Supplementary Materials – Figures

Increasing ambition in Nationally Determined Contributions through agriculture and food systems innovation

Evidence, foundational analysis, and recommendations for NDCs

Developed through a collaboration between the United Nations Foundation and Climate Focus
September 2024

List of Supplementary Figures

Prevalence and patterns of agriculture and food systems innovation in NDCs

Figure S 1:

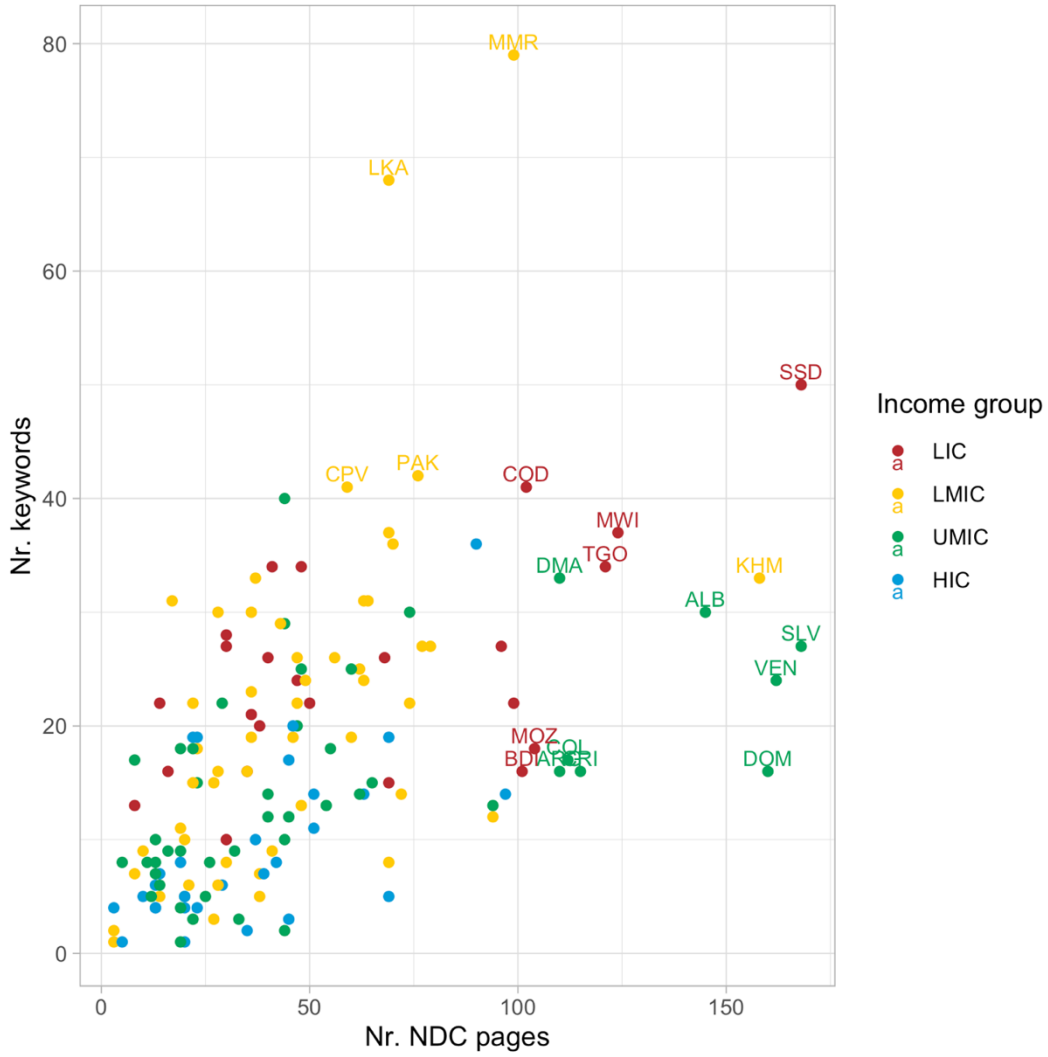


Figure S 1. Relationship between NDC length (number of pages) and the number of keywords mentioned related to agriculture and food systems innovation. Colors indicate the country income group.

- NDC document length varies widely across countries (range: 3 to 168 pages per NDC).
- The number of agriculture and food systems innovation keywords mentioned also varies widely. Note that the number of keywords refer to unique counts, meaning that, even if the same keyword was mentioned multiple times in the same document, it has been counted only once per NDC. Unique mentions of keywords range from 1 to 79 per NDC (see Annex 3 in main report).
- Longer NDCs generally include more unique keyword mentions.

Figure S 2:

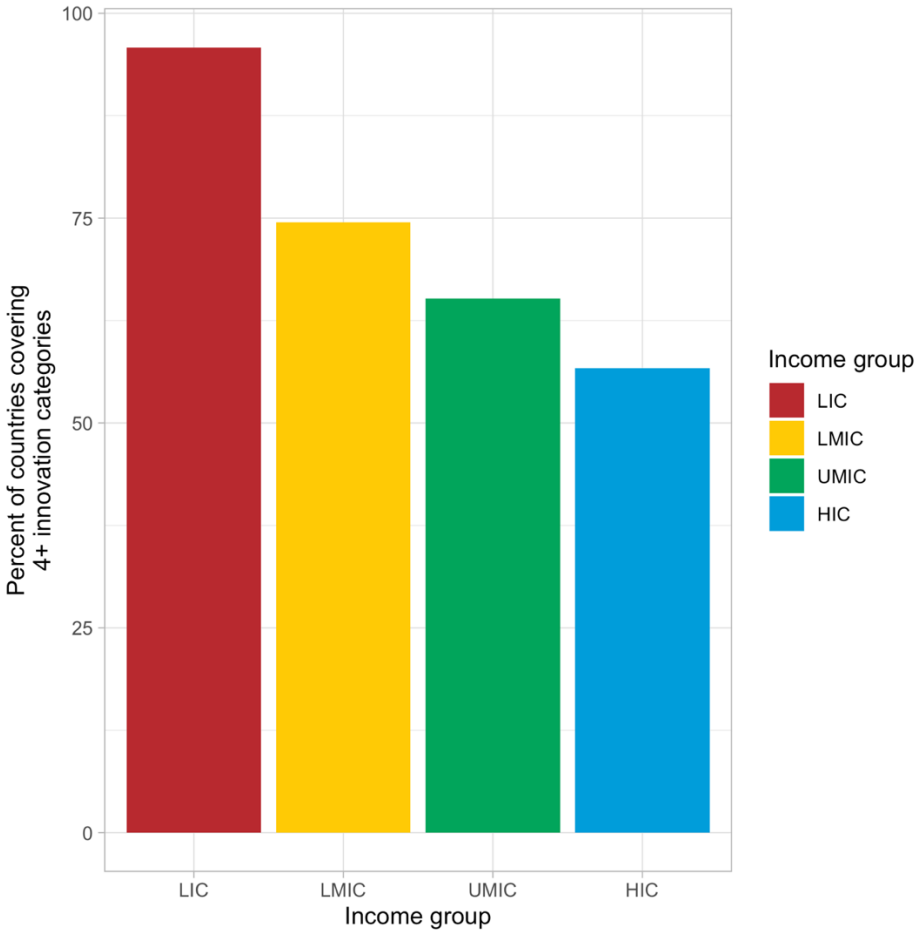


Figure S 2. Percent of countries covering more than four innovation categories.

- Almost all LICs mention at least four of the seven innovation categories in their NDCs.
- A great share of LMICs and UMICs include several innovation categories, although more than a fourth of countries include just three or fewer categories.
- Among all groups, HICs tend to include fewer innovation categories overall.

Figure S 3:

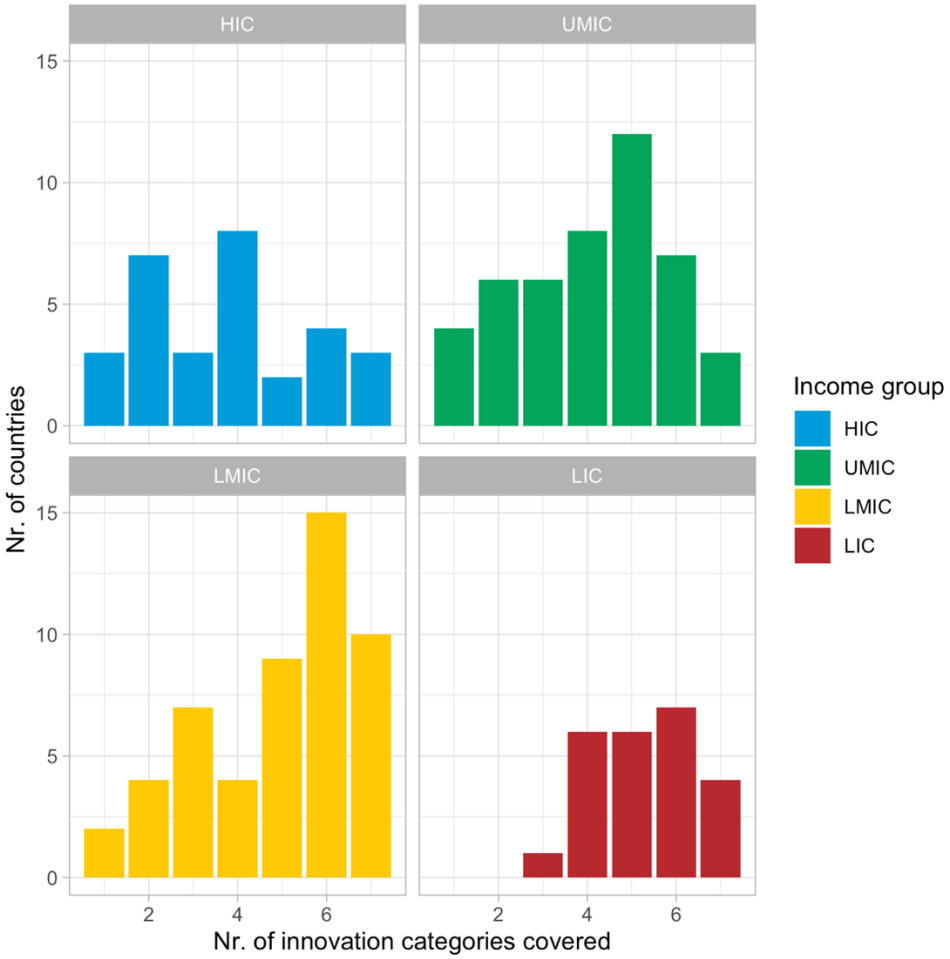


Figure S 3. Number of countries per number of innovation categories (1 to 7 categories) covered in each NDC by country income groups.

Figure S 4

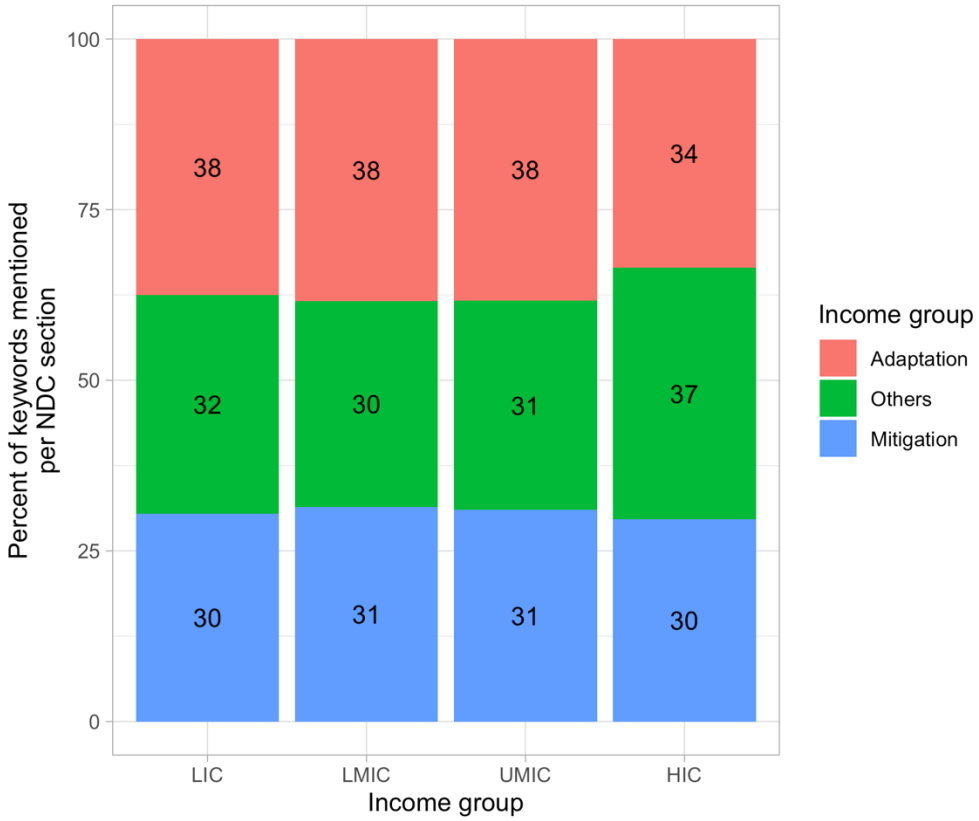


Figure S 4. Keywords related to agriculture and food systems innovation mentioned in different sections of NDC documents (% keywords per section) per country income groups. NDC sections others than "Mitigation" and "Adaptation" have been lumped together under "Others" section.

- Two thirds of keywords related to agriculture and food systems innovation are found in NDC sections about mitigation and adaptation measures.
- For LICs, LMICs, and UMICs, they are found in slightly higher proportion in the adaptation section, while for HICs they are in slightly more mentioned in the mitigation section.
- Another third of the keywords are found in other NDC sections, such as those referring to means of implementation, governance processes, methodology, annexes, and other non-standard sections.
- The number of keywords refer to unique counts, meaning that, even if the same keyword was mentioned multiple times in the same document, it has been counted only once per NDC.

Table S 1. Major sections in NDCs.

Each NDC is expected to represent a forward progression (e.g., in its emissions targets, policies and intervention areas) from previous iterations, and to reflect the country's highest possible ambition. NDCs often contain common elements from country to country, but they can differ significantly based on national circumstances, institutional responsibilities, and respective

capacities and resources. A major source of variation among NDCs is climate change mitigation and adaptation priorities across sectors. For example, tropical forest countries where forests provide enormous opportunities to mitigate climate change have more detailed policy measures and plans related to forests in their NDCs and countries where food security and adaptation in the agriculture sector are key national priorities, include more detailed plans for their agriculture sector. Content of current NDCs is broadly structured around the following sections.

NDC section	Typical contents
Mitigation	Concrete policy measures to achieve a country's numerical climate targets, often divided into measures that are conditional and unconditional upon financial support by other countries.
Adaptation	Concrete policy measures to adapt to climate impacts. Text may be brief if a country relies on National Adaptation Plans (NAPs) and Adaptation Communications (ACs) to describe intended adaptation actions.
Finance	Intentions for financing NDC implementation including plans for accessing climate finance from external sources and for allocating financial resource. Text may be brief for developed countries that do not rely on external climate finance. Alternatively called "means of implementation," may also cover capacity building, technology needs / use, and / or research and development.
Capacity needs	National capacity building needs and gaps for NDC implementation and possibly descriptions of existing capacity building measures. Alternatively called "means of implementation," may also cover finance, technology needs / use, and / or research and development.
Technology needs	Existing or needed technology development and transfer for NDC implementation. Alternatively called "means of implementation," may also cover finance, capacity building, and / or research and development.
Governance processes	Processes and systems used to prepare the NDC and to monitor and verify progress in NDC implementation. Often includes the term "planning and implementation processes."
Research & development	Existing or needed research and development for NDC implementation. Alternatively called "means of implementation," may also cover finance, capacity building, and / or technology needs / use.

For the second round of NDCs due in 2025, each country is expected to provide the information necessary to facilitate clarity, transparency, and understanding (ICTU), when communicating the NDC. This information should include: Quantifiable information on the reference point (including, as appropriate, a base year); Time frames and/or periods for implementation; Scope and coverage; Planning processes; Assumptions and methodological approaches, including those for estimating and accounting for anthropogenic GHG emissions and, as appropriate, removals; How the Party considers its NDC is fair and ambitious in the light of its national circumstances; How the NDC contributes toward achieving the objective of the UNFCCC as set out in Article 2 of the Convention.

Relationship between inclusion of agriculture and food systems innovation in NDCs and country characteristics

In this section, the prevalence in NDCs of keywords related to seven categories of agriculture and food systems innovation (unique keyword counts) are compared with seven types of country characteristics that can be expected to shape capacity for investment and implementation, including:

1. Vulnerability to climate change (ND-GAIN Vulnerability Index)
2. Percentage of farms that are less than 2 hectares (Lowder et al., 2021)
3. Gross Domestic Product (World Bank, 2022)
4. International finance flows to the agricultural sector (OECDStat, 2024)
5. Share of agriculture and food systems GHG emissions generated by food production: land use, land-use change, and primary production of food commodities (EDGAR-FOOD by Crippa et al., 2021)
6. Share of agriculture and food systems GHG emissions generated by post-production: transport, processing, packaging, and retail (EDGAR-FOOD by Crippa et al., 2021)
7. Average rank across six Worldwide Governance Indicators, WGI (World Bank, 2024)

For details about datasets used for country characteristics, see Table 3 in main report.

R&D systems

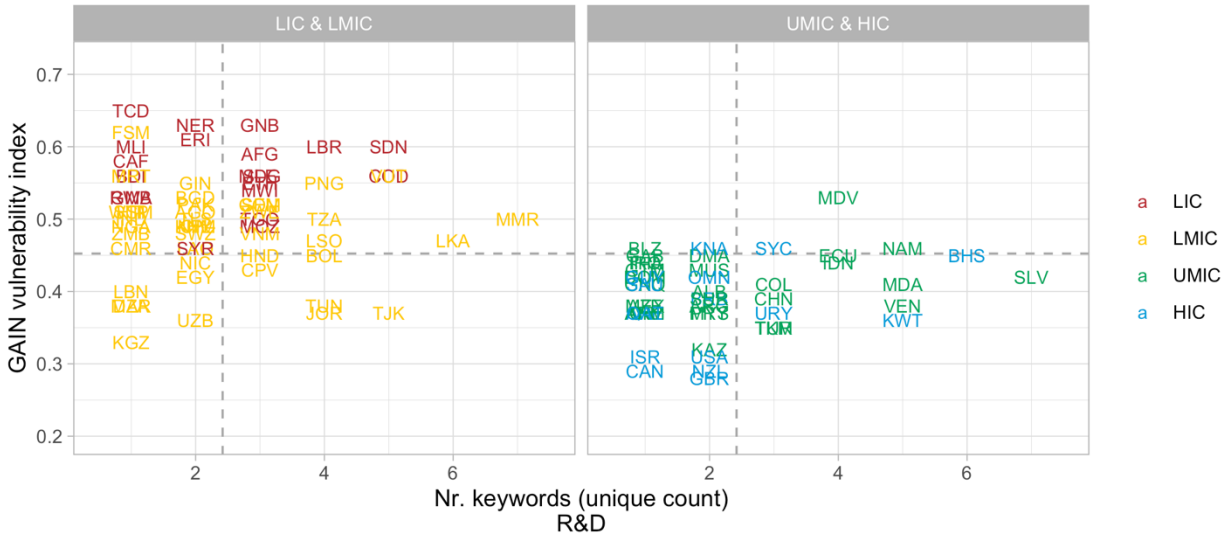


Figure S 5. Inclusion of R&D systems in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

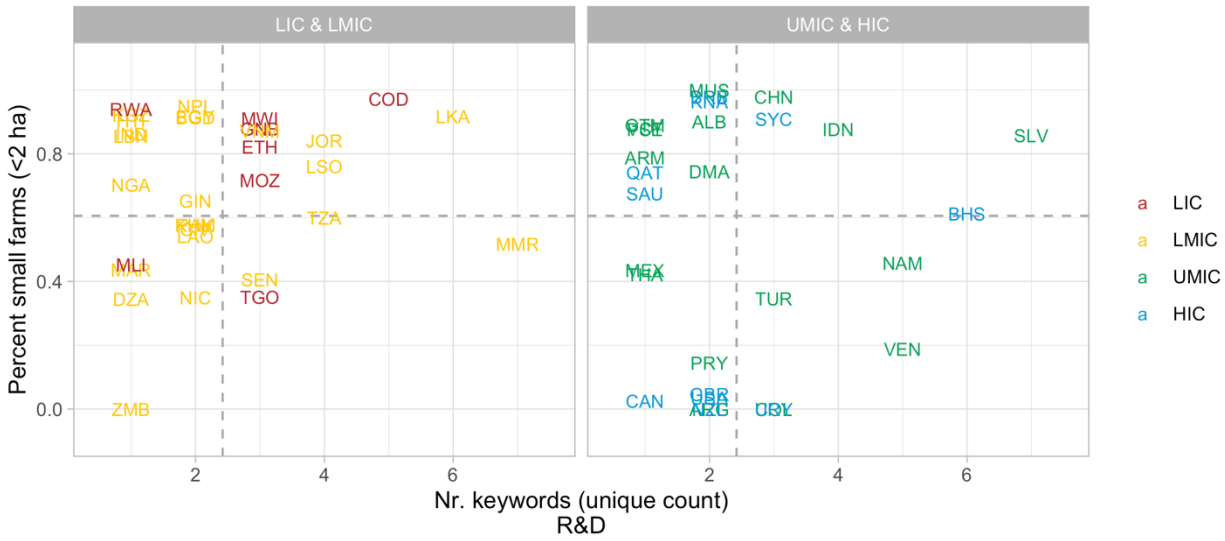


Figure S 6. Inclusion of R&D systems in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

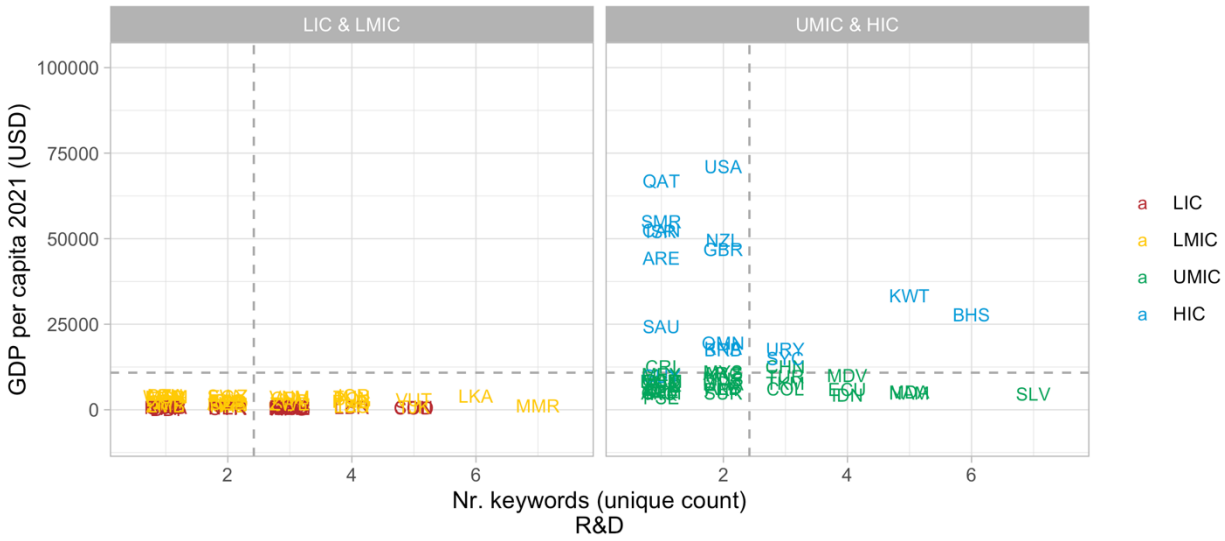


Figure S 7. Inclusion of R&D systems in NDCs and GDP per capita. Source: World Bank.

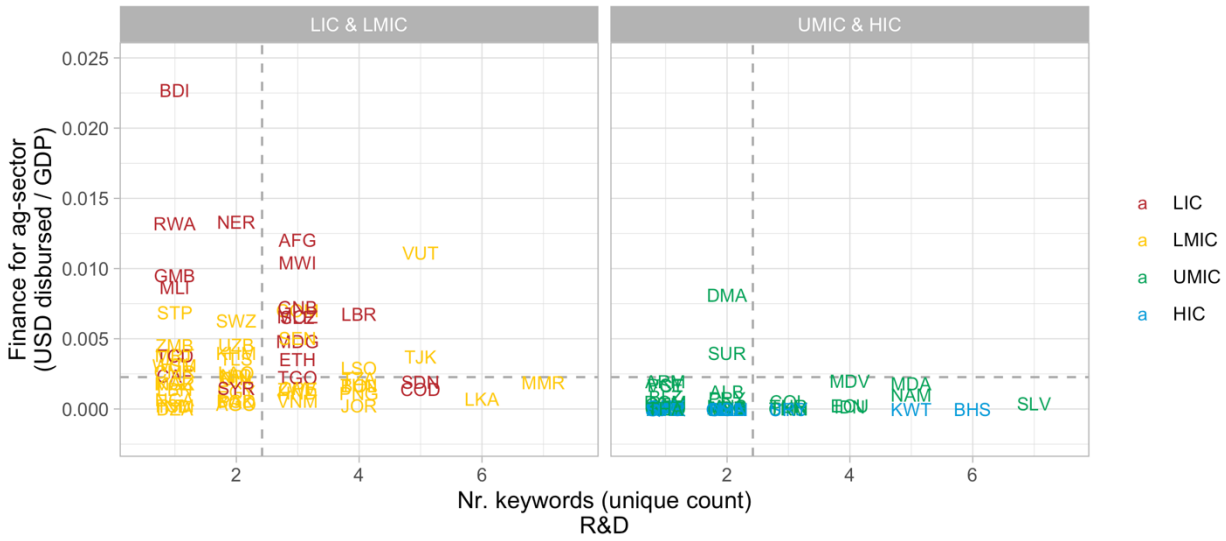


Figure S 8. Inclusion of R&D systems in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

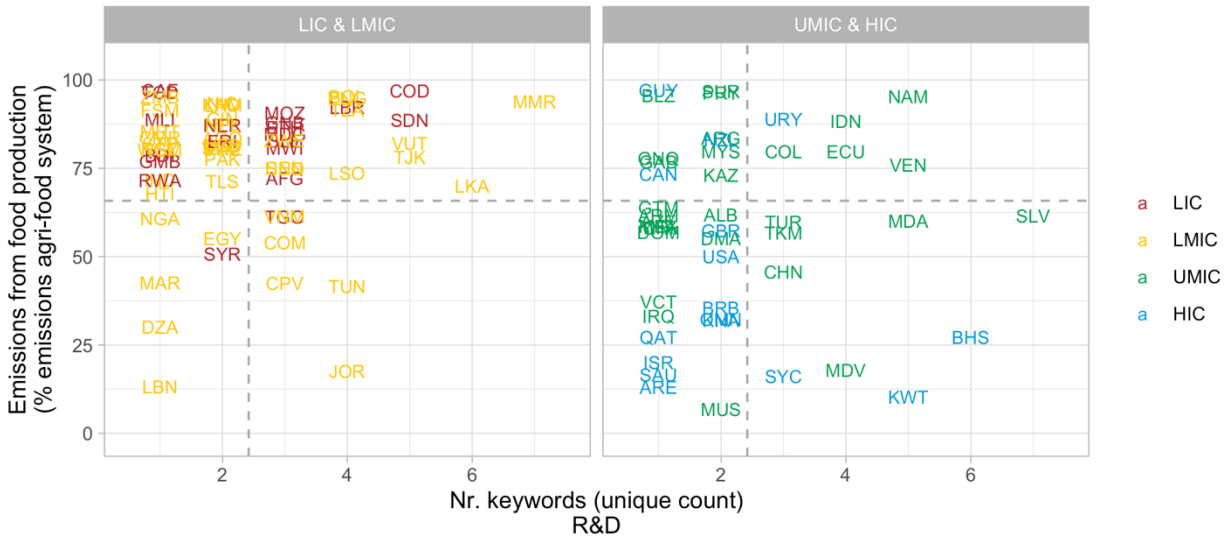


Figure S 9. Inclusion of R&D systems in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

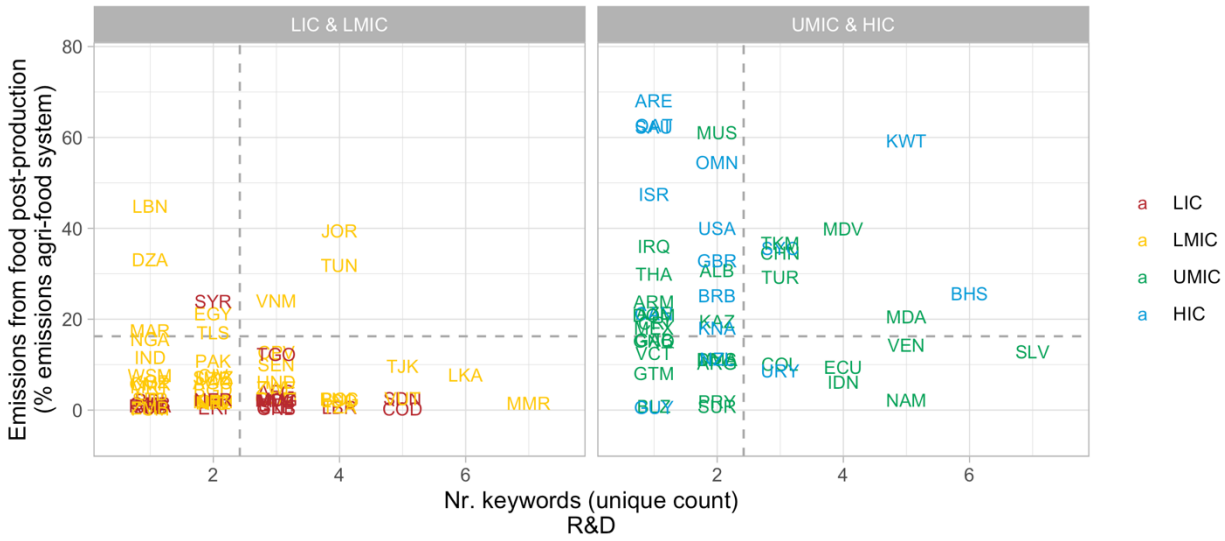


Figure S 10. Inclusion of R&D systems in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

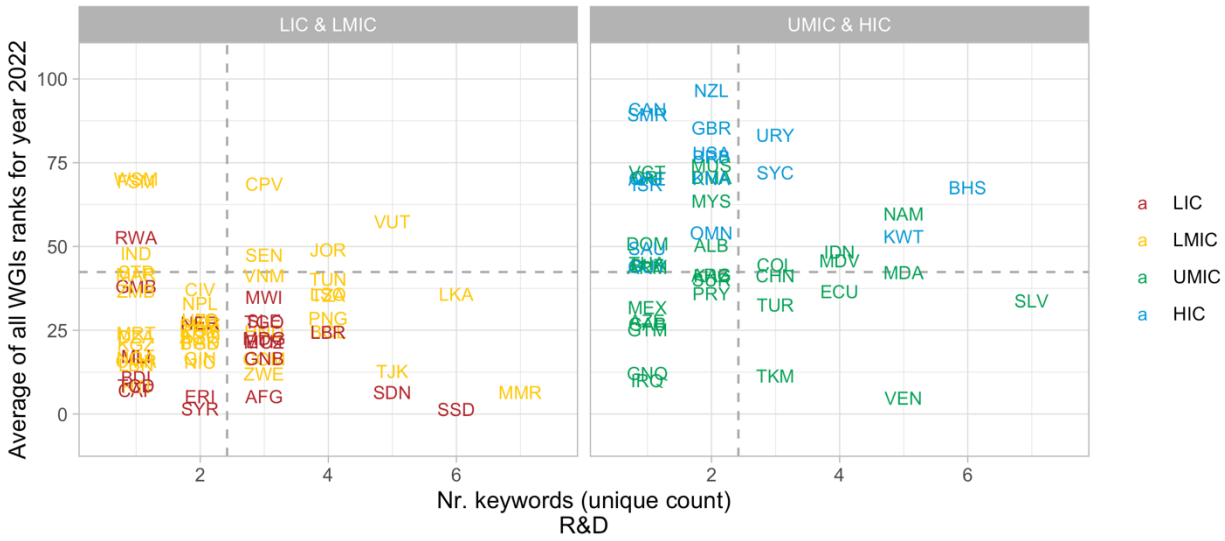


Figure S 11. Inclusion of R&D systems in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

Information systems

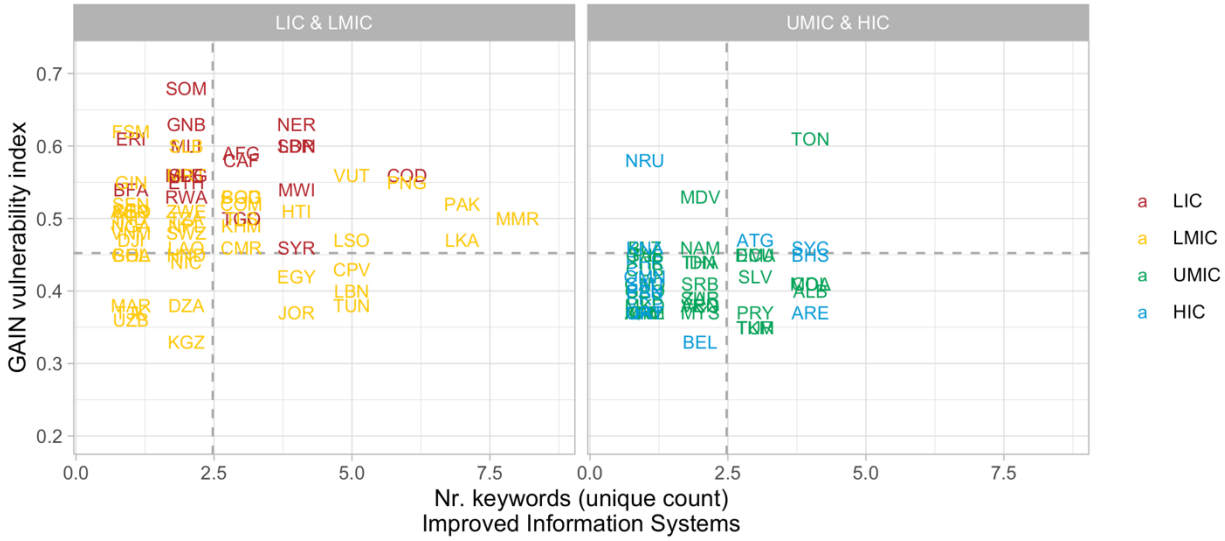


Figure S 12. Inclusion of information systems in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

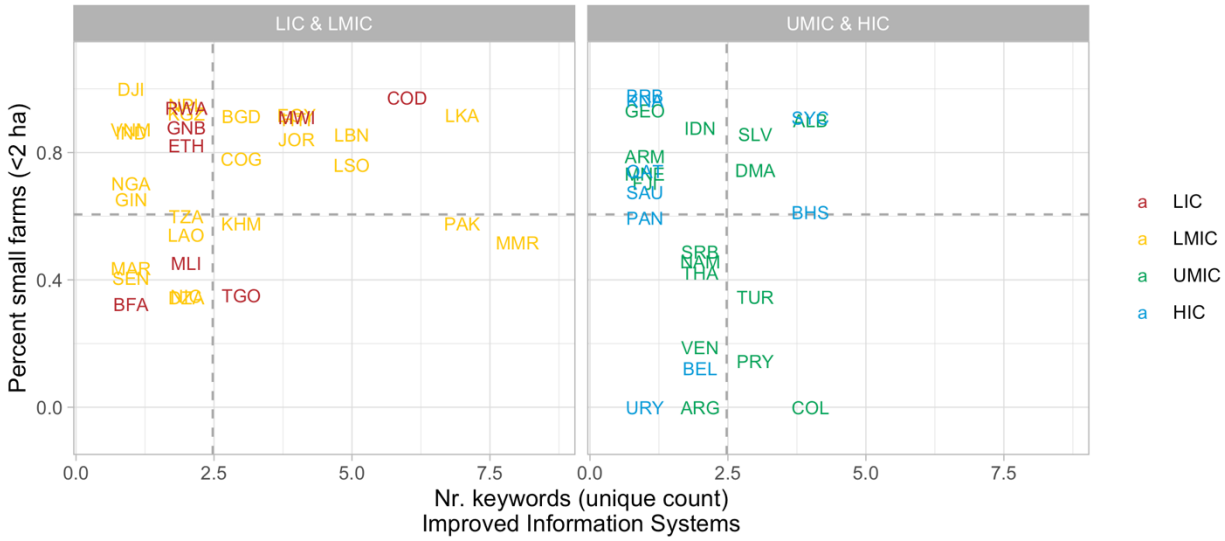


Figure S 13. Inclusion of information systems in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

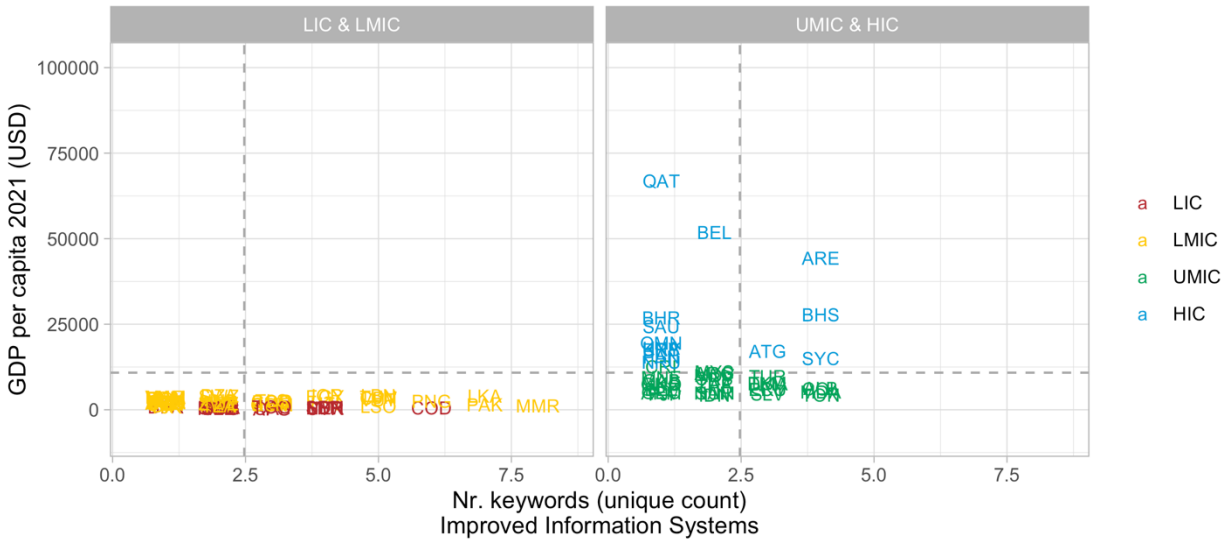


Figure S 14. Inclusion of information systems in NDCs and GDP per capita. Source: World Bank

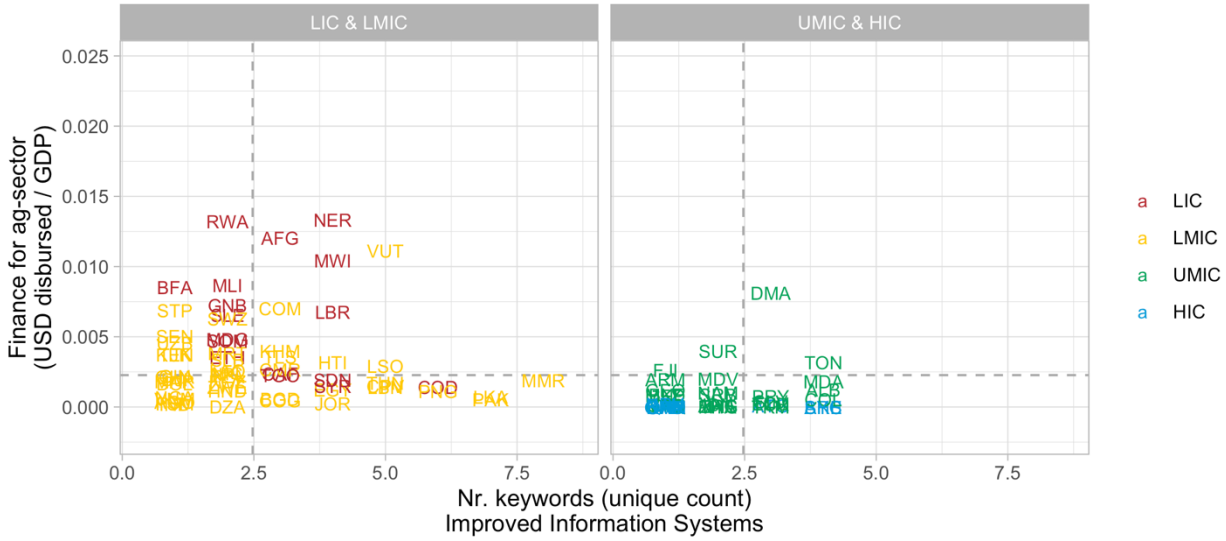


Figure S 15. Inclusion of information systems in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

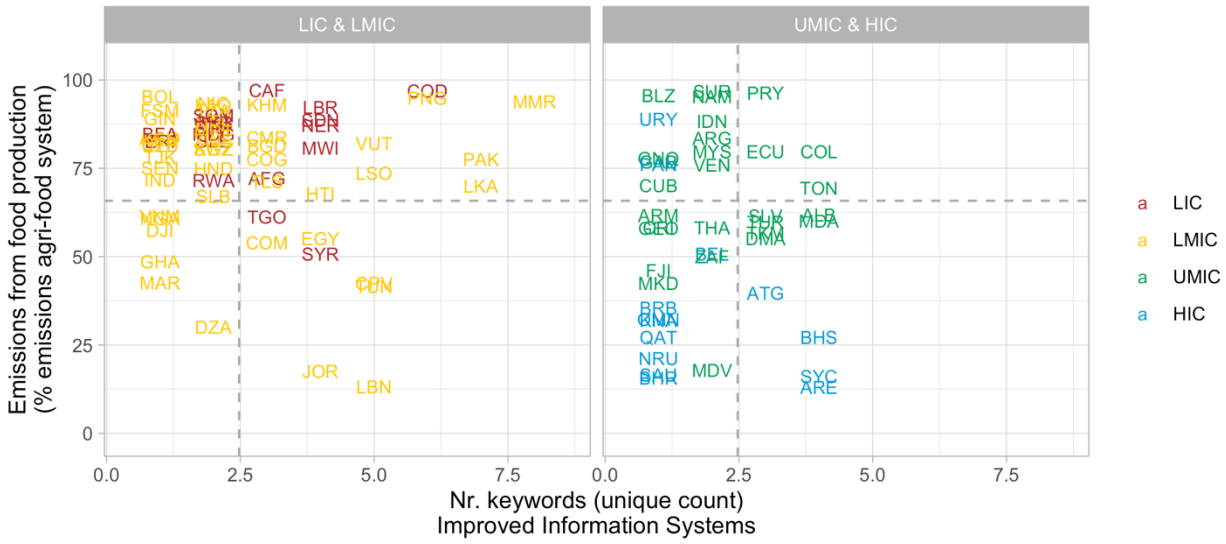


Figure S 16. Inclusion of information systemsin NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

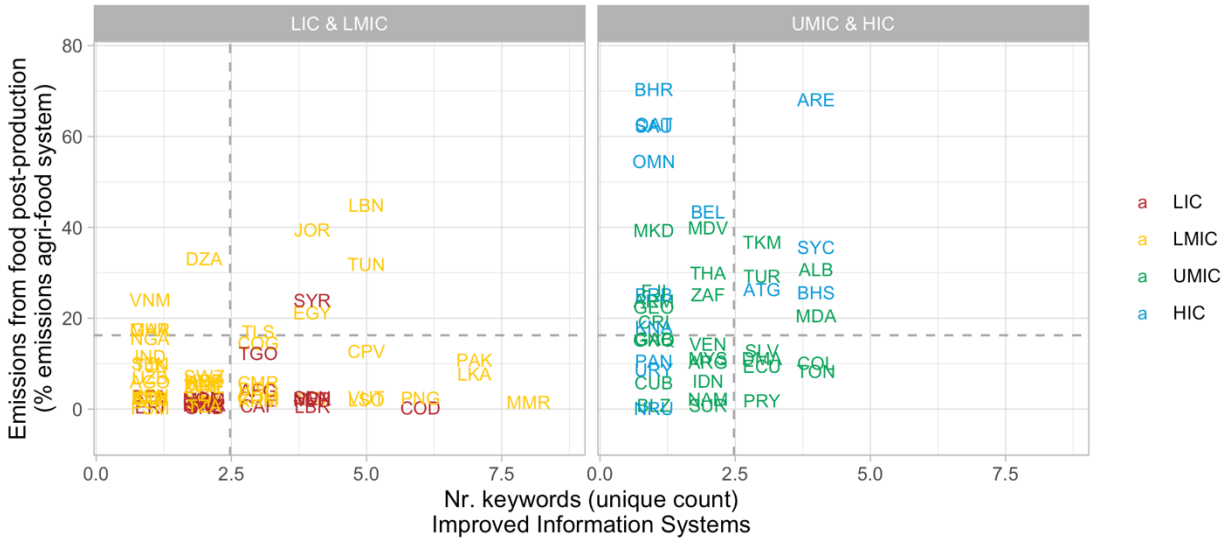


Figure S 17. Inclusion of information systems in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

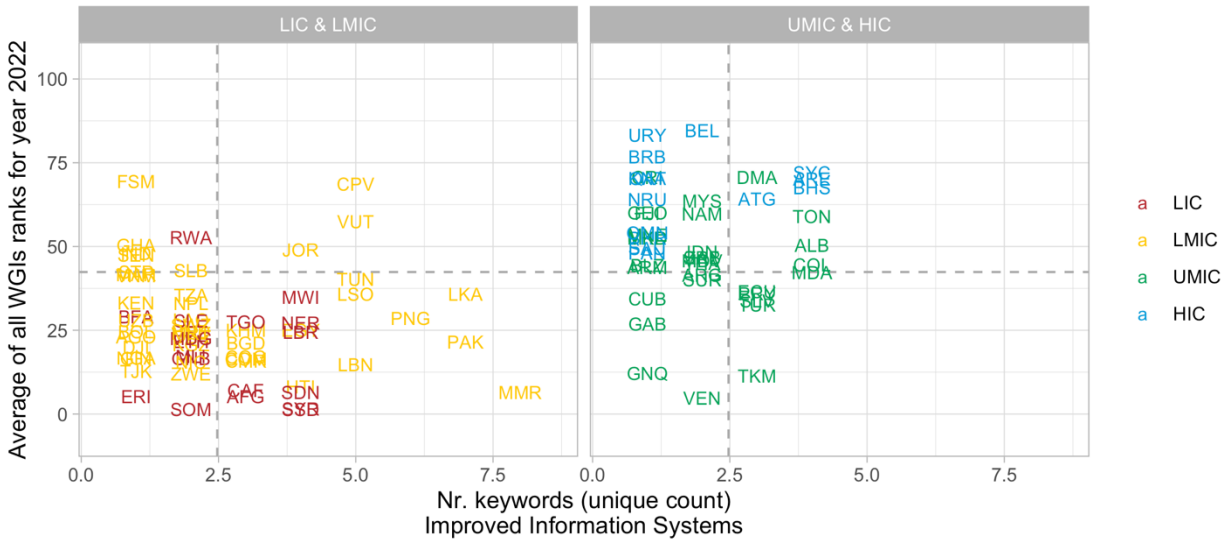


Figure S 18. Inclusion of information systems in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

On-farm production

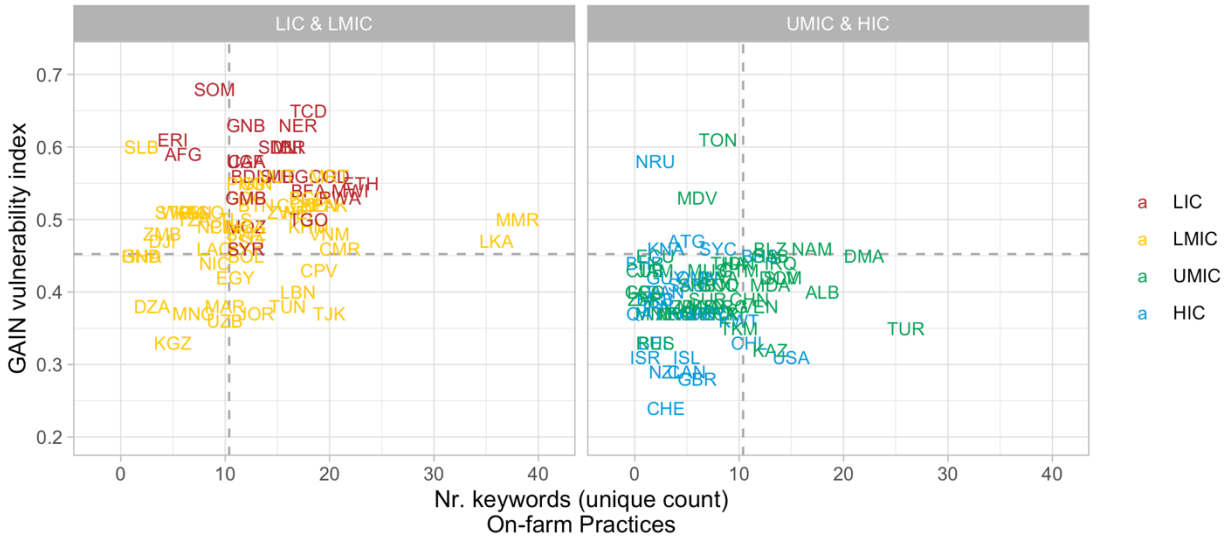


Figure S 19. Inclusion of on-farm production in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

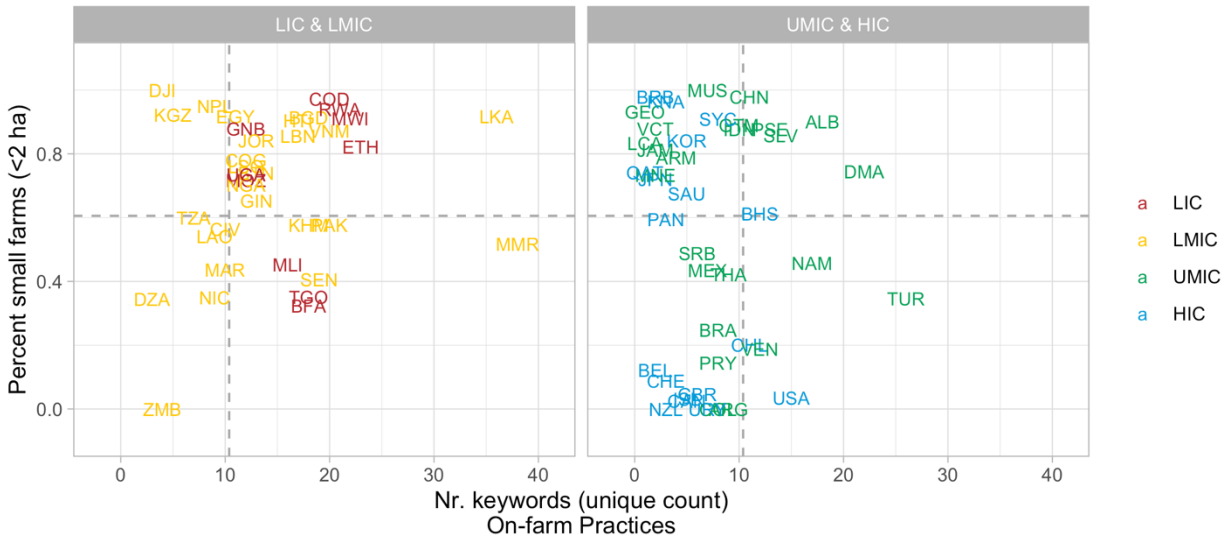


Figure S 20. Inclusion of on-farm production in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

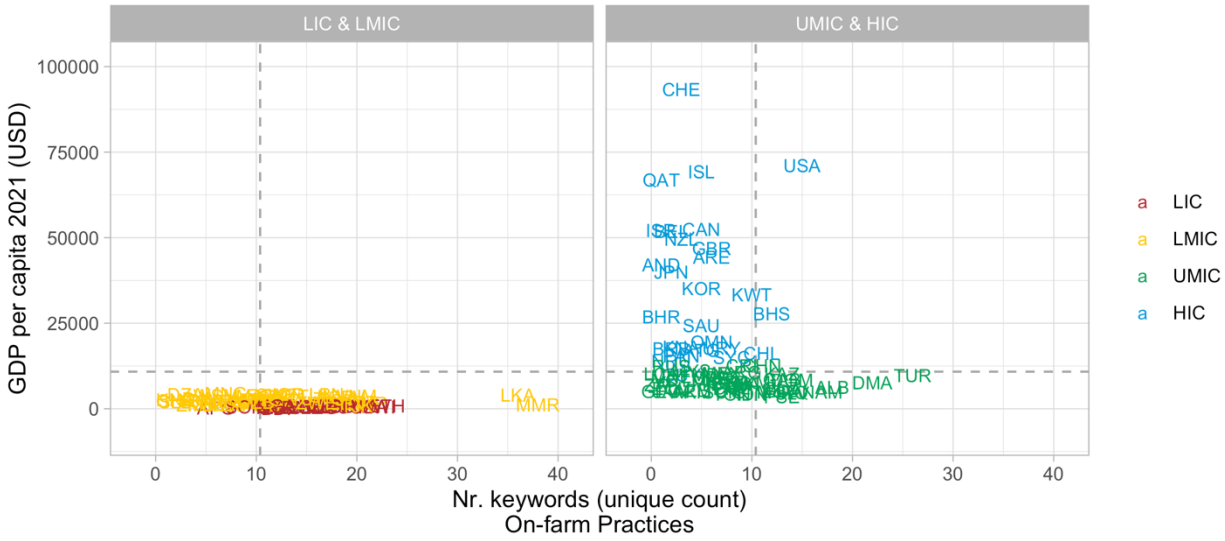


Figure S 21. Inclusion of on-farm production in NDCs and GDP per capita. Source: World Bank.

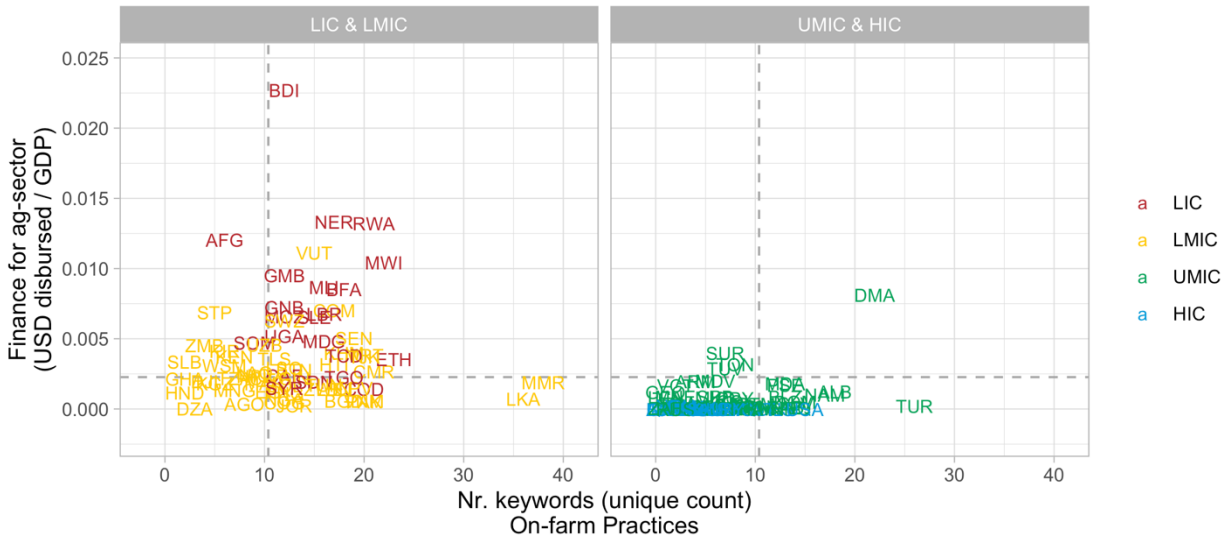


Figure S 22. Inclusion of on-farm production in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

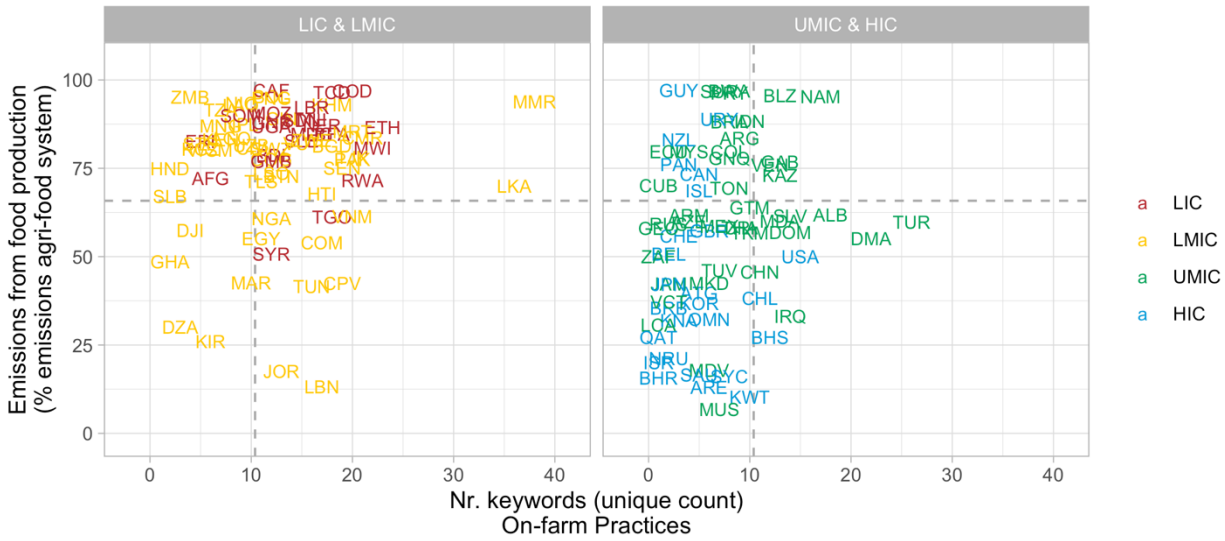


Figure S 23. Inclusion of on-farm production in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

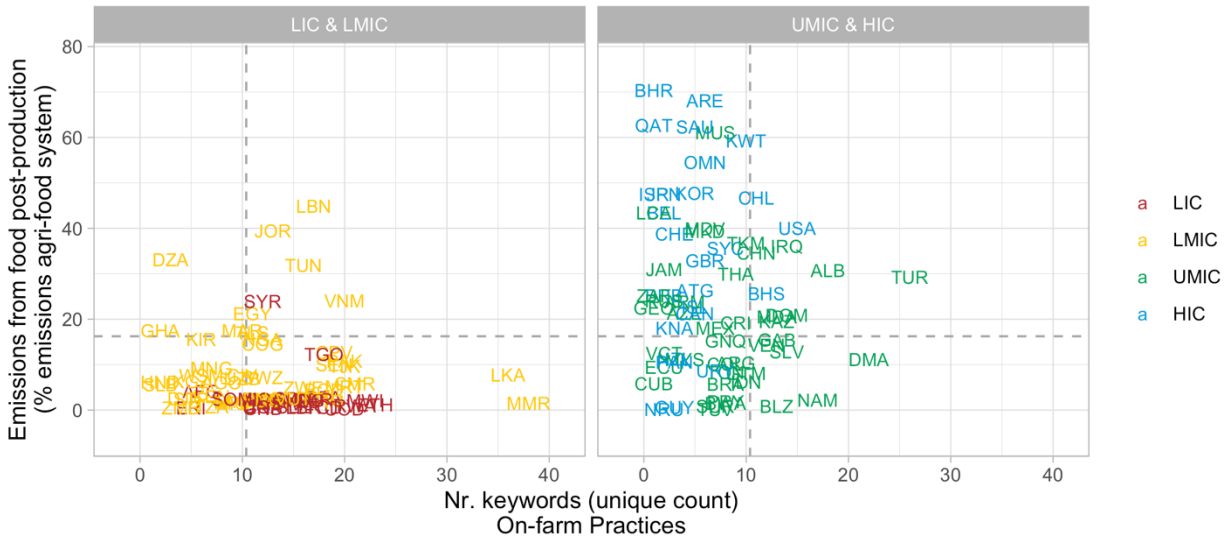


Figure S 24. Inclusion of on-farm production in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

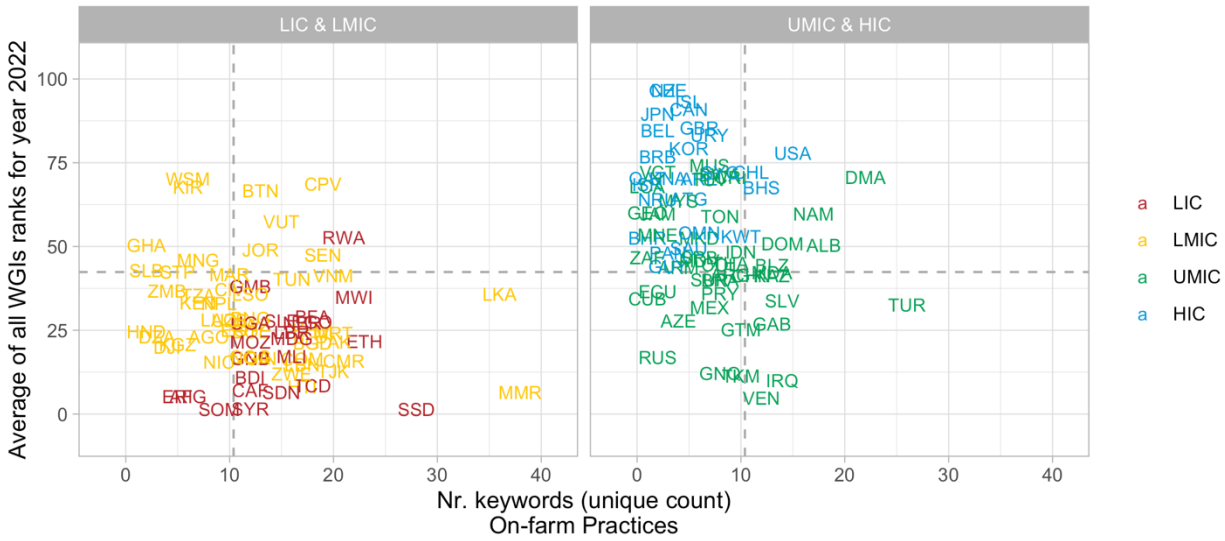


Figure S 25. Inclusion of on-farm production in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

Post-harvest handling

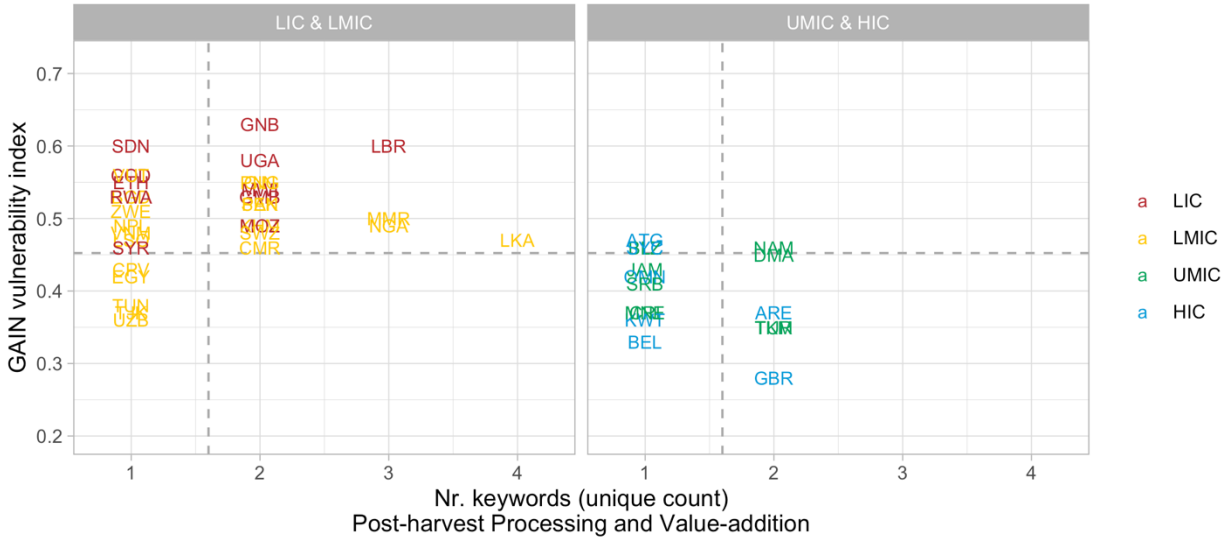


Figure S 26. Inclusion of post-harvest handling in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

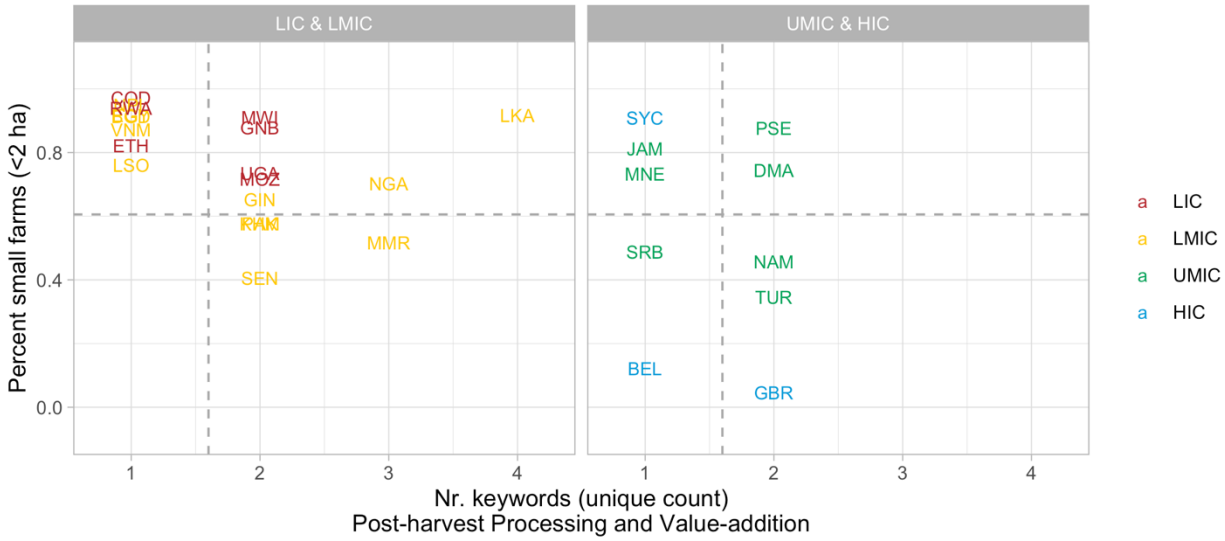


Figure S 27. Inclusion of post-harvest handling in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

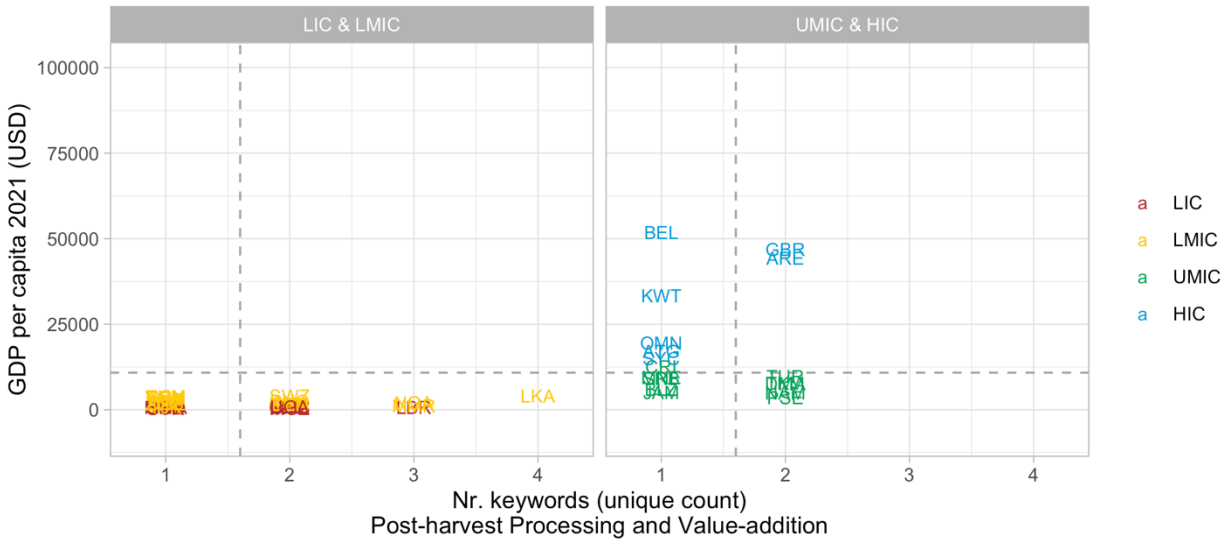
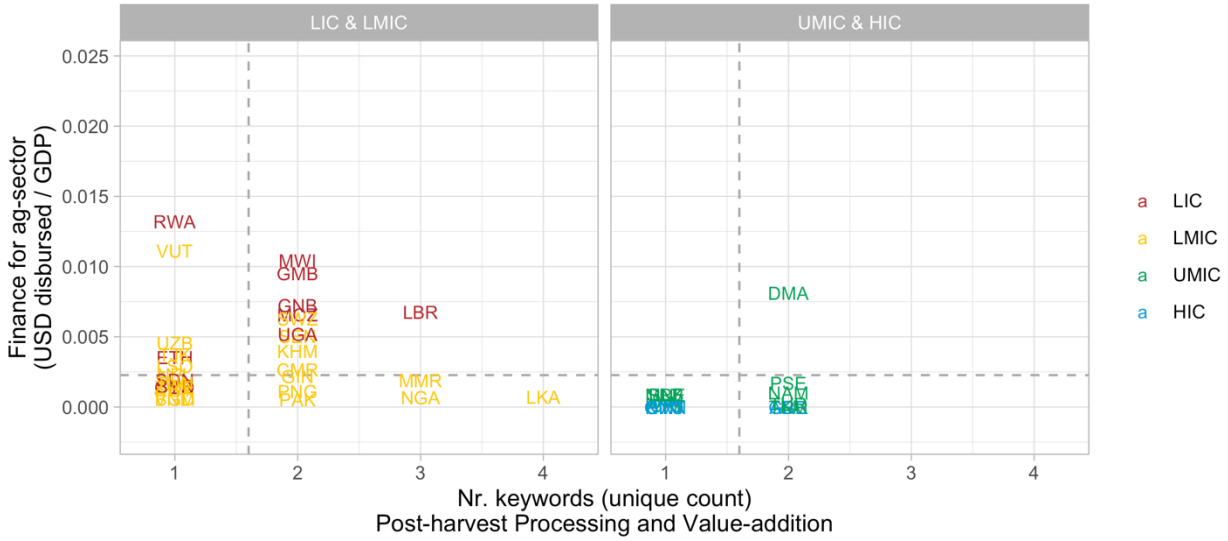


Figure S 28. Inclusion of post-harvest handling in NDCs and GDP per capita. Source: World Bank



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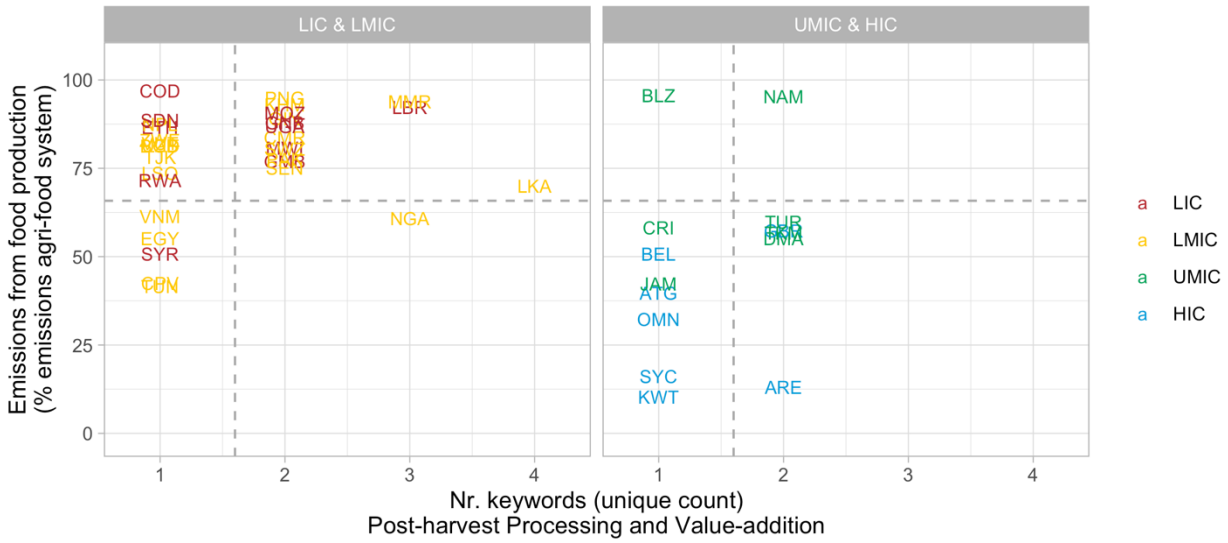


Figure S 30. Inclusion of post-harvest handling in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

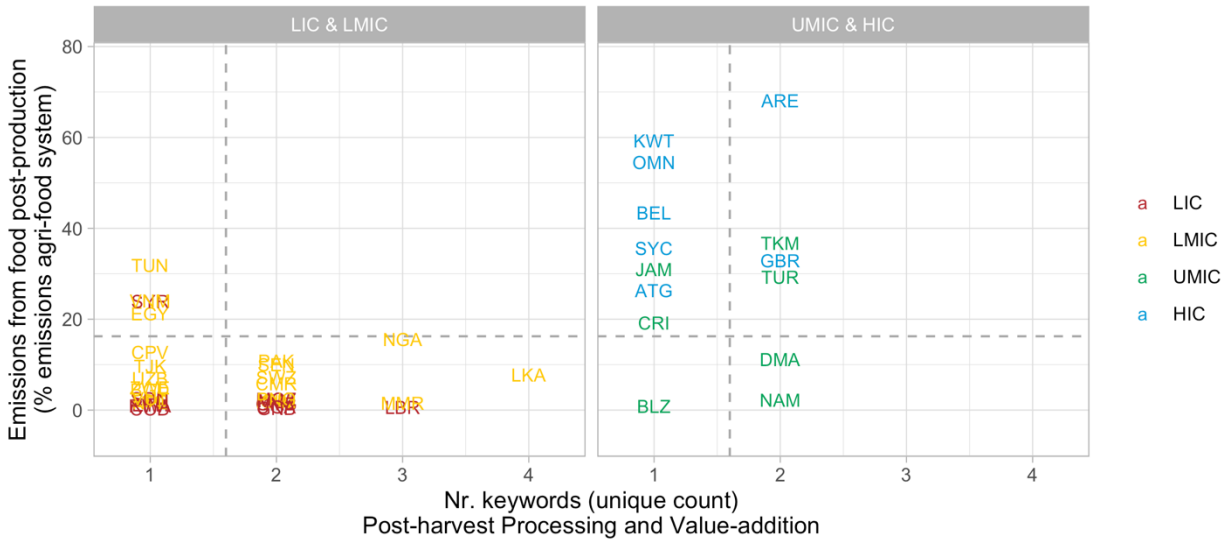
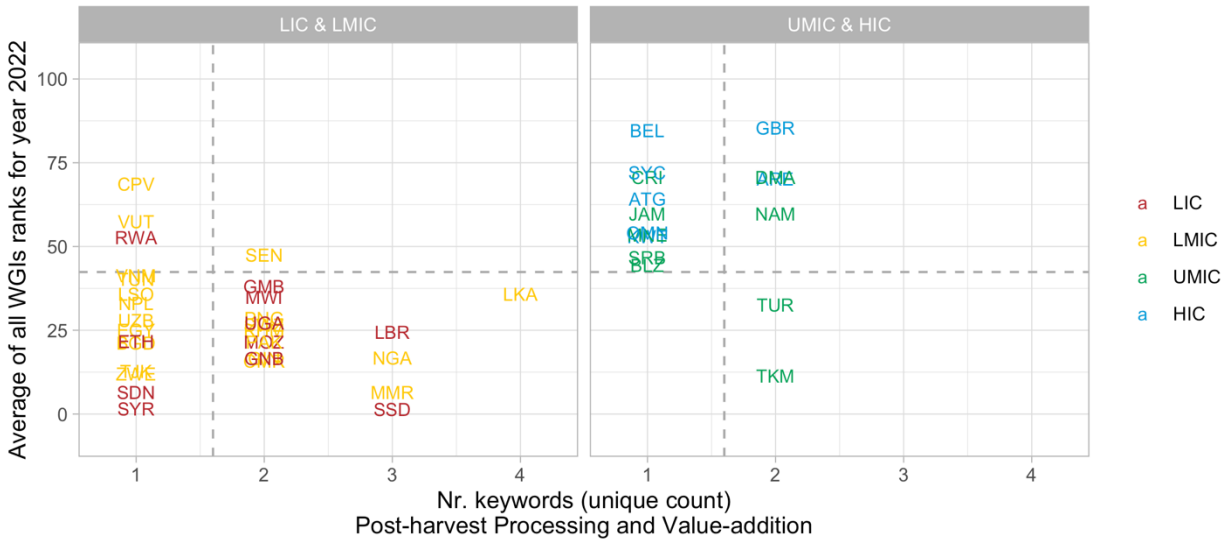


Figure S 31. Inclusion of post-harvest handling in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).



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Markets

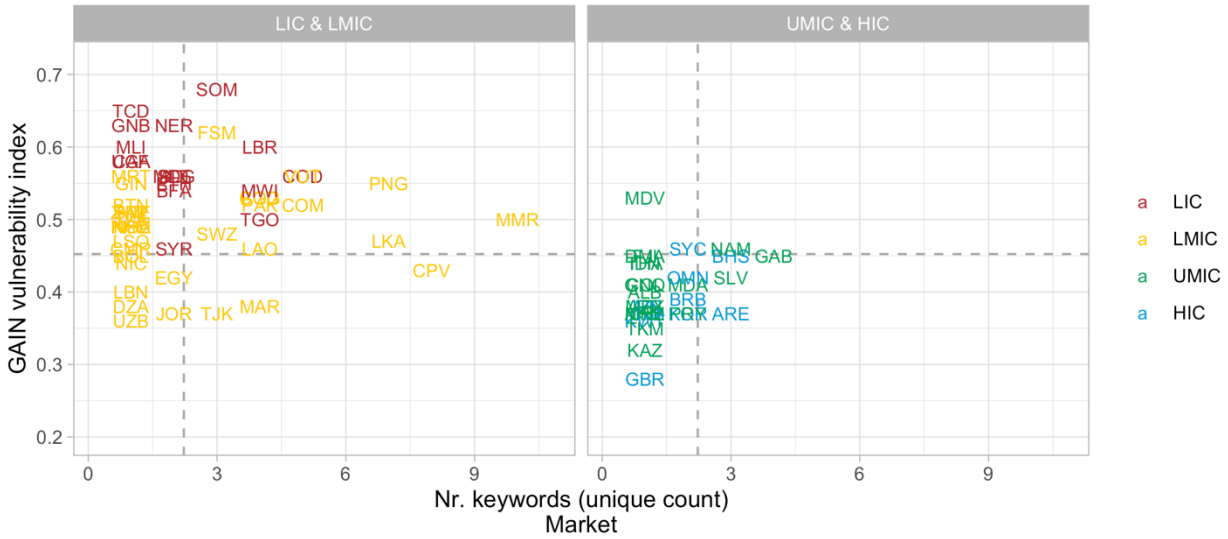
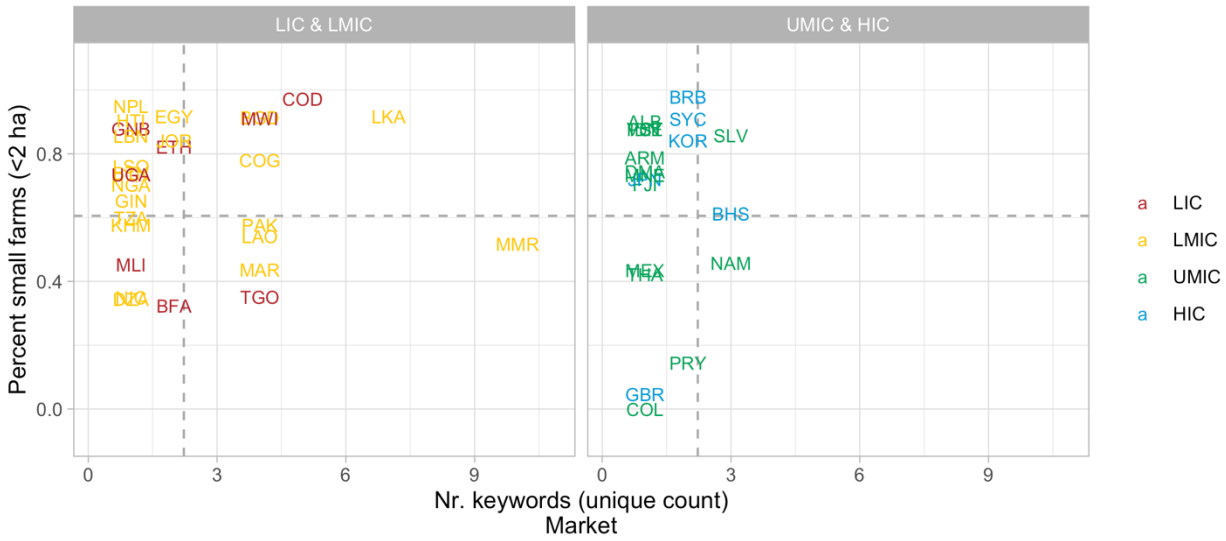


Figure S 33. Inclusion of markets in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).



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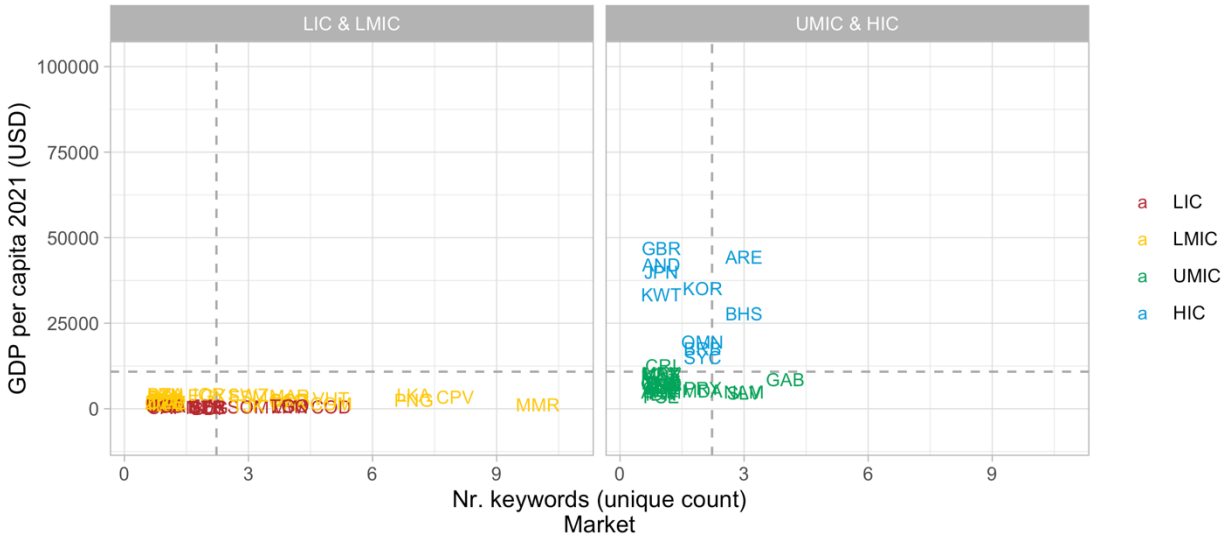

Figure S 35. Inclusion of markets in NDCs and GDP per capita. Source: World Bank

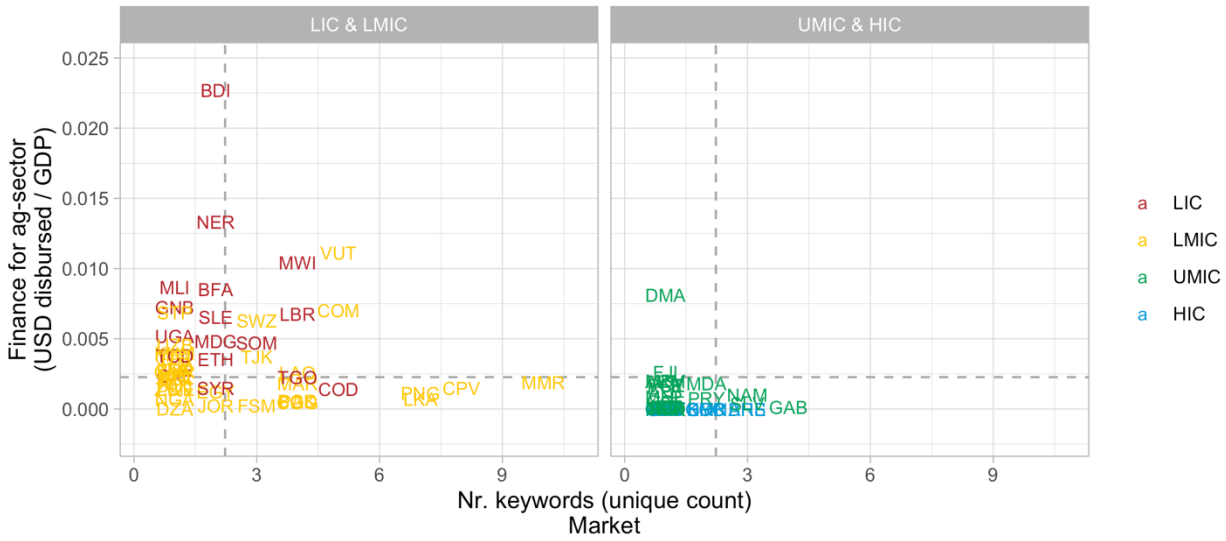

Figure S 36. Inclusion of markets in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

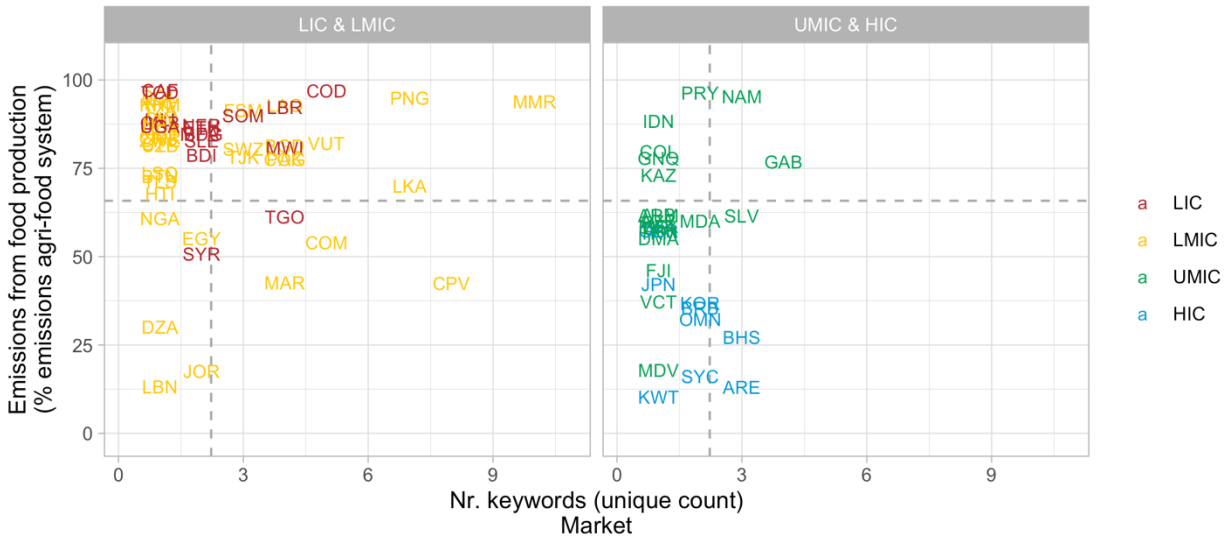

Figure S 37. Inclusion of markets in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

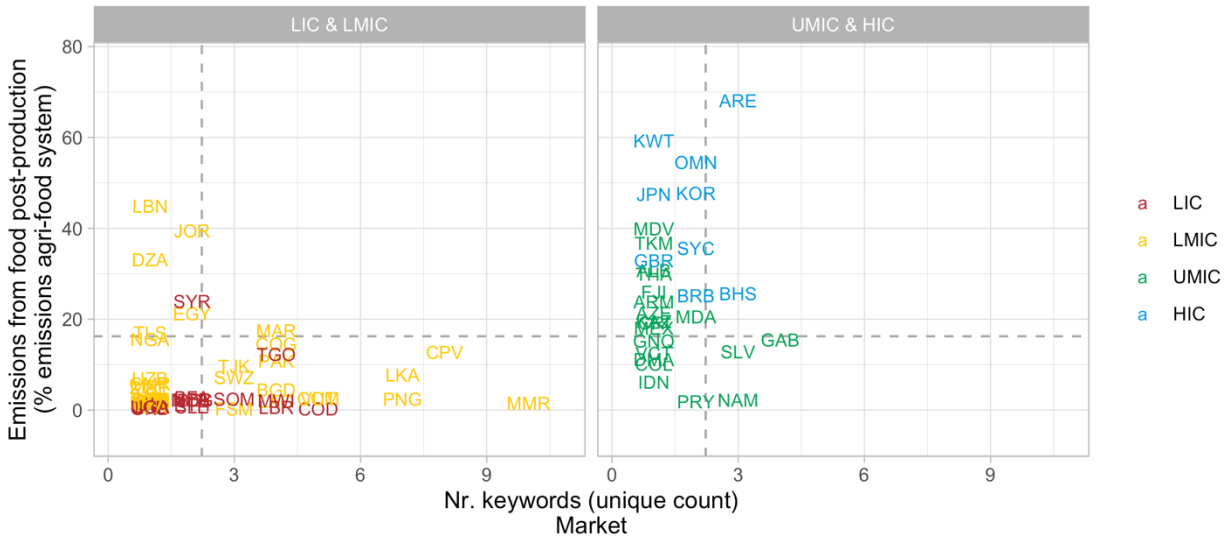

Figure S 38. Inclusion of markets in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

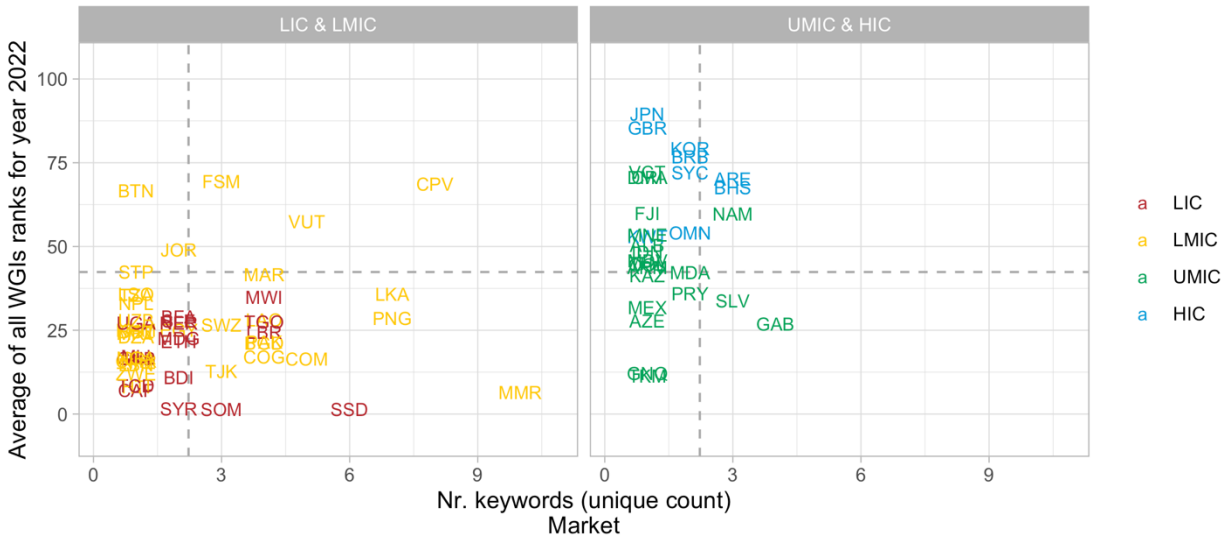

Figure S 39. Inclusion of markets in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

Finance

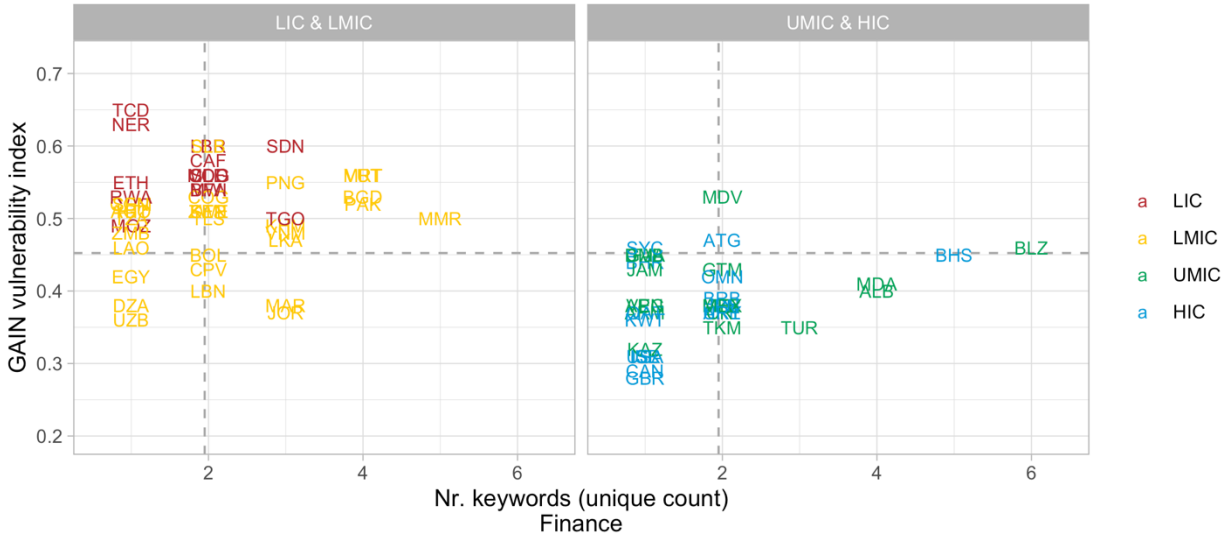

Figure S 40. Inclusion of finance in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

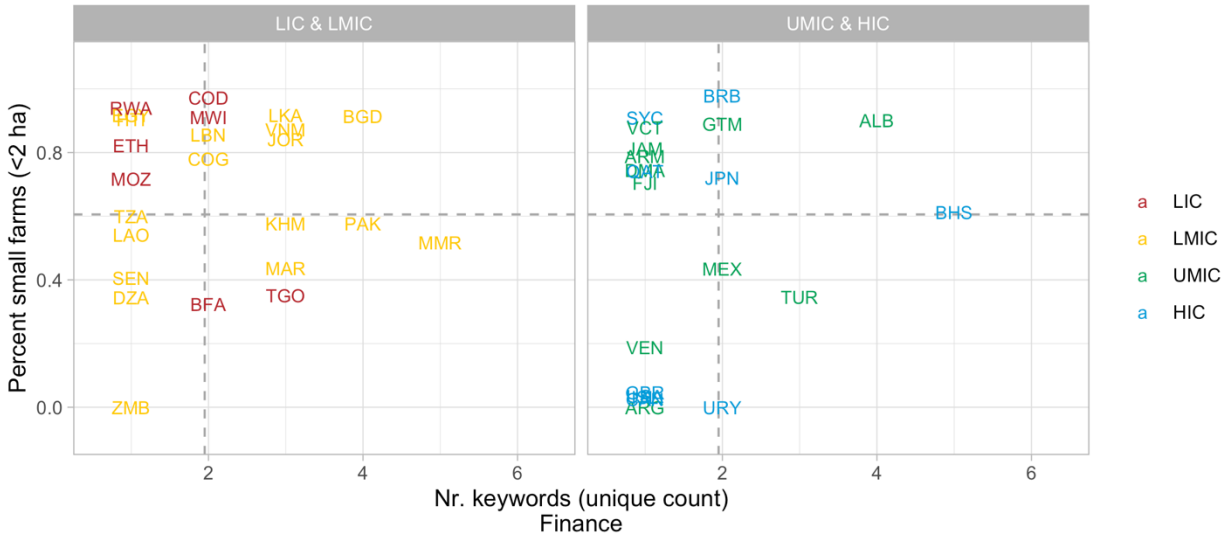

Figure S 41. Inclusion of finance in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

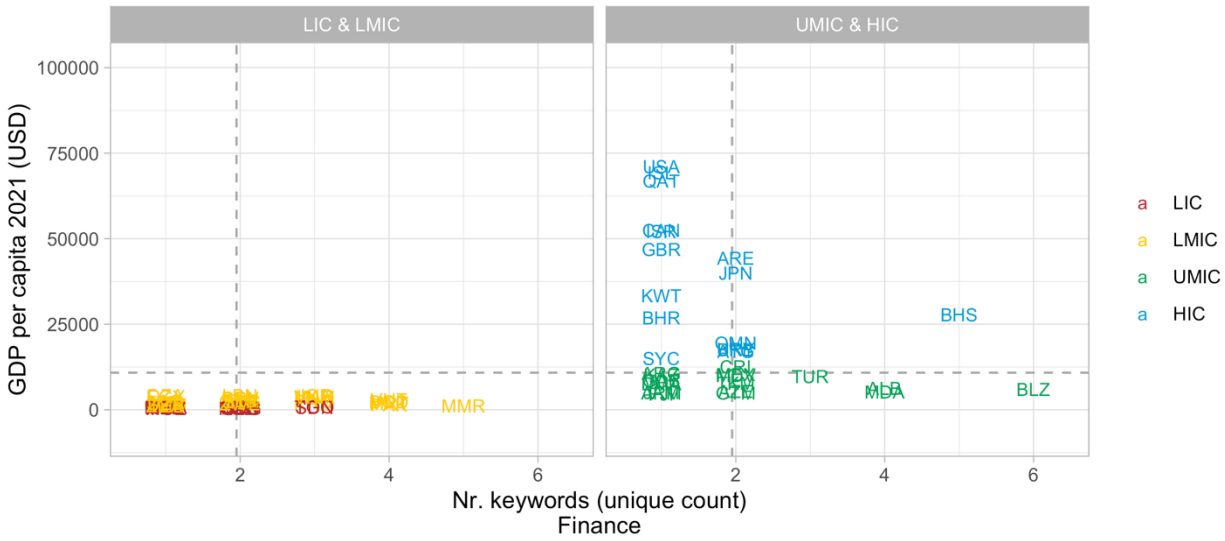

Figure S 42. Inclusion of finance in NDCs and GDP per capita. Source: World Bank

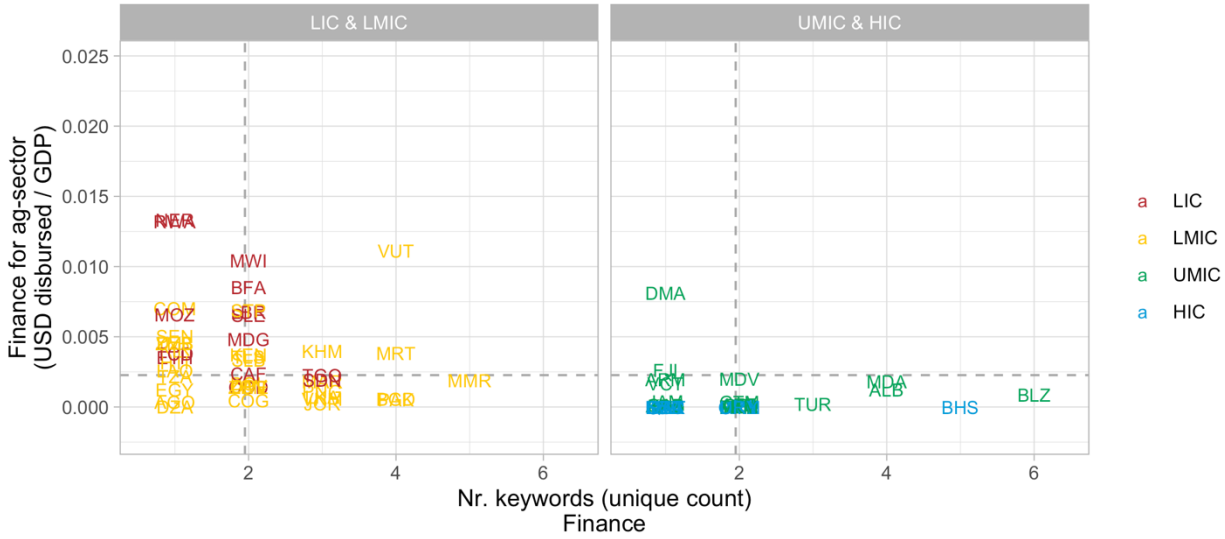

Figure S 43. Inclusion of finance in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

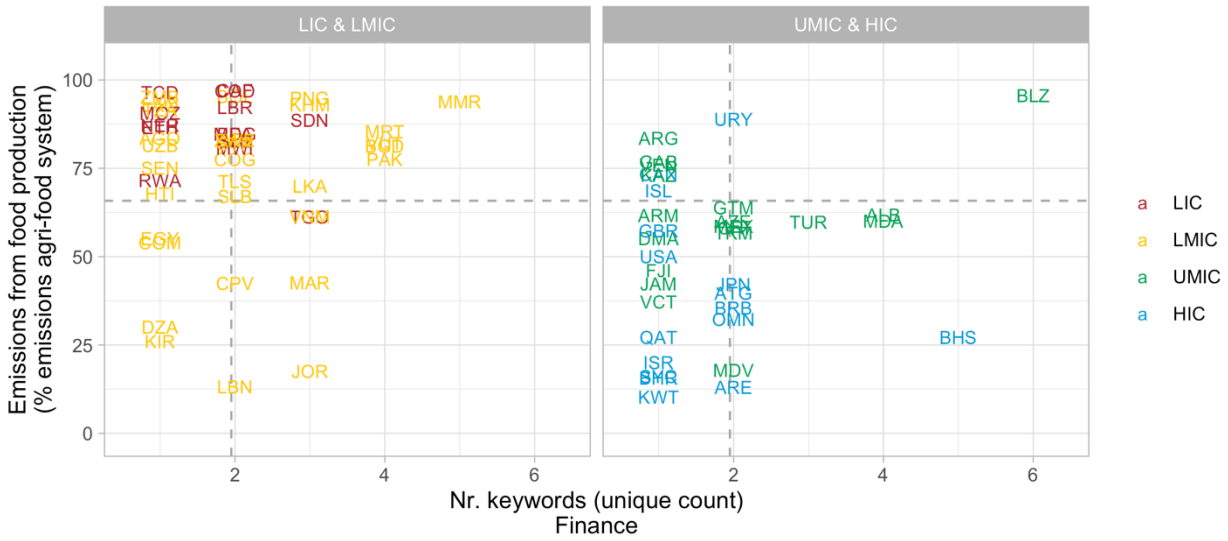

Figure S 44. Inclusion of finance in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

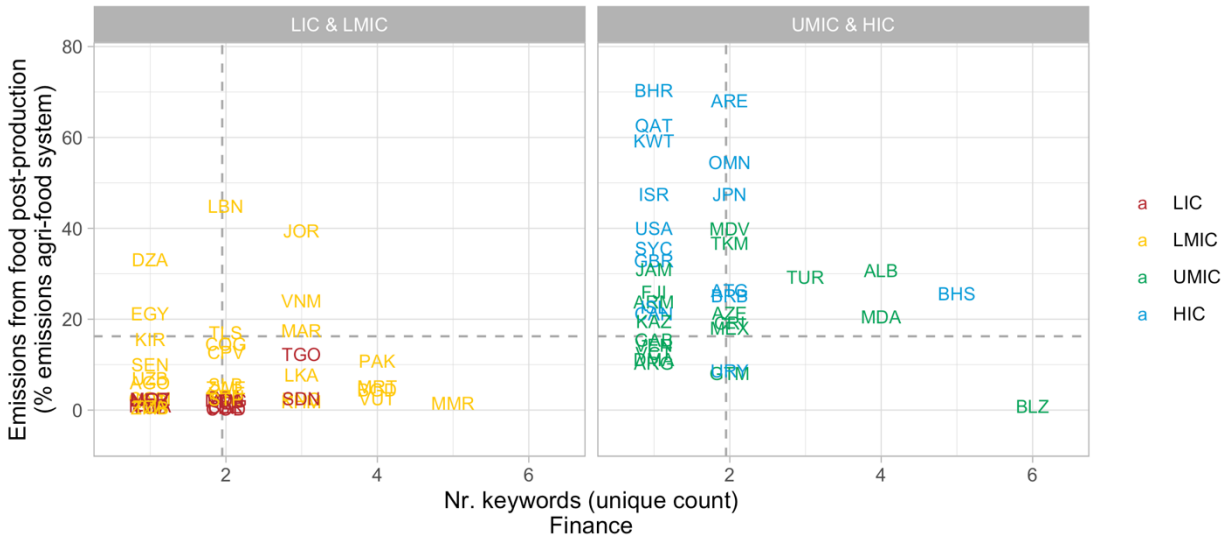

Figure S 45. Inclusion of finance in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

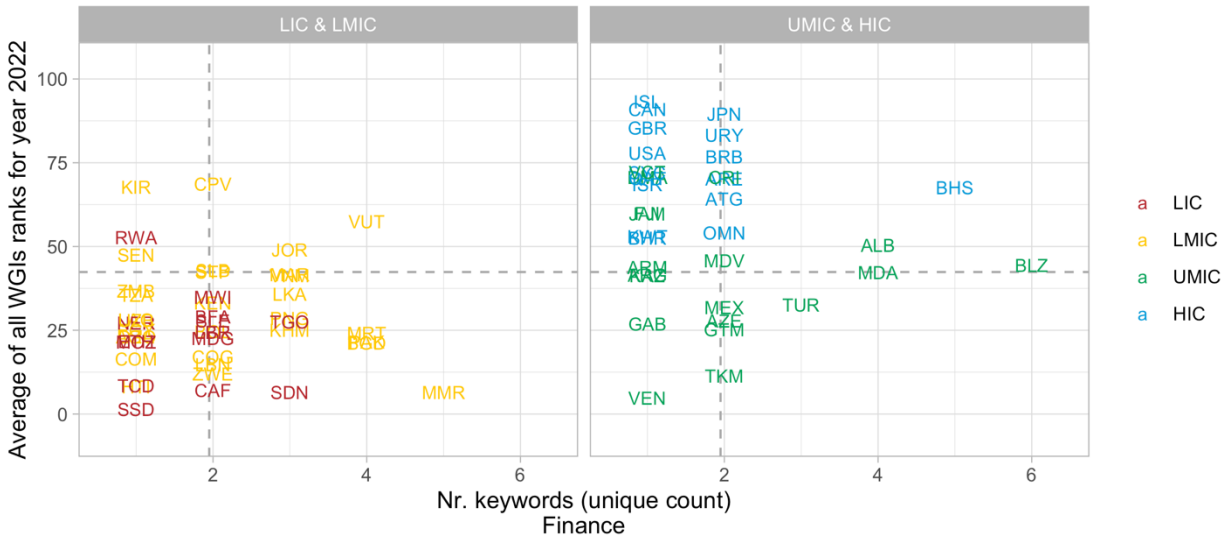

Figure S 46. Inclusion of finance in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

Policy

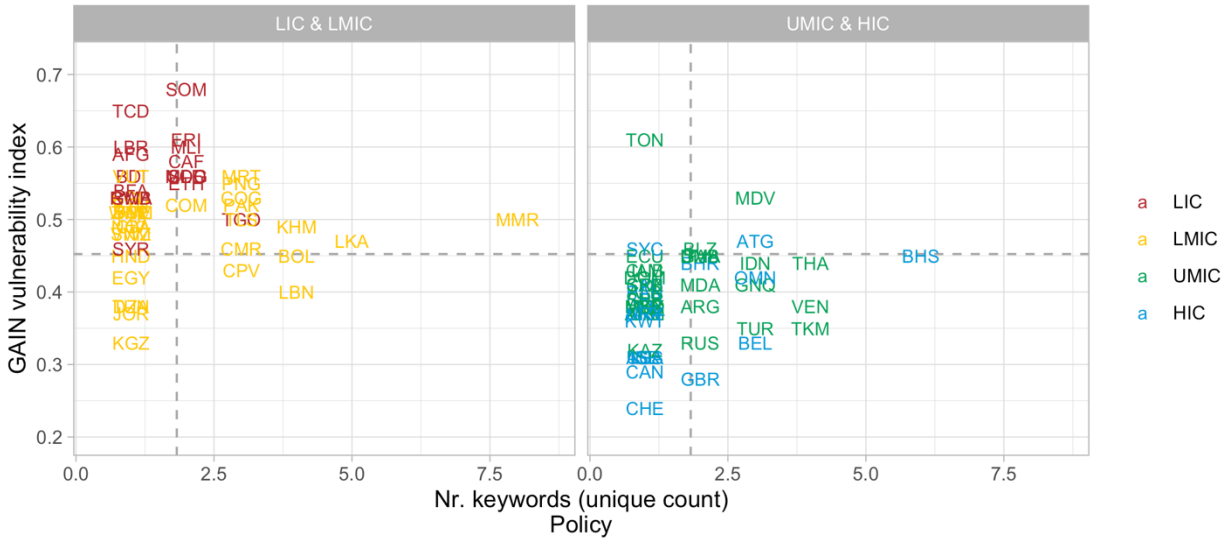

Figure S 47. Inclusion of policy in NDCs and vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability).

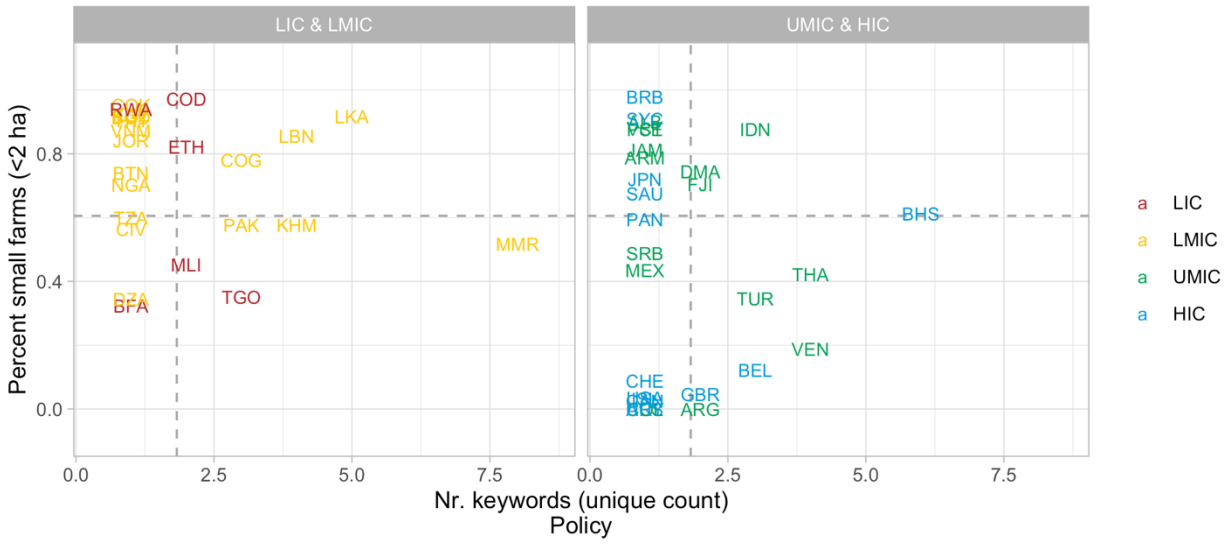

Figure S 48. Inclusion of policy in NDCs and percentage of small farms (<2 hectares) within national agricultural systems. Source: Lowder et al. 2021.

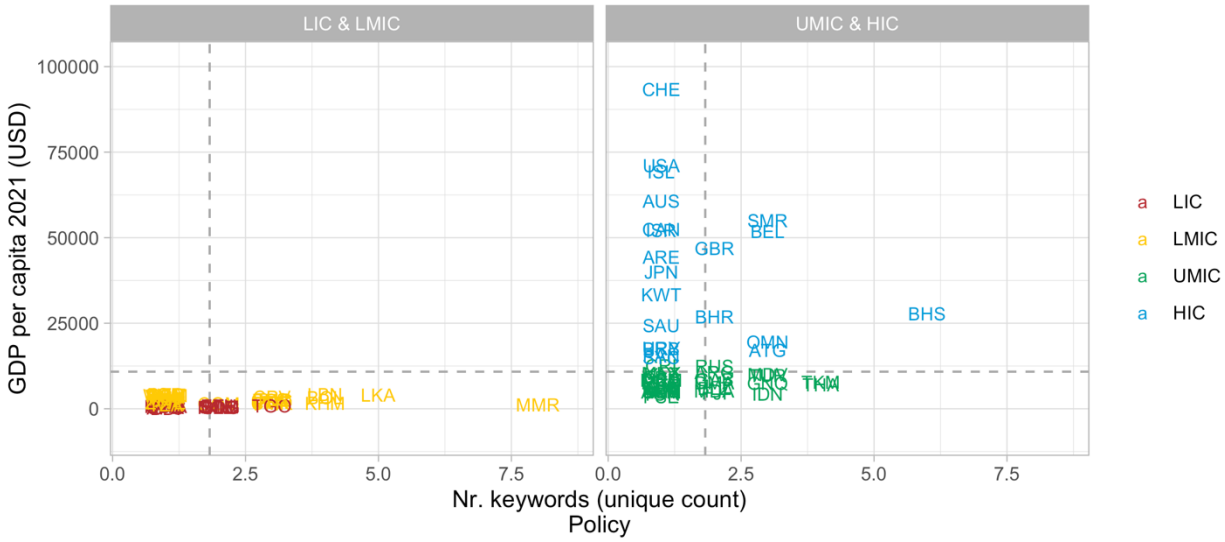

Figure S 49. Inclusion of policy in NDCs and GDP per capita. Source: World Bank

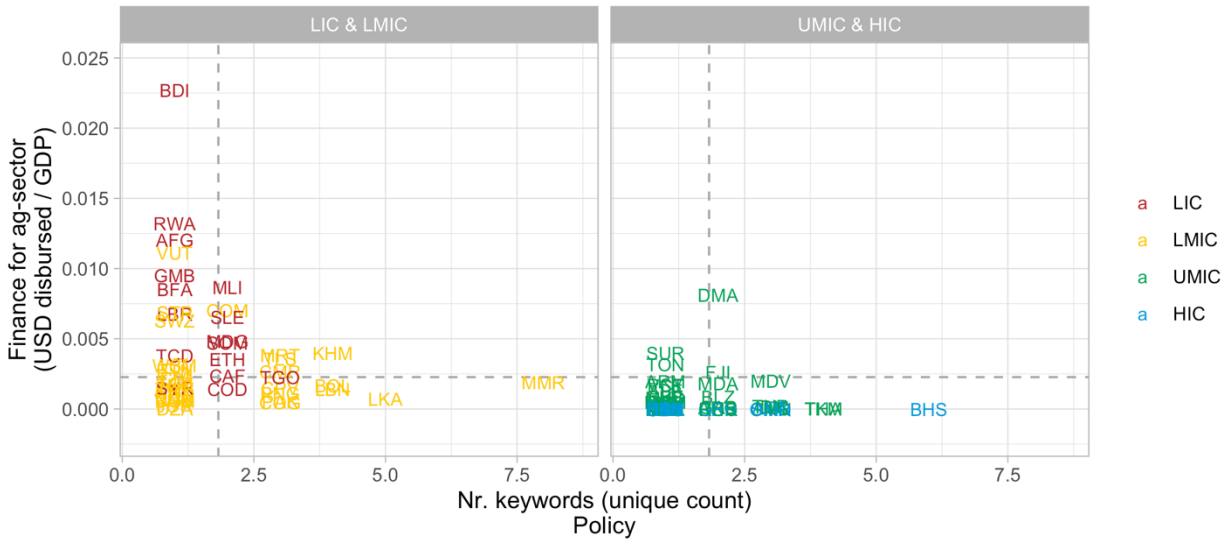

Figure S 50. Inclusion of policy in NDCs and international climate finance flows to agriculture. Finance flows are based on OECD Creditor Reporting System corrected for GDP of countries.

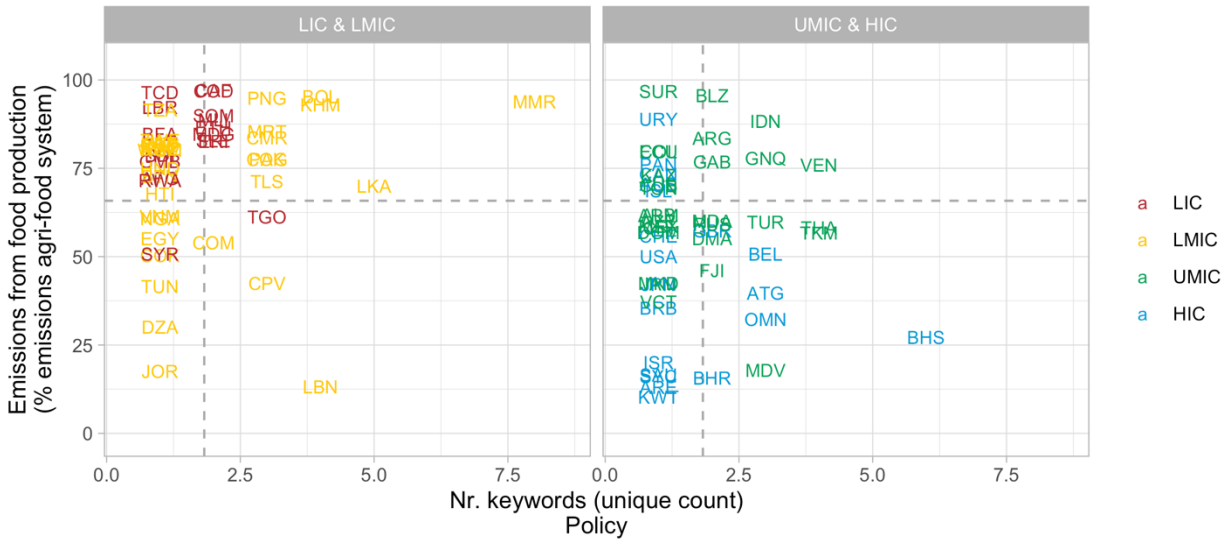

Figure S 51. Inclusion of policy in NDCs and share of emissions of agriculture production over total emissions from agriculture and food systems per country. Source: Crippa et al. (2021).

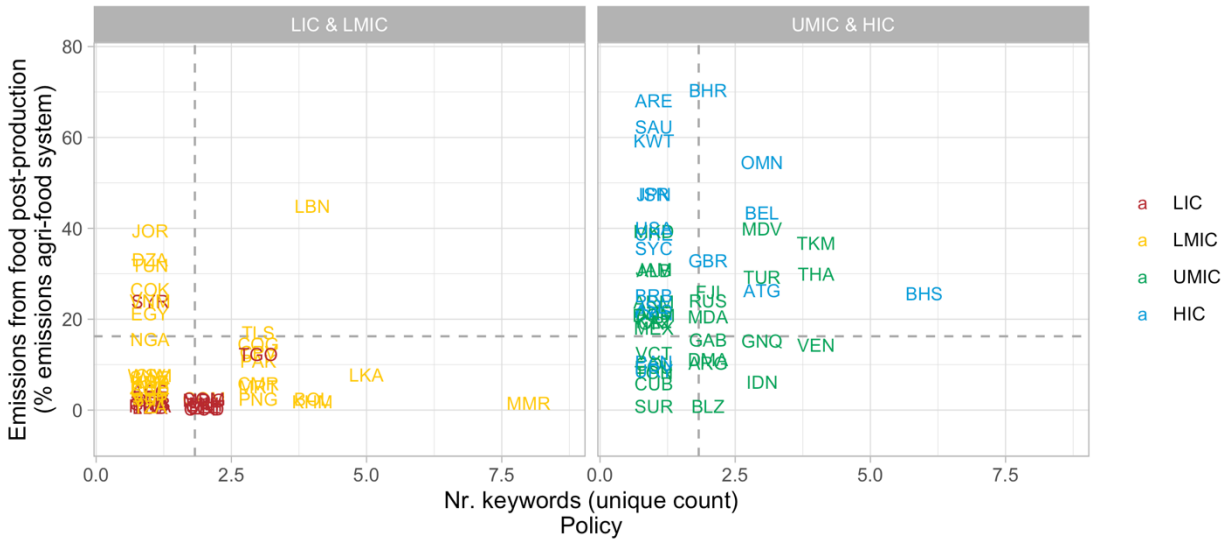

Figure S 52. Inclusion of policy in NDCs and percentage contribution of food post-production to total GHG emissions from agriculture and food systems. Source: Crippa et al. (2021).

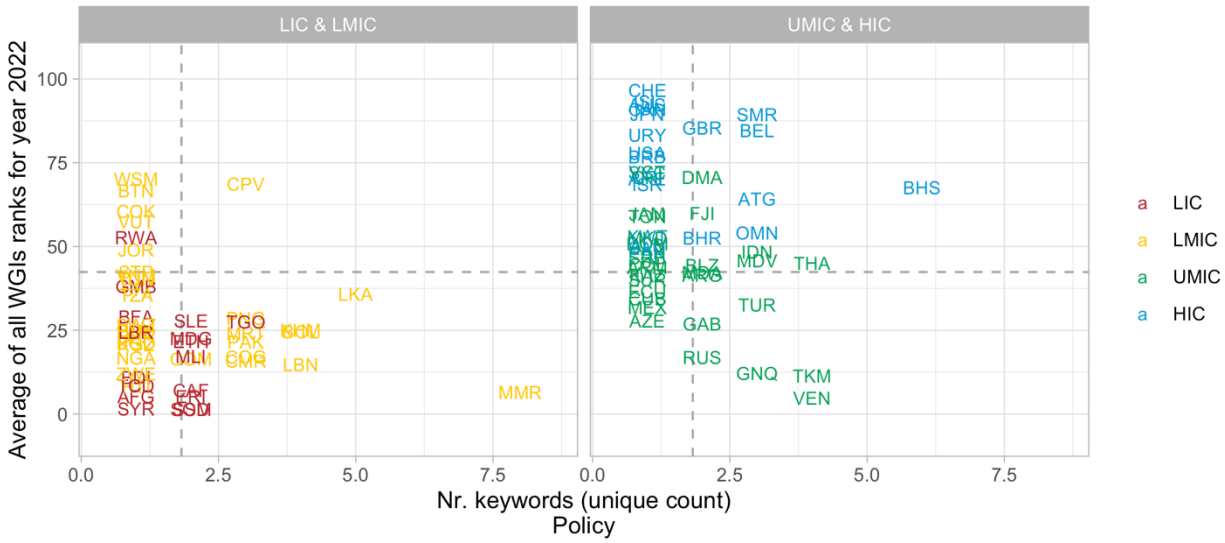

Figure S 53. Inclusion of policy in NDCs and the average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022. Source: World Bank - WGI).

Country characteristics compared to number of innovation categories in NDCs

In this section, the number of agriculture and food systems innovation categories mentioned by countries in their NDCs are compared with selected country characteristics.

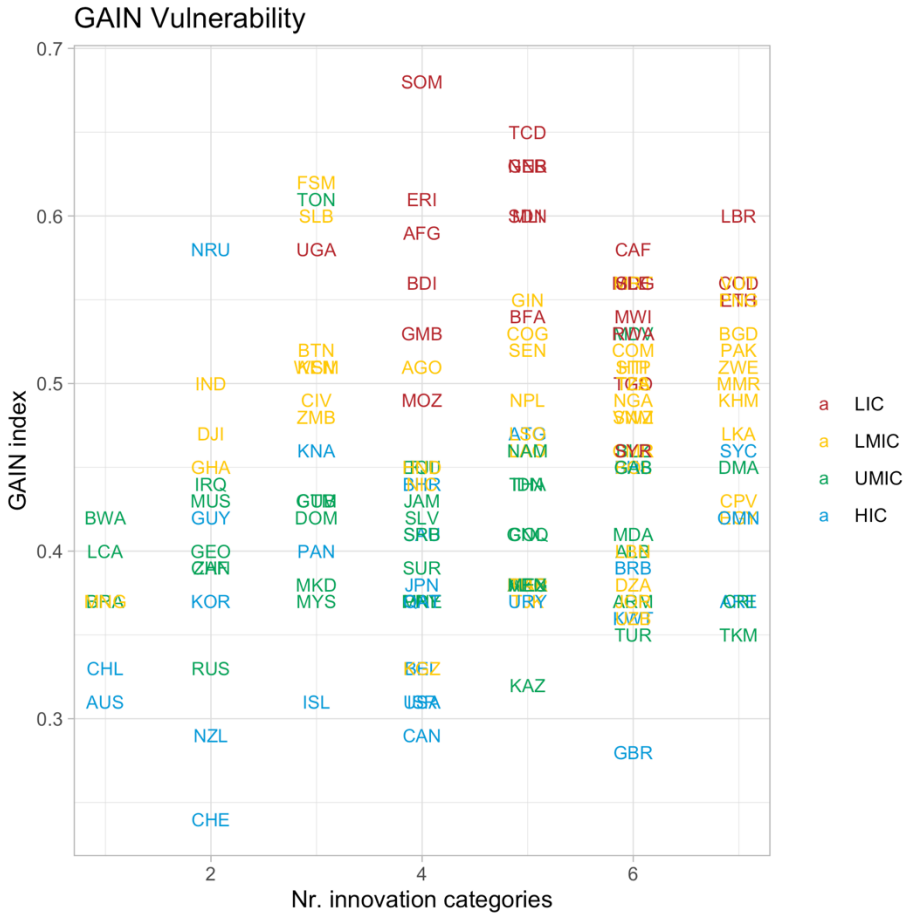

Figure S 54. Vulnerability to climate change based on the GAIN index (a higher score corresponds to higher vulnerability) compared to number of agriculture and food systems innovation categories mentioned in NDCs.

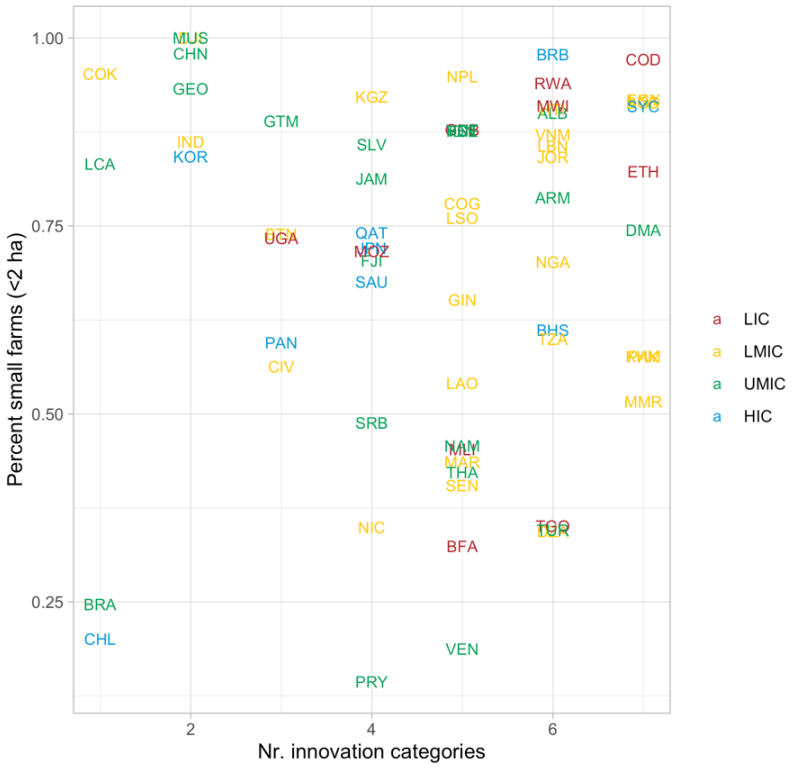

Figure S 55. Percentage of small farms (<2 hectares) within national agricultural systems compared to number of agriculture and food systems innovation categories mentioned in NDCs. Countries for which the share of small farms is close to zero or that have no innovation categories covered are not shown in the plot. Source for percent of small farms: Lowder et al. 2021.

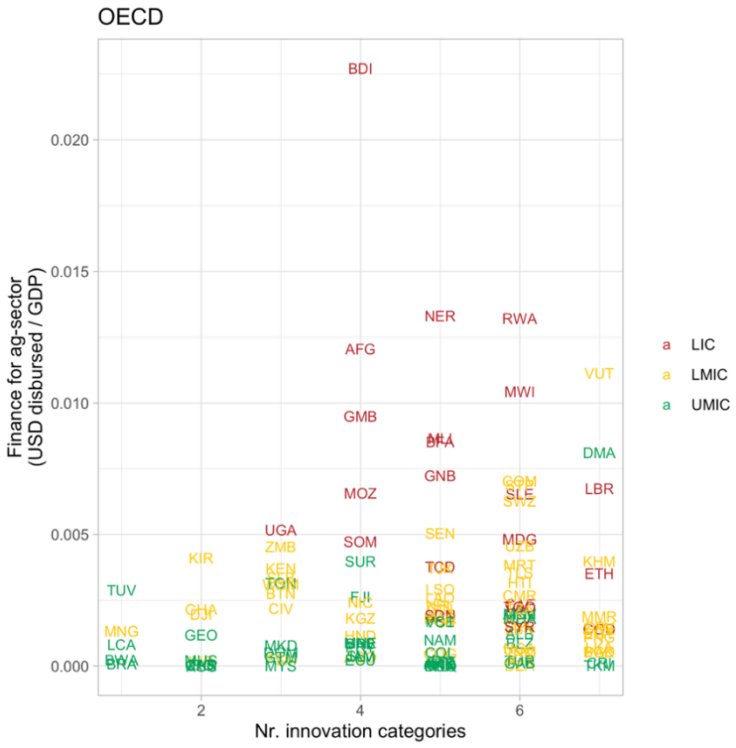

Figure S 56. International finance flows compared to number of agriculture and food systems innovation categories mentioned in NDCs. Finance flows are based on OECD's Creditor Reporting System (Source: OECD.Stat) for the agricultural sector (SectorName = III.1.a. Agriculture) in average USD disbursed between 2018 and 2022, divided by the country's gross domestic product (GDP) (Source: World Bank). HICs are not shown in the figure, as they mostly act as creditors and therefore receive negligible international finance flows.

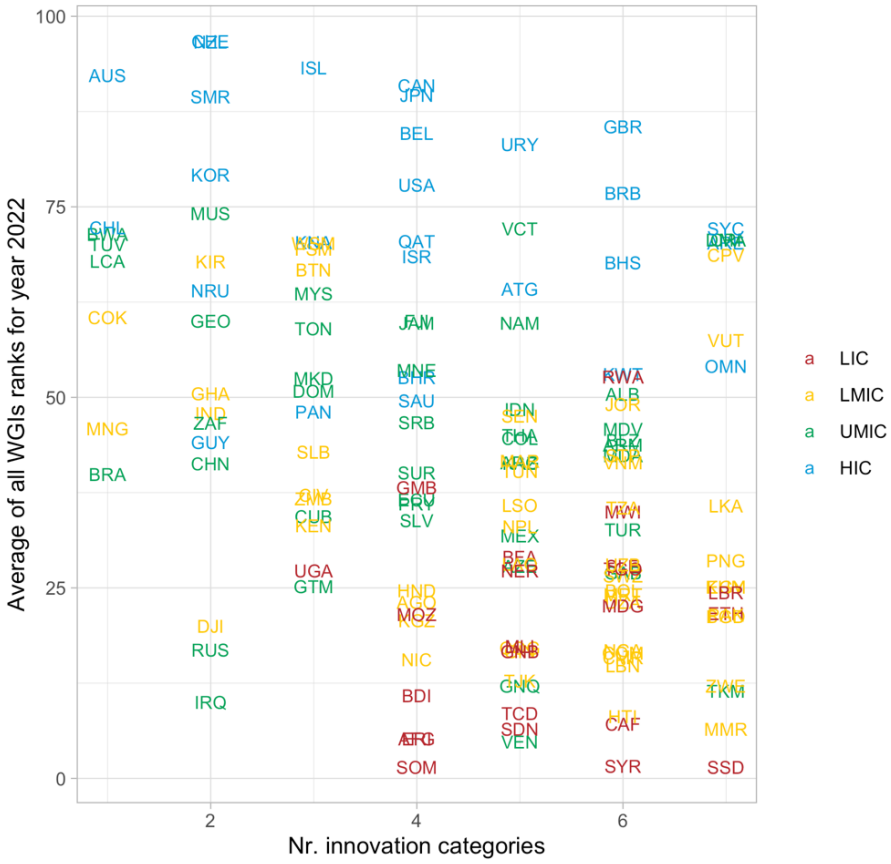

Figure S 57. Average rank per country of the six Worldwide Governance Indicators (WGI), i.e., Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption for the year 2022 compared to number of agriculture and food systems innovation categories mentioned in NDCs. Source: World Bank - WGI).