

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 (n) 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
Only common tests should be described solely by name; describe more complex techniques in the Methods section.
- ☐ ☒ 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. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
Give P values as exact values whenever suitable.
- ☒ ☐ 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 d , Pearson's r), 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 Data were collected in Microsoft Excel for Office 365 MSO, Version 1904

Data analysis SAS/STAT software, Version 9.3

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

The authors declare that all data analysed during this study are included in this published article and available on-line as a supplementary information file.

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	A meta-analysis of studies in sub-Saharan Africa was conducted comparing crop yields between conservation agriculture and conventional tillage systems.
Research sample	The data set used for the meta-analysis contains 992 observations from 87 published studies that were conducted in 16 different countries in sub-Saharan Africa.
Sampling strategy	The following search terms were used (an asterisk being a replacement for any ending of the respective term): 'conservation agriculture', 'zero till*', 'no till*', 'reduced till*', 'minimum till*', 'direct seeding', or 'direct drill*' in combination with 'yield' and 'Africa' or a country from the list of all countries of SSA (excluding South Africa and Lesotho) in the publication title, abstracts or keywords. The database searches were augmented with hand searches of library resources for relevant papers from citations in retrieved papers.
Data collection	A comprehensive search was conducted using the above search terms for peer-reviewed publications on the effect of CA on crop yields compared to CT in SSA using the online databases ISI Web of Science (Thomson Reuters, New York, NY, USA) and Scopus (Elsevier, Amsterdam, the Netherlands). This was done by the authors of the study. Studies from the retrieved publications were screened and had to meet the following defined basic selection criteria to be included in the meta-analysis. First, studies report crop yields from field experiments in which a CT treatment is compared with a (partial) CA treatment using statistical methods. Second, at least the effect of no- or minimum tillage is tested with the CA treatment. Third, the experiments are conducted under rainfed field conditions in a specified location in SSA. Fourth, the mean, sample size and standard deviation of crop yields are directly reported as numerical or graphical data or can be calculated from the reported data. Standard deviations were calculated from standard errors, coefficients of variation, 95% confidence intervals or least significant differences (LSDs), in case that they were not reported in the papers. For some observations, LSD was estimated as the smallest difference between the mean values of treatments that were still significant.
Timing and spatial scale	The data are from studies published between 1977 and 2019 - and cover 16 countries of SSA .
Data exclusions	Data from the same study but reported in more than one publication were not repeated to avoid double counting; the publication with the most complete dataset was used. Observations were excluded from the analysis when only average crop yields over several years or sites were presented. If more than one form of tillage was assessed in a study, we selected the CT treatment that represented the greatest soil disturbance. Studies were rejected if crop management practices other than those related to the three CA principles (no- or minimum tillage, residue management or rotation/intercropping) differed between CA and CT treatments, with exception of weed management.
Reproducibility	The selection criteria for studies to be included in the meta-analysis were well defined. All data analysed during the study are included in the published article and available on-line as a supplementary information file.
Randomization	We distinguished three levels of CA in the analysis that represent the varying degrees of application of the CA principles: no- or minimum tillage without mulching and intercropping or rotation (NT-M-IR), no- or minimum tillage with mulching, but without intercropping/rotation (NT+M-IR), and no- or minimum tillage with mulching and intercropping/rotation (NT+M+IR). A list of covariates was tested to explain heterogeneity in study outcomes.
Blinding	During data acquisition from published studies no blinding was undertaken. The selection criteria for studies to be included in the meta-analysis were rigorously followed. Blinding during data analysis by the statistician was done through coding of the studies, observations and treatments.
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