

Supporting Information

Crowder and Reganold 10.1073/pnas.1423674112

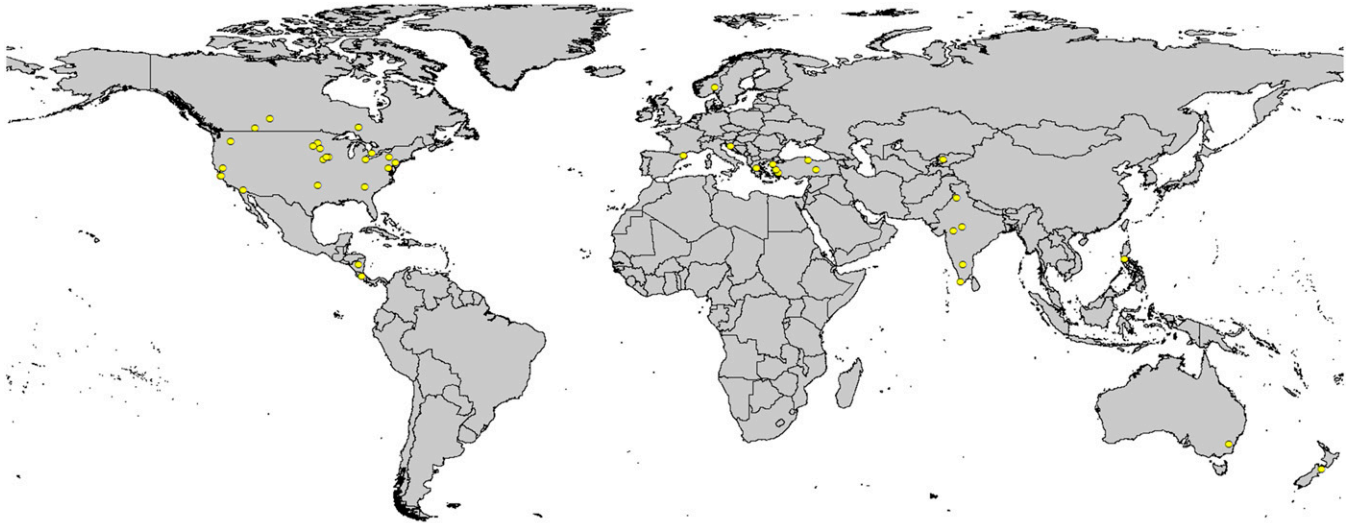


Fig. S1. Locations of the 44 studies included in our global meta-analysis.

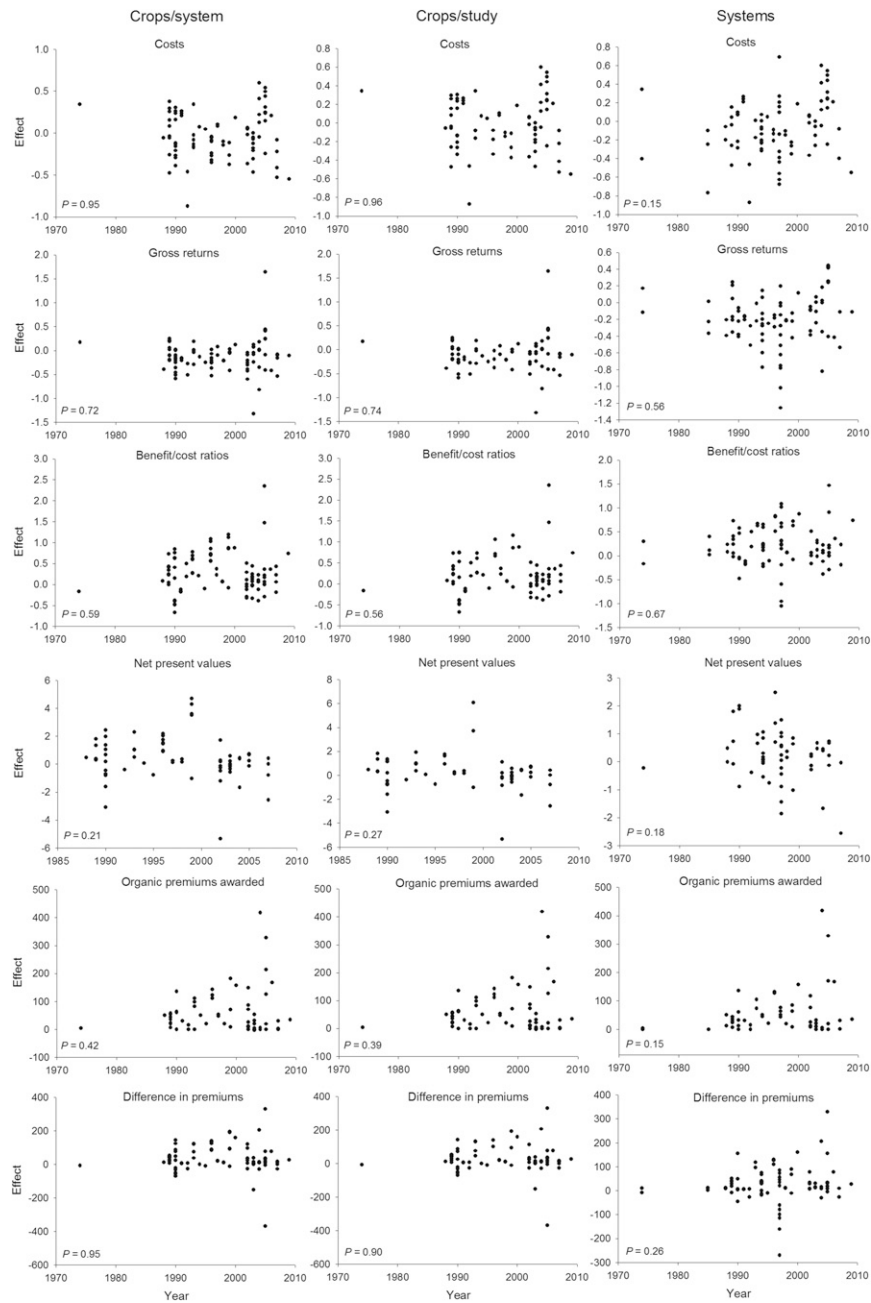


Fig. S2. Variation in effects based on the year studies were initiated. Shown are effect sizes for costs (log response-ratio), gross returns without premiums (log response-ratio), benefit/cost ratios with premiums (log response-ratio), net present values with premiums (Hedges d), organic premiums awarded, and the differences between premiums awarded and breakeven premiums needed for organic net present values to match conventional net present values for organic crops and systems compared with their conventional counterparts. The x axis in each panel is the year studies in the meta-analysis were initiated. All regressions were not significant, indicating that effects did not vary significantly over time.

Table S1. Financial performance of organic compared with conventional agriculture: Crops per system

Variable	<i>N</i>	Mean	SE	Median	SE	SR ⁺	<i>P</i>
Total costs	91	-0.027	0.029	-0.050	0.034	-226.5	0.36
Variable costs	62	0.012	0.034	-0.010	0.039	13.0	0.92
Fixed costs	36	0.020	0.060	0.015	0.033	11.0	0.86
Labor costs	38	0.20	0.073	0.13	0.039	186.0	0.0013
Gross without premiums	91	-0.12	0.035	-0.10	0.030	-1,054.0	<0.0001
Gross with premiums	91	0.25	0.051	0.19	0.058	1198.0	<0.0001
B/C without premiums	91	-0.085	0.036	-0.070	0.043	-585.0	0.016
B/C with premiums	91	0.28	0.050	0.22	0.048	1170.5	<0.0001

Shown are the mean and median effect sizes and their SEs using log response-ratios for costs, gross returns, and benefit/cost (B/C) ratios comparing organic crops (per system) with their conventional counterparts. Distributions of effect sizes were nonnormal, so we used nonparametric statistics [Wilcoxon signed-rank test (SR)] to analyze if effect sizes differed from 0. Values >0 indicate that costs, returns, or benefit/cost ratios were greater in organic crops, whereas values <0 indicate effect sizes were greater in conventional crops.

Table S2. Financial performance of organic compared with conventional agriculture: Crops per study

Variable	<i>N</i>	Mean	SE	Median	SE	SR ⁺	<i>P</i>
Total costs	77	-0.011	0.032	-0.040	0.052	-37.0	0.85
Variable costs	52	0.013	0.039	-0.030	0.046	27.5	0.79
Fixed costs	30	0.082	0.067	0.045	0.044	60.0	0.18
Labor costs	35	0.17	0.076	0.11	0.044	140.0	0.0067
Gross without premiums	77	-0.10	0.039	-0.10	0.034	-624.5	0.0005
Gross with premiums	77	0.20	0.057	0.14	0.054	700.5	0.0002
B/C without premiums	77	-0.082	0.041	-0.070	0.052	-404.0	0.036
B/C with premiums	77	0.22	0.053	0.17	0.053	701.0	<0.0001

Shown are the mean and median effect sizes and their SEs using log response-ratios for costs, gross returns, and benefit/cost ratios comparing organic crops (per study) with their conventional counterparts. Distributions of effect sizes were nonnormal, so we used nonparametric statistics (Wilcoxon signed-rank test) to analyze if effect sizes differed from 0. Values >0 indicate that costs, returns, or benefit/cost ratios were greater in organic crops, whereas values <0 indicate effect sizes were greater in conventional crops.

Table S3. Financial performance of organic compared with conventional agriculture: Systems

Variable	<i>N</i>	Mean	SE	Median	SE	SR ⁺	<i>P</i>
Total costs	84	-0.064	0.033	-0.060	0.044	-405.0	0.061
Variable costs	49	-0.095	0.049	-0.10	0.060	-178.5	0.067
Fixed costs	36	0.051	0.060	0.025	0.025	71.0	0.21
Labor costs	40	0.14	0.067	0.070	0.038	145.0	0.034
Gross without premiums	84	-0.19	0.034	-0.21	0.036	-1,063.0	<0.0001
Gross with premiums	84	0.13	0.043	0.090	0.033	684.5	0.0018
B/C without premiums	84	-0.12	0.041	-0.080	0.036	-536.5	0.014
B/C with premiums	84	0.21	0.045	0.18	0.046	945.0	<0.0001

Shown are the mean and median effect sizes and their SEs using log response-ratios for costs, gross returns, and benefit/cost ratios comparing organic systems with their conventional counterparts. Distributions of effect sizes were nonnormal, so we used nonparametric statistics (Wilcoxon signed-rank test) to analyze if effect sizes differed from 0. Values >0 indicate that costs, returns, or benefit/cost ratios were greater in organic systems, whereas values <0 indicate effect sizes were greater in conventional systems.

Table S4. Financial performance of organic compared with conventional agriculture using weighted effect sizes: Crops per system

Variable	<i>N</i>	Log RR (weighted)			Hedges <i>d</i>		
		Median	SR ⁺	<i>P</i>	Median	SR ⁺	<i>P</i>
Total costs	48	-0.060	-152.5	0.12	-0.31	-87.0	0.38
Variable costs	23	-0.020	-33.0	0.19	-0.19	-25.0	0.46
Fixed costs	11	0.060	20.5	0.031	0.47	17.0	0.14
Labor costs	18	0.0	22.5	0.018	0.74	33.0	0.061
Net present value without premium	70				-0.38	-673.0	<0.0001
Net present value with premium	70				0.35	513.5	0.0016
Gross without premium	70	-0.11	-819.5	<0.0001	-0.52	-849.5	<0.0001
Gross with premium	70	0.15	617.5	0.0002	0.47	485.5	0.0038
B/C without premium	70	-0.065	-331.0	0.038	-0.27	-379.0	0.026
B/C with premium	70	0.16	712.5	<0.0001	0.52	723.5	<0.0001

Median effect sizes comparing organic crops (per system) with their conventional counterparts using log response-ratio (RR) with weighting or Hedges *d*. Values >0 indicate that effect sizes were greater in organic crops, whereas values <0 indicate that effect sizes were greater in conventional crops.

Table S5. Financial performance of organic compared with conventional agriculture using weighted effect sizes: Crops per study

Variable	<i>N</i>	Log RR (weighted)			Hedges <i>d</i>		
		Median	SR ⁺	<i>P</i>	Median	SR ⁺	<i>P</i>
Total costs	44	-0.075	-164.5	0.054	-0.47	-123.0	0.15
Variable costs	22	-0.025	-37.5	0.23	-0.29	-31.0	0.33
Fixed costs	12	0.030	3.0	0.81	0.25	-6.0	0.66
Labor costs	16	0.0	13.0	0.078	0.38	20.5	0.16
Net present value without premium	56				-0.36	-420.5	0.0002
Net present value with premium	56				0.22	189.5	0.11
Gross without premium	56	-0.11	-466.0	<0.0001	-0.45	-487.5	<0.0001
Gross with premium	56	0.055	252.0	0.038	0.20	166.0	0.18
B/C without premium	56	-0.045	-208.0	0.073	-0.21	-246.5	0.043
B/C with premium	56	0.095	358.5	0.0007	0.38	382.0	0.0013

Median effect sizes comparing organic crops (per study) with their conventional counterparts using log response-ratio with weighting or Hedges *d* value. Values >0 indicate that effect sizes were greater in organic crops, whereas values <0 indicate that effect sizes were greater in conventional crops.

Table S6. Financial performance of organic compared with conventional agriculture using weighted effect sizes: Systems

Variable	N	Log RR (weighted)			Hedges <i>d</i>		
		Median	SR ⁺	P	Median	SR ⁺	P
Total costs	42	-0.10	-239.5	0.0011	-0.57	-212.5	0.0063
Variable costs	21	-0.030	-32.5	0.27	-0.18	-33.0	0.26
Fixed costs	11	-0.020	-2.5	0.83	-0.15	-12.0	0.32
Labor costs	12	0.0	9.0	0.094	0.38	17.5	0.084
Net present value without premium	59				-0.37	-545.5	<0.0001
Net present value with premium	59				0.23	314.0	0.017
Gross without premium	59	-0.17	-619.0	<0.0001	-0.65	-634.0	<0.0001
Gross with premium	59	0.050	213.5	0.11	0.18	192.0	0.15
B/C without premium	59	-0.070	-288.0	0.024	-0.17	-301.0	0.022
B/C with premium	59	0.13	479.5	<0.0001	0.42	509.0	<0.0001

Median effect sizes comparing organic systems with their conventional counterparts using log response-ratio with weighting or Hedges *d*. Values >0 indicate that effect sizes were greater in organic systems, whereas values <0 indicate that effect sizes were greater in conventional systems.

Table S7. Price premiums for organically grown crops and systems

Variable	Premium awarded				Premium to match conventional				Difference				SR ⁺	P
	Mean	SE	Median	SE	Mean	SE	Median	SE	Mean	SE	Median	SE		
Crops per system	59.2	7.7	31.7	9.1	18.9	7.6	5.09	4.6	40.3	8.6	21.9	7.2	1,423.0	<0.0001
Crops per study	49.3	8.5	20.6	6.4	20.3	8.9	4.50	4.1	29.0	9.3	15.3	4.0	876.5	<0.0001
Systems	48.5	8.8	29.5	6.0	19.1	5.8	7.05	4.4	27.2	8.0	16.9	6.8	1,042.0	<0.0001

Shown are the mean and median premiums awarded (and their SEs) for organic crops and farming systems; also shown are the mean and median premiums (and their SEs) that were needed for organic crops or systems to match the net present values of their conventional counterparts. The differences between the premium awarded and the premium needed to match conventional are also shown. The distribution of differences between awarded premiums and premiums to match conventional were nonnormal, so we used nonparametric statistics to evaluate whether these values were significantly different from 0 (Wilcoxon signed-rank test statistics shown). Values >0 indicate that the premiums awarded were significantly greater than the premiums needed to match conventional.

Table S8. Sensitivity of organic-to-conventional effect sizes comparing total costs

Variable	Crops/system		Crops/study		Systems	
	F	P	F	P	F	P
Crop type	0.64	0.74	0.44	0.89	1.31	0.26
Continent	0.17	0.95	0.17	0.95	1.23	0.31
Study duration	1.08	0.37	1.02	0.40	1.68	0.19
Rotation length	0.83	0.48	1.43	0.25	2.93	0.041
Annual/perennial	0.29	0.59	0.53	0.47	0.86	0.43
Legume/not legume	0.42	0.52	0.0026	0.96	1.93	0.15
Study type	0.41	0.67	0.42	0.66	0.73	0.49
Time since conversion	0.028	0.97	0.033	0.97	0.44	0.65
Organic status	0.013	0.99	0.031	0.97	0.13	0.88
Crop diversity	0.54	0.47	0.56	0.46	2.27	0.11
Nitrogen input	3.82	0.037	0.80	0.46	0.19	0.83
Country development	0.00	1.00	0.0002	0.99	0.25	0.62
Latitude	0.033	0.86	0.035	0.85	0.13	0.72
Study scale	0.63	0.43	0.65	0.42	1.24	0.27

Results of mixed-effects models testing the sensitivity of effect sizes (log response-ratios) for total costs to 14 categorical variables associated with studies in the meta-analysis. Significant effects indicate that total costs varied for different categories of the explanatory variable.

Table S9. Sensitivity of organic-to-conventional effect sizes comparing gross returns without premiums

Variable	Crops/system		Crops/study		Systems	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
Crop type	1.43	0.20	1.12	0.36	0.92	0.51
Continent	0.43	0.79	0.43	0.79	0.49	0.79
Study duration	2.46	0.089	2.57	0.076	1.40	0.26
Rotation length	0.51	0.68	0.40	0.75	1.40	0.25
Annual/perennial	0.26	0.61	0.037	0.85	0.026	0.97
Legume/not legume	0.020	0.89	0.0070	0.93	0.92	0.40
Study type	1.12	0.33	1.31	0.28	0.25	0.78
Time since conversion	0.083	0.92	0.15	0.86	0.66	0.52
Organic status	0.66	0.52	0.74	0.48	0.12	0.88
Crop diversity	0.19	0.66	0.31	0.58	12.9	<0.0001
Nitrogen input	0.37	0.69	0.52	0.60	0.11	0.90
Country development	0.013	0.91	0.085	0.77	0.30	0.59
Latitude	0.14	0.71	0.067	0.80	0.76	0.38
Study scale	0.78	0.38	1.03	0.32	0.019	0.89

Results of mixed-effects models testing the sensitivity of effect sizes (log response-ratios) for gross returns without premiums to 14 categorical variables associated with studies in the meta-analysis. Significant effects indicate that gross returns without premiums varied for different categories of the explanatory variable.

Table S10. Sensitivity of organic-to-conventional effect sizes comparing net present values with premiums

Response	Crops/system		Crops/study		Systems	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
Crop type	3.38	0.0034	2.26	0.044	1.30	0.29
Continent	1.48	0.24	1.13	0.35	0.33	0.85
Study duration	1.82	0.18	1.27	0.31	2.45	0.098
Rotation length	2.97	0.041	3.84	0.016	2.03	0.13
Annual/perennial	7.06	0.0098	4.14	0.047	0.30	0.74
Legume/not legume	3.59	0.064	2.52	0.12	3.57	0.066
Study type	1.24	0.30	0.92	0.41	1.88	0.17
Time since conversion	0.30	0.74	0.17	0.85	1.00	0.39
Organic status	0.13	0.88	0.24	0.79	0.66	0.53
Crop diversity	2.78	0.11	1.89	0.18	3.11	0.059
Nitrogen input	0.61	0.55	0.43	0.66	1.72	0.25
Country development	1.30	0.26	0.91	0.35	3.14	0.087
Latitude	1.36	0.25	1.05	0.31	2.55	0.12
Study scale	0.88	0.35	0.63	0.44	0.98	0.33

Results of mixed-effects models testing the sensitivity of effect sizes (Hedges *d*) for net present values with premiums to 14 categorical variables associated with studies in the meta-analysis. Significant effects indicate that net present values with premiums varied for different categories of the explanatory variable.

Table S11. Sensitivity of organic-to-conventional effect sizes comparing benefit/cost ratios with premiums

Variable	Crops/system		Crops/study		Systems	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
Crop type	2.32	0.028	1.89	0.077	0.48	0.87
Continent	0.36	0.84	0.30	0.87	0.26	0.93
Study duration	1.07	0.38	0.97	0.42	0.41	0.75
Rotation length	2.86	0.043	3.48	0.024	2.21	0.099
Annual/perennial	1.10	0.30	0.63	0.43	0.075	0.93
Legume/not legume	3.65	0.060	2.63	0.11	1.07	0.35
Study type	0.67	0.52	0.57	0.57	0.53	0.59
Time since conversion	0.39	0.68	0.31	0.74	0.61	0.55
Organic status	0.42	0.66	0.45	0.64	0.084	0.92
Crop diversity	9.34	0.0037	7.89	0.0073	3.00	0.074
Nitrogen input	1.40	0.26	1.20	0.32	1.48	0.27
Country development	0.37	0.55	0.28	0.60	0.11	0.74
Latitude	1.07	0.31	0.93	0.34	1.31	0.26
Study scale	0.099	0.75	0.039	0.84	0.061	0.81

Results of mixed-effects models testing the sensitivity of effect sizes (log response-ratios) for benefit/cost ratios with premiums to 14 categorical variables associated with studies in the meta-analysis. Significant effects indicate that benefit/cost ratios with premiums varied for different categories of the explanatory variable.

Table S12. Sensitivity of differences between organic premiums awarded and breakeven premiums for organic net present values to match conventional net present values

Variable	Crops/system		Crops/study		Systems	
	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>	<i>F</i>	<i>P</i>
Crop type	1.46	0.18	0.89	0.53	0.22	0.99
Continent	0.41	0.80	0.29	0.88	0.23	0.95
Study duration	2.53	0.087	2.58	0.12	0.60	0.62
Rotation length	4.31	0.0082	2.64	0.057	2.28	0.088
Annual/perennial	1.40	0.24	0.44	0.51	0.30	0.74
Legume/not legume	9.51	0.0028	5.47	0.022	0.35	0.71
Study type	0.68	0.51	0.43	0.65	0.63	0.53
Time since conversion	1.84	0.19	2.11	0.15	0.68	0.51
Organic status	0.016	0.98	0.062	0.94	0.11	0.89
Crop diversity	0.68	0.42	0.59	0.45	6.87	0.0020
Nitrogen input	1.41	0.29	1.43	0.25	1.07	0.38
Country development	0.49	0.49	0.45	0.51	0.0016	0.97
Latitude	1.21	0.28	0.80	0.38	0.93	0.34
Study scale	0.24	0.63	0.13	0.72	0.030	0.86

Results of mixed-effects models testing the sensitivity of differences in premiums awarded and premiums needed for organic net present values to break even with conventional net present values to 14 categorical variables associated with studies in the meta-analysis. Significant effects indicate that differences in premiums varied for different categories of the explanatory variable.

Dataset S1. Raw data for the crops per system classification

[Dataset S1](#)

The file contains data associated with each study that were used in the analysis of crops per system, including variables associated with each study, raw data on financial parameters, and effect size calculations.

Dataset S2. Raw data for the crops per study classification

[Dataset S2](#)

The file contains data associated with each study that were used in the analysis of crops per study, including variables associated with each study, raw data on financial parameters, and effect size calculations.

Dataset S3. Raw data for the systems classification

[Dataset S3](#)

The file contains data associated with each study that were used in the analysis of systems, including variables associated with each study, raw data on financial parameters, and effect size calculations.

Dataset S4. List of studies that were not suitable for the meta-analysis

[Dataset S4](#)

The file contains a list of studies that contained data on some aspects of conventional or financial performance but did not meet at least one of our inclusion criteria.

Dataset S5. References for studies in the meta-analysis

[Dataset S5](#)

The file contains a list of references associated with studies in the meta-analysis.