

Reporting Summary

Nature Portfolio 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 Portfolio 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.

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: A novel evolutionary game theory model was developed via open-source Python 3 software to support this analysis. The code for that model is available via a Zenodo repository at DOI: 10.5281/zenodo.8347265.
- Data analysis: All data was converted to .csv format and analyzed using open-source Python 3 software. Code to analyze the data is available in a Zenodo repository at DOI: 10.5281/zenodo.8347265

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 Portfolio [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 description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

Data to support this analysis was collected from open-source repositories, including:

- Chitwan Valley Family Study: Labour Outmigration, Agricultural Productivity, and Food Security, Nepal (ICPSR 36755): <https://www.icpsr.umich.edu/web/DSDR/studies/36755/versions/V5>
 - IBLI Borena Household Survey R1-4 Stata 13 data: <https://data.ilri.org/portal/dataset/ibli-borena-r1/resource/41b75ad5-71cd-4d23-911c-dcce53bc68a7>
 - Standardized Precipitation and Evapotranspiration Index: <https://spei.csic.es/database.html>

Human research participants

Policy information about [studies involving human research participants and Sex and Gender in Research](#).

Reporting on sex and gender	N/A
Population characteristics	N/A
Recruitment	N/A
Ethics oversight	N/A

Note that full information on the approval of the study protocol must also be provided in the manuscript.

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)

Behavioural & social sciences study design

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

Study description	This study develops an evolutionary game theory (EGT) model to simulate smallholder farmer risk management strategies under various climate and policy scenarios. The main method is a computational model, combined with analysis of publicly-available socioeconomic data from Nepal (Chitwan Valley Family Study) and Ethiopia (Borena Index-Based Livestock Insurance Study), as well as biophysical data from the Standardized Precipitation and Evapotranspiration Index. All data used in this study are quantitative.
Research sample	No new data was collected in this study. Publicly-available datasets that were used in this analysis surveyed smallholder farmers in the Chitwan District of Nepal and Borena region of Ethiopia, two agricultural regions that are experiencing significant climate change and are suitable case studies for studying risk management strategies under climate stress. Additionally, publicly-available global data on soil moisture balance was used to assess drought risk levels for these two case studies. Specifically, the following datasets were used in this analysis: - Chitwan Valley Family Study: Labour Outmigration, Agricultural Productivity, and Food Security, Nepal (ICPSR 36755): https://www.icpsr.umich.edu/web/DSDR/studies/36755/versions/V5 . This is a panel dataset that reports farmers' cropping choices, migration trips, and income earned from 2006-2015 for the Chitwan Valley in Nepal. - IBLI Borena Household Survey R1-4 Stata 13 data: https://data.ilri.org/portal/dataset/ibli-borena-r1/resource/41b75ad5-71cd-4d23-911c-dcce53bc68a7 . This is a dataset of herders' livestock possessions, income earned, and purchase of index-based insurance in the Borena Region of Ethiopia, collected over four waves from 2012-2015. - Standardized Precipitation and Evapotranspiration Index: https://spei.csic.es/database.html . This is a global raster database of soil moisture balance, reported at 0.5 degree grid cells for the years 1901-2019. For each grid cell, standardized water balance measures are reported at time scales ranging from 1 to 48 months.
Sampling strategy	No data were collected in this study. Rather, results were generated from an evolutionary game theory model that simulates farmers' risk management strategies under different climate and policy scenarios. Therefore, sampling methods for data collection (e.g. random, snowball, stratified, convenience) do not apply to this study.
Data collection	No data were collected for this study. Rather, results were generated from an evolutionary game theory model that simulates farmers' risk management strategies under different climate and policy scenarios. There was no experimental condition or study hypothesis.
Timing	No data were collected for this study. Rather, results were generated from an evolutionary game theory model that simulates farmers' risk management strategies under different climate and policy scenarios. Therefore, there was no timing of data collection.
Data exclusions	We parametrized the EGT model by fitting a Weibull distribution to estimated farmer incomes from survey data from the Chitwan

Data exclusions	Valley Family Study (described in Supplemental Information 1.4). Here, we excluded the top 1 percent of farm incomes in the survey so that the Weibull distribution converges.
Non-participation	No data were collected for this study. Rather, results were generated from an evolutionary game theory model that simulates farmers' risk management strategies under different climate and policy scenarios. No participants were involved in this study.
Randomization	No data were collected for this study. Rather, results were generated from an evolutionary game theory model that simulates farmers' risk management strategies under different climate and policy scenarios. Therefore, randomization techniques for data collection do not apply here.

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	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> Antibodies
<input checked="" type="checkbox"/>	<input type="checkbox"/> Eukaryotic cell lines
<input checked="" type="checkbox"/>	<input type="checkbox"/> Palaeontology and archaeology
<input checked="" type="checkbox"/>	<input type="checkbox"/> Animals and other organisms
<input checked="" type="checkbox"/>	<input type="checkbox"/> Clinical data
<input checked="" type="checkbox"/>	<input type="checkbox"/> Dual use research of concern

Methods

n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> ChIP-seq
<input checked="" type="checkbox"/>	<input type="checkbox"/> Flow cytometry
<input checked="" type="checkbox"/>	<input type="checkbox"/> MRI-based neuroimaging