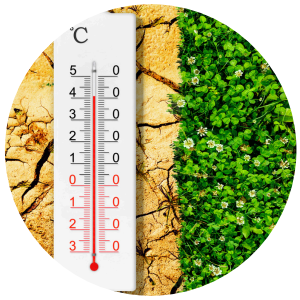
THE IMPACT OF AGROECOLOGY ON CLIMATE CHANGE

What does science tell us?




Aims

- Researchers from ISARA in Lyon and the Sant´Anna School of Advanced Studies in Pisa assessed the impact of combined agroecological practices on greenhouse gas emissions and carbon sequestration to ask whether agroecology or conventional farming was better in terms of climate change mitigation.

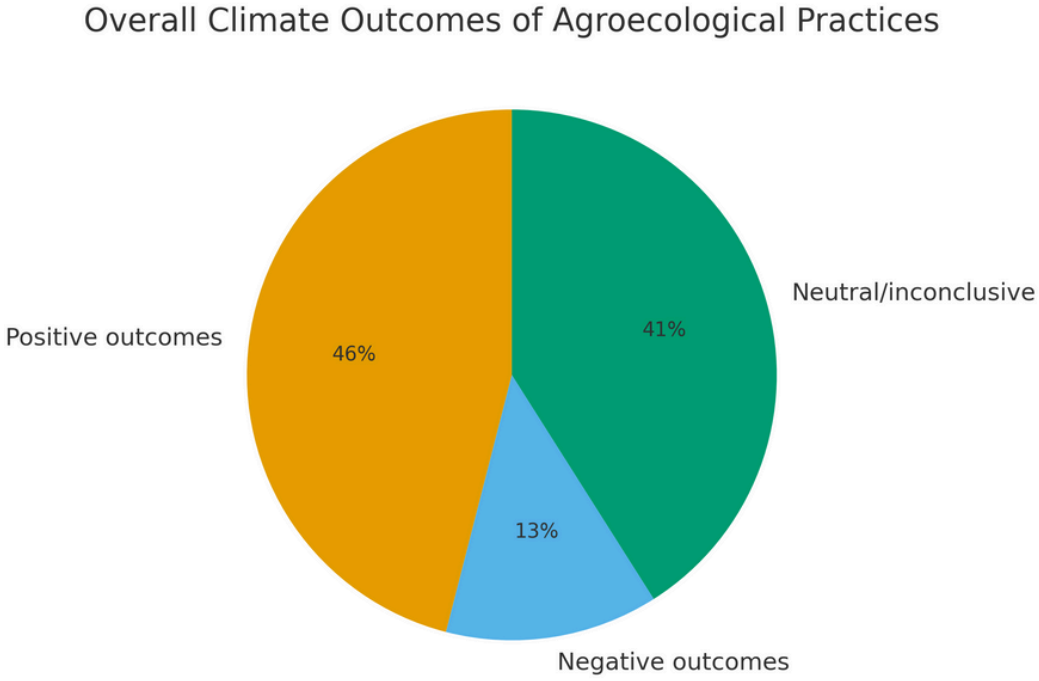
- Given that agriculture is both a contributor to greenhouse gas emissions but can also potentially mitigate climate impacts, the researchers sought hard data on the climate benefits or drawbacks of agroecology.

- They focused on agroecological multi-practices, i.e. cases combining two or more agroecological practices, as opposed to the performance of single agroecological practices for which large scientific evidence already exists.

METHODOLOGY

- Screening more than 16,000 scientific publications from the Web of Science.
- 138 peer-reviewed articles met all eligibility standards for detailed analysis, providing 285 comparative case studies, including 248 on-station experiments (87%), 24 on-farm intervention studies (8%), and 13 actual farm data from farmers already implementing practices (5%).
- To ensure accuracy and reliability, comparisons were only made between agroecological and conventional farming systems within similar climatic environments.
- Each outcome was classified as positive, negative, inconclusive, or neutral (not statistically significant) based on the reported statistical evidence.

Agroecological Systems Show Clear Climate Benefits



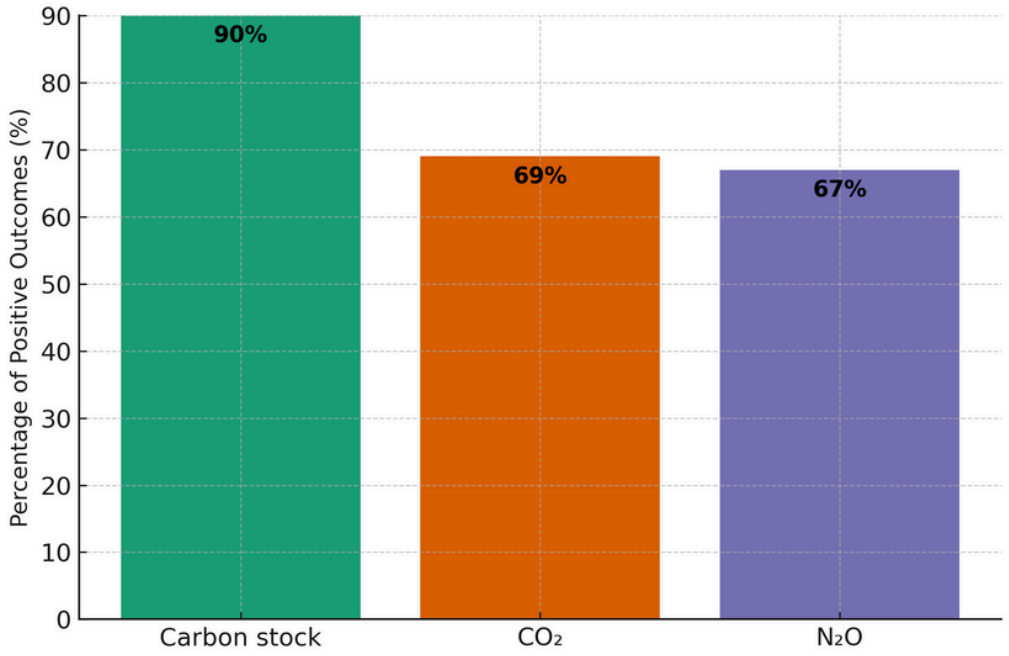
Out of 499 total measured outcomes, 46% showed positive results for agroecology, 13% showed negative results, 41% neutral or inconclusive.

Agroecological systems outperformed conventional farming both in sequestering carbon in the soil and in reducing greenhouse gas emissions.

CARBON STOCK

A significant positive outcome for carbon stock was found under agroecological systems (90%) when compared to negative outcomes.
Positive outcomes for carbon dioxide (69%) and nitrous oxide (67%) release also coincide with agroecological systems.

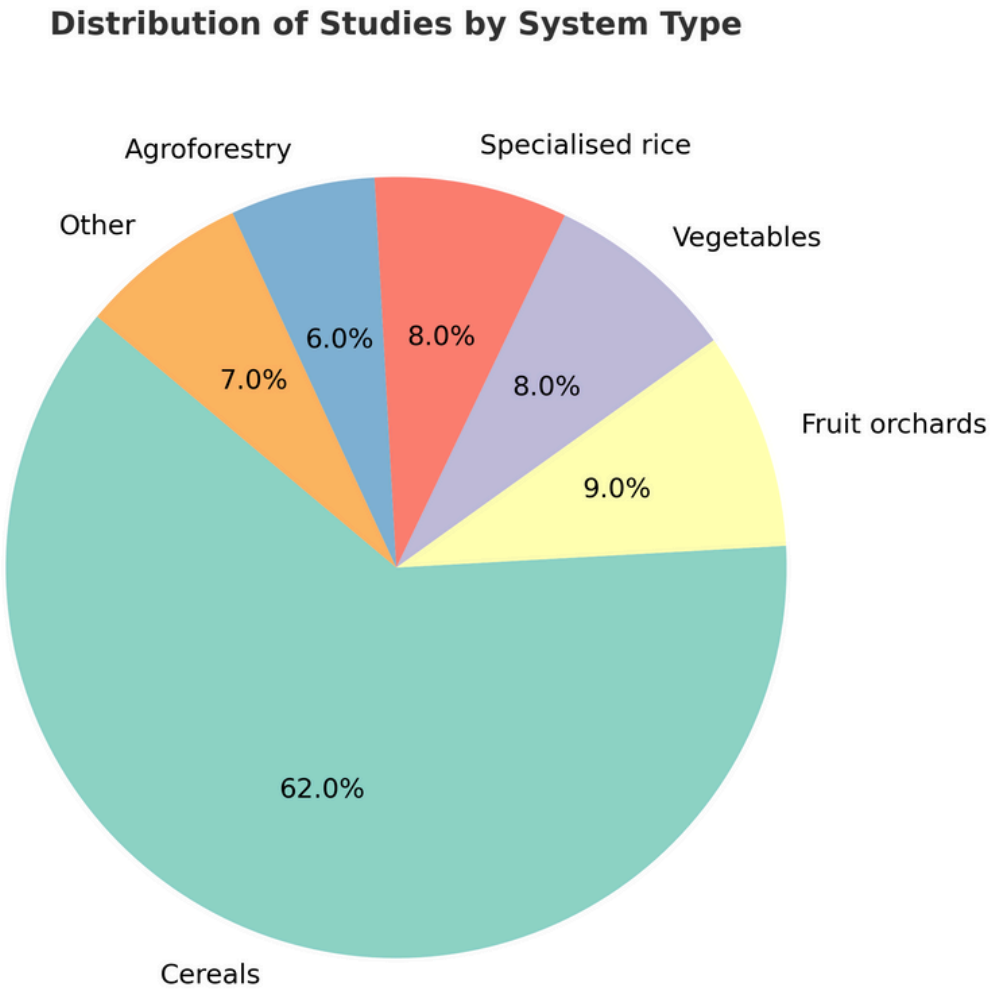
Share of Significant Positive Outcomes for Gas Type and Carbon Sequestration Compared to Negative Ones



GREENHOUSE GASES

Positive compared to negative greenhouse gas outcomes for agroecology were most frequent for CO_2 (69%) and N_2O (67%), but many were also neutral showing no clear differences. Methane (CH_4) results were fewer and more variable, with some rice systems showing comparatively increased emissions with multiple agroecological practices. In general, adding more agroecological practices tends to enhance carbon sequestration but does not always reduce all greenhouse gases.

SYSTEM TYPES AND TRADE-OFFS



Most studies focused on cereal systems (62%), followed by fruit orchards (9%), vegetables (8%), specialized rice (8%), and agroforestry (6%). While arable agroecological systems often showed strong climate benefits, agroecological rice cultivation can increase methane emissions. Agroforestry and livestock integrations are less studied but show potential for further mitigation benefits.





KEY TAKEAWAYS AND POLICY IMPLICATIONS

- Agroecological farming outperforms conventional systems in climate mitigation potential.
- The strongest benefits come from carbon sequestration and improved soil health. However, trade-offs exist: some practices that build soil carbon can increase certain emissions.
- Supporting farmers to adopt multiple, complementary practices can help achieve both climate goals and sustainable food production.
- Constraints or barriers to the adoption of combined agroecological practices include a lack of access to affordable land, institutional difficulties (administrative license and certification), a lack of fair financial rewards from sales, risk, and a lack of knowledge.

Source: Wezel, A., Marchetti, A., Nichenametla, C.K., Boughamoura, O., Kamilia, K., & Bàrberi, P. (2025). Multiple Agroecological Practices Use and Climate Change Mitigation: A Review. Agronomy for Sustainable Development, 45:10.1007/s13593-025-01048-9.

https://link.springer.com/article/10.1007/s13593-025-01048-9

Agroecology Europe

More information
www.agroecology-europe.org

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