

Reporting Summary

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Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

- | n/a | Confirmed |
|-------------------------------------|--|
| ☐ | ☒ The exact sample size (<i>n</i>) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☒ | ☐ A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☐ | ☒ The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☐ | ☒ A description of all covariates tested |
| ☐ | ☒ A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☐ | ☒ For null hypothesis testing, the test statistic (e.g. <i>F</i> , <i>t</i> , <i>r</i>) with confidence intervals, effect sizes, degrees of freedom and <i>P</i> value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☐ | ☐ For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☒ | ☐ For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☐ | ☒ Estimates of effect sizes (e.g. Cohen's <i>d</i> , Pearson's <i>r</i>), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection

The data used in this study were obtained from on-station trials conducted by the researchers (a total of 2741 paired data points from 156 on-station studies carried out from 2000-2018) and from those conducted on-farm by the researchers in participation with farmers (a total of 1197 paired data from 1097 on-farm studies carried out during 2003-2018) in South Asia. The on-station data were archived from 143 original peer-reviewed publications and 13 proceedings/book chapters/reports through the Web of Science and Google Scholar search, libraries, and personal communications. The on-farm original data (published/unpublished) were obtained from researchers on a personal contact basis as well as using open access data. Details are given in Supplementary Information.

Data analysis

All the variables were subjected to the meta-analysis by using 'R' in two stages: 1) the effect size was calculated for each study as the natural log of the response ratio (LRR) and 2) effect sizes from individual studies were combined using a random-effects model and was considered significant if the 95% confidence intervals [$\text{Mean} \pm 1.96 * \text{SD}/\text{Sqrt}(\text{number of observations})$; 1.96 is the 'z'-value at 95%] did not overlap with zero. Since within-study variance of means of parameters was not available for most of the OS studies, individual observations were weighted by the experimental replications. However, in on-farm studies, replicated observations were available, and therefore the variances were calculated. In situations where more than one observation from a study was included in a category, weights were divided by the total number of observations from that study. The log response ratio (LRR) was finally back-transformed to generate the percent change of parameters. Meta-analysis was also performed for the groups (cropping system, individual crop and soil texture). The between-study variability (heterogeneity) and the publication bias were also evaluated before analysis. Supplementary Information includes details of data analysis methods.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

A list of on-station studies, which were used in meta-analysis has been provided in the Supplementary Information file. The on-farm data (in MS Excel format) is available with the lead author, and will be provided upon request.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	This is a meta-analysis to assess performance of three core elements of conservation agriculture (CA) against the conventional best management practice. The performance parameters were grain and protein equivalent yields, water input, cost of cultivation and net return and green-house gases emission. The categorical variable were selected as crop rotation, crop and soil texture.
Research sample	Data from on-station trials (2741 paired data points from 156 studies between year 2000-18; collected and compiled from 143 original peer-reviewed publications and 13 proceedings/book chapters/reports through the Web of Science and Google Scholar search, libraries, and personal communications) and on-farm experimentations (published/unpublished) was used in the analysis.
Sampling strategy	No sampling strategy is applicable here. All data (Explained above) were used in the meta-analysis.
Data collection	On-station data were collected from peer-reviewed publications (published between 2000 and 2018) by searching through Web of Science (Elsevier) indexing service and Google Scholars with relevant keywords. Proceedings/book chapters/reports were included, and non-English language publications were excluded. On-farm data were collected from researchers on personal communication basis.
Timing and spatial scale	All data (On-station) pertains to the period between 2000 and 2018. Period of on-farm data was 2003 and 2008-18.
Data exclusions	No data were excluded from the compilation.
Reproducibility	There was no experiment involved in this study. On-station and on-farm Data (explained above) were analyzed by using open source 'R' software by following set procedure. The software performs 999 iterations during computation of cumulative effect size.
Randomization	Randomization is not relevant to this study
Blinding	Not relevant to the study.
Did the study involve field work?	☐ Yes ☒ No

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging