize	CT	25–50	> 6	Hu et al. [13]
40	106	3	1.53	1.18	1.18	0.14	Wheat	CT	50–75	4–6	Hu et al. [13]
41	254	3	1.00	0.76	0.76	0.13	Maize	CT	25–50	>6	Hu et al. [13]
42	104	3	1.18 †	1.09 †	0.62 †	0.33 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
43	104	3	0.20 †	0.09 †	0.15 †	0.02 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
44	104	3	2.71 †	1.80 †	1.05 †	0.65 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
45	257	3	0.98 †	0.89 †	0.19 †	0.29 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
46	257	3	0.34 †	0.11 †	0.11 †	0.02 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
47	257	3	1.83 †	1.47 †	1.00 †	0.85 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
48	107	3	1.21 †	0.72 †	0.04 †	0.06 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
49	107	3	0.19 †	0.17 †	0.07 †	0.04 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
50	107	3	2.39 †	1.97 †	0.41 †	0.20 †	Wheat	NT	75–100 [¶]	-	Huang et al. [14]
51	259	3	1.43 †	0.75 †	0.65 †	0.46 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
52	259	3	0.64 †	0.30 †	0.17 †	0.05 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
53	259	3	1.96 †	1.50 †	0.63 †	0.56 †	Maize	CT	50–75 [¶]	-	Huang et al. [14]
54	365	3	1.39	0.69	0.62	0.09	Wheat	NT	75–100 [¶]	> 6	Jacinthe and Lal [15]
55	365	3	5.50	2.41	2.22	1.28	Wheat	NT	75–100 [¶]	> 6	Jacinthe and Lal [15]
56	365	3	1.19	0.69	0.38	0.09	Wheat	NT	75–100 [¶]	> 6	Jacinthe and Lal [15]
57	365	3	4.45	2.41	1.33	1.28	Wheat	NT	75–100 [¶]	> 6	Jacinthe and Lal [15]
58	365	4	3.50	2.80	0.20	0.20	Maize	NT, CT	50–75 [¶]	> 6	Jin et al. [16]
59	342	4	5.10	4.70	0.50	0.21	Maize	NT	50–75	> 6	Johnson and Barbour [17]
60	341	4	3.60	4.00	0.13	0.18	Maize	NT	50–75	> 6	Johnson and Barbour [17]
61	365	4	4.85	3.85	0.67	0.14	Maize	NT	50–75	> 6	Johnson and Barbour [17]
62	337	4	4.68	4.14	0.62	0.34	Maize	NT	50–75	> 6	Johnson and Barbour [17]
63	342	4	3.81	4.48	0.17	0.28	Maize	CT	50–75	> 6	Johnson and Barbour [17]
64	341	4	3.84	3.89	0.35	0.25	Maize	CT	50–75	> 6	Johnson and Barbour [17]
65	365	4	3.79	3.66	0.25	0.10	Maize	CT	50–75	> 6	Johnson and Barbour [17]
66	337	4	3.56	4.24	0.09	0.27	Maize	CT	50–75	> 6	Johnson and Barbour [17]
67	299	4	1.89	2.02	0.89 [§]	1.85 [§]	Rapeseed	CT	50–75	> 6	Kesenheimer et al. [18]
68	299	4	2.41	1.73	2.37 [§]	0.82 [§]	Rapeseed	RT	50–75	> 6	Kesenheimer et al. [18]
69	365	3	2.70	3.00	0.40	0.70	Maize	NT	50–75 [¶]	> 6	Lehman and Osborne [19]
70	365	3	1.20	0.60	0.30	0.10	Maize	NT	50–75 [¶]	> 6	Lehman and Osborne [19]
71	131	4	3.00	1.90	0.70	0.40	Wheat	CT	75–100	-	Liu et al. [20]

72	237	4	1.50	1.60	0.10	0.10	Maize	CT	50–75	-	Liu et al. [20]
73	69	4	0.44	0.31	0.04 #	0.09 #	Pea	CT	25–50 [¶]	4–6	Malhi et al. [21]
74	69	4	0.16	0.10	0.13 #	0.17 #	Pea	CT	25–50 [¶]	4–6	Malhi et al. [21]
75	69	4	0.17	0.15	0.07 *	0.06 *	Pea	NT	25–50 [¶]	4–6	Malhi et al. [21]
76	69	4	0.10	0.04	0.04 *	0.02 *	Pea	NT	25–50 [¶]	4–6	Malhi et al. [21]
77	108	4	0.43	0.48	0.48 #	0.24 #	Wheat	CT	75–100 [¶]	4–6	Malhi et al. [21]
78	108	4	0.04	0.02	0.02 #	0.18 #	Wheat	CT	75–100 [¶]	4–6	Malhi et al. [21]
79	108	4	0.25	0.11	0.11 *	0.04 *	Wheat	NT	75–100 [¶]	4–6	Malhi et al. [21]
80	108	4	0.06	0.07	0.07 *	0.03 *	Wheat	NT	75–100 [¶]	4–6	Malhi et al. [21]
81	114	4	0.28	0.24	0.12 *	0.09 *	Rapeseed	CT	50–75 [¶]	-	Malhi and Lemke [22]
82	114	4	0.04	0.03	0.02 *	0.01 *	Rapeseed	CT	50–75 [¶]	-	Malhi and Lemke [22]
83	114	4	0.23	0.20	0.10 *	0.01 *	Rapeseed	NT	50–75 [¶]	-	Malhi and Lemke [22]
84	114	4	0.04	0.02	0.02 *	0.08 *	Rapeseed	NT	50–75 [¶]	-	Malhi and Lemke [22]
85	75	4	0.14	0.12	0.06 *	0.05 *	Barley	CT	75–100 [¶]	< 4	Malhi and Lemke [22]
86	75	4	0.10	0.10	0.04 *	0.04 *	Barley	CT	75–100 [¶]	< 4	Malhi and Lemke [22]
87	75	4	0.15	0.14	0.07 *	0.06 *	Barley	NT	75–100 [¶]	< 4	Malhi and Lemke [22]
88	75	4	0.09	0.08	0.04 *	0.03 *	Barley	NT	75–100 [¶]	< 4	Malhi and Lemke [22]
89	140	4	1.30	1.18	0.57 *	0.46 *	Pea	CT	25–50 [¶]	< 4	Malhi and Lemke [22]
90	140	4	0.08	0.08	0.04 *	0.03 *	Pea	CT	25–50 [¶]	< 4	Malhi and Lemke [22]
91	140	4	0.67	0.80	0.29 *	0.31 *	Pea	NT	25–50 [¶]	< 4	Malhi and Lemke [22]
92	140	4	0.16	0.10	0.07 *	0.04 *	Pea	NT	25–50 [¶]	< 4	Malhi and Lemke [22]
93	190	4	0.83	0.82	0.36 *	0.32 *	Wheat	CT	75–100 [¶]	4–6	Malhi and Lemke [22]
94	190	4	0.47	0.52	0.21 *	0.20 *	Wheat	CT	75–100 [¶]	4–6	Malhi and Lemke [22]
95	190	4	1.13	1.02	0.49 *	0.40 *	Wheat	NT	75–100 [¶]	4–6	Malhi and Lemke [22]
96	190	4	0.29	0.32	0.13 *	0.13 *	Wheat	NT	75–100 [¶]	4–6	Malhi and Lemke [22]
97	119	3	1.45	1.10	0.16	0.19	Maize	CT	25–50	4–6	Maris et al. [23]
98	119	3	1.83	0.83	0.27	0.27	Maize	CT	25–50	> 6	Maris et al. [23]
99	119	3	1.41	1.05	0.06	0.11	Maize	CT	25–50	> 6	Maris et al. [23]
100	121	3	1.67	2.09	0.71	0.45	Maize	CT	50–75	> 6	Maris et al. [23]
101	121	3	1.41	1.76	0.13	0.56	Maize	CT	50–75	> 6	Maris et al. [23]
102	121	3	1.44	1.21	0.77	0.52	Maize	CT	50–75	> 6	Maris et al. [23]
103	237	3	0.67*	1.93*	0.29*	0.75 *	Barley	NT	75–100 [¶]	-	Mutegi et al. [24]
104	237	3	1.14*	1.48*	0.49*	0.58 *	Barley	RT	75–100 [¶]	-	Mutegi et al. [24]
105	237	3	2.50*	1.91*	1.08*	0.74 *	Barley	CT	75–100 [¶]	-	Mutegi et al. [24]
106	120	3	0.36	0.38	0.04#	0.06 #	Maize	CT	50–75 [¶]	4–6	Nath et al. [25]
107	120	3	0.42	0.44	0.04#	0.10 #	Maize	NT	50–75 [¶]	4–6	Nath et al. [25]
108	89	3	1.82	0.69	0.11	0.44	Wheat	CT	75–100 [¶]	4–6	Nawaz et al. [26]
109	213	3	1.54	0.23	0.79	0.09	Cauliflower	RT	< 25	> 6	Nett et al. [27]
110	213	3	1.02	0.09	0.29	0.11	Cauliflower	RT	< 25	> 6	Nett et al. [27]

111	213	3	1.33	0.67	0.16	0.15	Cauliflower	RT	< 25	> 6	Nett et al. [27]
112	365	4	0.77	0.44	0.14 §	0.10 §	Sugarcane	NT	50–75	> 6	Pinheiro et al. [28]
113	365	4	1.05	0.51	0.13 §	0.16 §	Sugarcane	NT	50–75	> 6	Pinheiro et al. [28]
114	365	4	0.49	0.44	0.05 §	0.10 §	Sugarcane	NT	50–75	4–6	Pinheiro et al. [28]
115	365	4	0.64	0.51	0.11 §	0.16 §	Sugarcane	NT	50–75	4–6	Pinheiro et al. [28]
116	365	4	0.70	0.44	0.06 §	0.10 §	Sugarcane	NT	50–75	> 6	Pinheiro et al. [28]
117	365	4	0.81	0.51	0.04 §	0.16 §	Sugarcane	NT	50–75	> 6	Pinheiro et al. [28]
118	365	4	3.43	5.32	0.57 #	0.11 #	Sugarcane	NT	> 100	> 6	Pitombo et al. [29]
119	365	4	4.55	5.32	0.71 #	0.61 #	Sugarcane	NT	> 100	4–6	Pitombo et al. [29]
120	365	4	3.20	5.32	1.00 #	0.09 #	Sugarcane	NT	> 100	>6	Pitombo et al. [29]
121	82	4	0.49 §	0.29 §	0.09 §	0.02 §	Icesalat	CT	< 25 [¶]	-	Seiz et al. [30]
122	195	4	40.14 §	7.52 §	6.68 §	1.51 §	Broccoli	CT	< 25 [¶]	-	Seiz et al. [30]
123	112	4	3.68 §	1.69 §	0.60 §	0.25 §	Cauliflower	CT	< 25 [¶]	-	Seiz et al. [30]
124	119	4	3.85 §	1.39 §	1.26 §	0.41 §	Broccoli	CT	< 25 [¶]	-	Seiz et al. [30]
125	243	3	1.12	0.89	0.32	0.19	Maize	NT	50–75 [¶]	-	Tan et al. [31]
126	243	3	0.77	0.73	0.26	0.10	Maize	CT	50–75 [¶]	-	Tan et al. [31]
127	243	3	1.79	1.24	0.03	0.10	Maize	NT	50–75 [¶]	-	Tan et al. [31]
128	243	3	1.00	1.46	0.23	0.24	Maize	CT	50–75 [¶]	-	Tan et al. [31]
129	122	3	1.83	2.81	0.22	0.54	Wheat	NT	75–100 [¶]	-	Tan et al. [31]
130	122	3	1.06	1.20	0.24	0.14	Wheat	CT	75–100 [¶]	-	Tan et al. [31]
131	122	3	3.65	3.30	1.43	0.66	Wheat	NT	75–100 [¶]	-	Tan et al. [31]
132	122	3	2.52	1.42	0.48	0.35	Wheat	CT	75–100 [¶]	-	Tan et al. [31]
133	243	3	0.56	1.06	0.18	0.33	Maize	NT	50–75 [¶]	-	Tan et al. [31]
134	243	3	1.22	0.92	0.16	0.17	Maize	CT	50–75 [¶]	-	Tan et al. [31]
135	243	3	2.50	1.06	0.74	0.32	Maize	NT	50–75 [¶]	-	Tan et al. [31]
136	243	3	1.52	0.83	0.39	0.12	Maize	CT	50–75 [¶]	-	Tan et al. [31]
137	122	3	1.66	2.19	0.17	0.15	Wheat	NT	75–100 [¶]	-	Tan et al. [31]
138	122	3	1.51	1.41	0.49	0.19	Wheat	CT	75–100 [¶]	-	Tan et al. [31]
139	122	3	3.37	2.49	0.54	0.32	Wheat	NT	75–100 [¶]	-	Tan et al. [31]
140	122	3	1.69	1.37	0.12	0.24	Wheat	CT	75–100 [¶]	-	Tan et al. [31]
141	209	3	1.58	1.19	0.18	0.12	Wheat	RT	75–100 [¶]	4–6	Wang et al. [32]
142	207	3	1.72	1.30	0.19	0.09	Wheat	RT	75–100 [¶]	4–6	Wang et al. [32]
143	201	3	1.11	0.74	0.10	0.05	Wheat	RT	75–100 [¶]	4–6	Wang et al. [32]
144	126	4	0.81	0.94	0.13	0.14	Soybean	NT	25–50 [¶]	-	Wegner et al. [33]
145	126	4	0.66	0.89	0.25	0.20	Maize	NT	50–75 [¶]	-	Wegner et al. [33]
146	112	4	0.77	0.89	0.16	0.11	Soybean	NT	25–50 [¶]	-	Wegner et al. [33]
147	112	4	0.57	0.89	0.09	0.10	Maize	NT	50–75 [¶]	-	Wegner et al. [33]
148	91	4	0.19	0.25	0.07	0.02	Soybean	NT	25–50 [¶]	-	Wegner et al. [33]
149	91	4	0.18	0.20	0.04	0.04	Maize	NT	50–75 [¶]	-	Wegner et al. [33]

150	236	3	0.37	0.25	0.03	0.05	Maize	CT	75–100	> 6	Xu et al. [34]
151	236	3	0.93	0.95	0.08	0.15	Maize	CT	75–100	> 6	Xu et al. [34]
152	99	3	1.20	1.72	0.12	0.10	Wheat	NT	75–100	-	Yao et al. [35]
153	246	3	0.71	1.07	0.05	0.15	Maize	RT	50–75	-	Yao et al. [35]
154	155	3	2.23	2.18	0.13	0.08	Wheat	CT	75–100	-	Yao et al. [35]
155	183	3	0.14	0.13	0.03	0.04	Soybean	CT	50–75	< 4	Yazaki et al. [36]
156	183	3	0.08	0.10	0.06	0.06	Soybean	NT	50–75	< 4	Yazaki et al. [36]
157	183	3	0.42	0.49	0.10	0.14	Soybean	CT	50–75	< 4	Yazaki et al. [36]
158	183	3	0.44	0.38	0.14	0.06	Soybean	NT	50–75	< 4	Yazaki et al. [36]
159	183	3	0.56	0.37	0.25	0.20	Wheat	CT	50–75	4–6	Yazaki et al. [36]
160	183	3	0.35	0.28	0.14	0.10	Wheat	NT	50–75	4–6	Yazaki et al. [36]
161	183	3	0.27	0.24	0.07	0.03	Wheat	CT	> 100	> 6	Yazaki et al. [36]
162	183	3	0.20	0.54	0.08	0.02	Wheat	NT	> 100	> 6	Yazaki et al. [36]
163	183	3	0.70	0.58	0.36	0.26	Wheat	CT	> 100	4–6	Yazaki et al. [36]
164	183	3	0.82	0.87	0.36	0.27	Wheat	NT	> 100	4–6	Yazaki et al. [36]
165	131	3	2.04	2.42	0.36 [#]	0.43 [#]	Wheat	CT	75–100 [¶]	-	Yeboah et al. [37]
166	131	3	1.70	2.11	0.02 [#]	0.04 [#]	Wheat	NT	75–100 [¶]	-	Yeboah et al. [37]
167	169	3	2.92	3.08	0.31 [#]	0.26 [#]	Wheat	CT	75–100 [¶]	4–6	Yeboah et al. [37]
168	169	3	2.31	2.47	0.13 [#]	0.17 [#]	Wheat	NT	75–100 [¶]	4–6	Yeboah et al. [37]
169	170	3	2.00	2.12	0.41 [#]	0.58 [#]	Pea	CT	25–50 [¶]	< 4	Yeboah et al. [37]
170	170	3	1.67	1.84	0.32 [#]	0.09 [#]	Pea	NT	25–50 [¶]	< 4	Yeboah et al. [37]
171	150	4	5.67	13.22	0.74 [#]	1.85 [#]	Maize	CT	50–75 [¶]	> 6	Yuan et al. [38]
172	150	4	8.10	10.41	0.19 [#]	0.17 [#]	Maize	NT	50–75 [¶]	> 6	Yuan et al. [38]
173	150	4	6.22	9.50	0.17 [#]	0.18 [#]	Maize	CT	50–75 [¶]	> 6	Yuan et al. [38]
174	150	4	3.15	2.37	0.14 [#]	0.44 [#]	Maize	NT	50–75 [¶]	> 6	Yuan et al. [38]
175	100	4	4.10	4.69	0.02 [#]	0.02 [#]	Maize	CT	50–75 [¶]	> 6	Yuan et al. [38]
176	100	4	1.69	1.61	0.70 [#]	0.40 [#]	Maize	NT	50–75 [¶]	> 6	Yuan et al. [38]

RT, reduced tillage; CT, conventional tillage; NT, zero or no-tillage. [#] obtained through Imputation. [§] received through personal contact. * from meta-analysis “Shan and Yan [39]”. [†] from study “Huang et al. [40]” estimated C/N value.

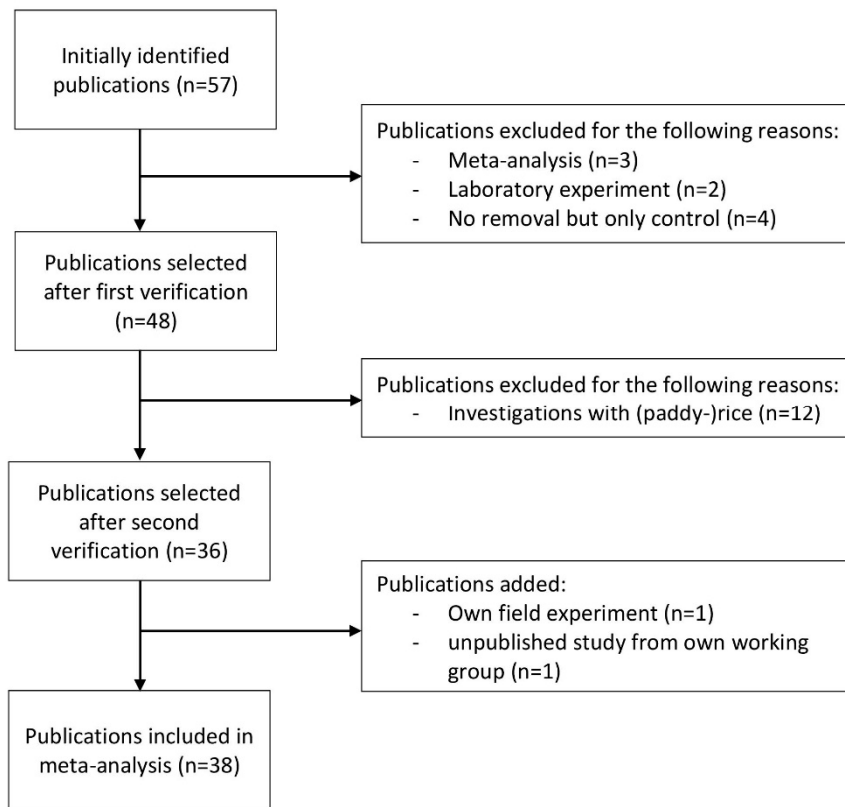


Figure S1. Flow chart for the selection process of the meta-analysis.

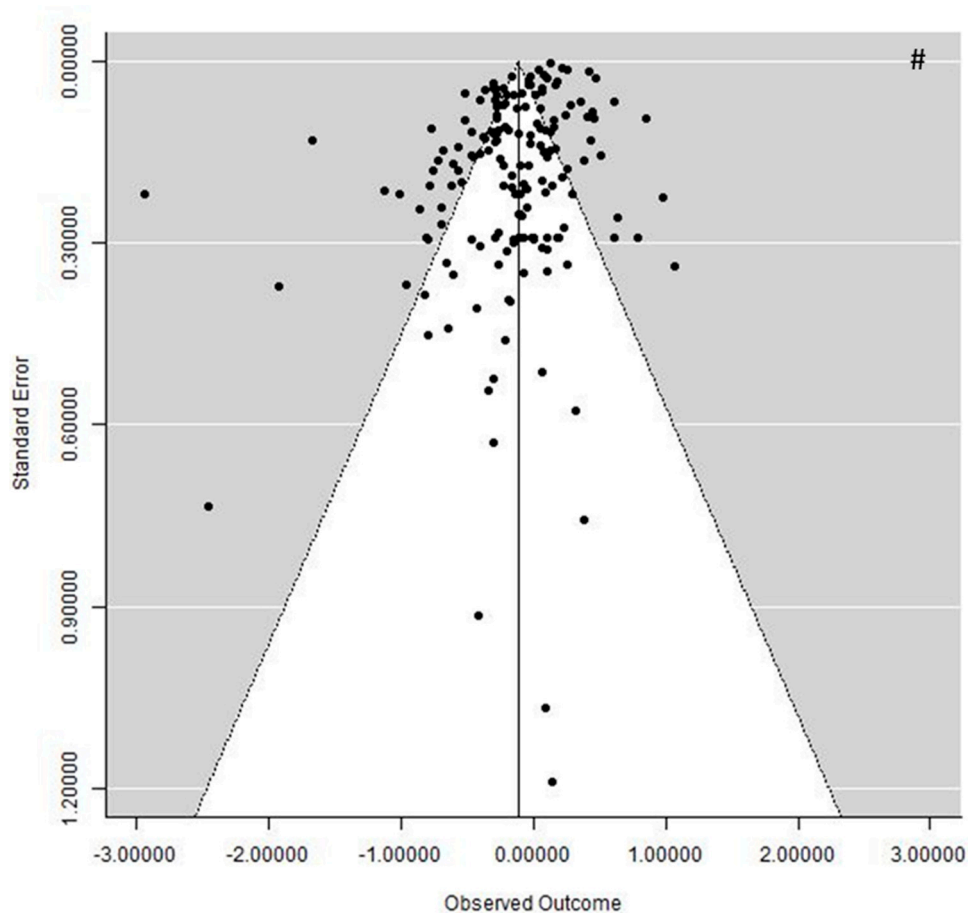


Figure S2. Funnel plot of effect size distribution around the overall mean effect size.

excluding three observations from three studies [1,21,22] with extremely high standard errors by setting limits (x-axis: -3 – $+3$; y-axis: 0 – 1.2).

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