Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

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

- 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: No software was used to collect data. All data were produced in the experiment.
- Data analysis: All the analyses were done in R software and associated codes

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 and 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

All the data is available at: https://figshare.com/s/4e36e5b55a49bc038cc4
Ecological, evolutionary & environmental sciences study design

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

| Study description | It is a manipulative full factorial design |
|-------------------|------------------------------------------|
| Research sample   | Samples were taken from the soil surface, where biological activity is more intense, and the dried and sieved |
| Sampling strategy | We sampled five independent replicates |
| Data collection   | Data were collected according to standard procedures, processed and analysed with appropriate analytical equipment and the results were processed and compiled in Excel files |
| Timing and spatial scale | Surface soils were sampled from the same area at the beginning of the experiment and after seven years of treatment |
| Data exclusions   | No data was excluded |
| Reproducibility  | It is a manipulative experiment replicated in the field with independent adjacent plots |
| Randomization     | Randomized blocks |
| Blinding          | Samples were collected and numbered |

Field work, collection and transport

| Field conditions | Typical Mediterranean summer, 25-35 °C |
|------------------|----------------------------------------|
| Location         | Sorbas, Almería, South East Spain. Coordinates: 37°05′N–2°04′W; 397 m a.s.l. |
| Access & import/export | The researchers got permission from the landowner to set up and access the field experiment. No import/export of samples was needed |
| Disturbance      | Sampling disturbed the plots. Since the experiment is still running, we minimized the impact by not sampling all the plots at the same time (e.g. changing sampling plots every sampling year) |

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 | Methods |
|---------------------------------|---------|
| n/a                             | n/a     |
| Involved in the study           | Involved in the study |
| Antibodies                      | ChIP-seq |
| Eukaryotic cell lines           | Flow cytometry |
| Palaeontology and archaeology   | MRI-based neuroimaging |
| Animals and other organisms     |         |
| Human research participants     |         |
| Clinical data                   |         |
| Dual use research of concern    |         |