

IMMANA Review of Climate Change & Agriculture Nutrition and Health (ANH): Evidence, data, methods and metrics of ANH impacts and responses to climate change with an equity lens

1. BACKGROUND

Climate change presents an urgent planetary crisis. Scientific research has proliferated, generating evidence for overwhelming anthropogenic contributions to climate change, and the subsequent environmental and human health impacts (1). One intersection of particular interest is the continuum along which Climate Change impacts Nutrition and Health via Agriculture pathways – otherwise known as the Agriculture, Nutrition and Health (ANH) nexus. In the past 5 years, there has been a steady increase in literature synthesizing the myriad of pathways through which climate change can impact ANH (e.g., via changes in soil fertility and crop yield, composition, and bioavailability of nutrients in foods, pest resistance, risk of malnutrition, livestock and increased loss of nutrient-dense perishables) (2). Today we have a wealth of systematic reviews linking the consequences of climate change to destabilized global food systems, decreases in food security and diet quality, and increased risk of malnutrition (2).

Despite the vast volumes of existing literature, we are still struggling to respond to climate change, and it is unclear where researchers should invest their efforts. For instance, it is known that extreme weather events have catastrophic effects on childhood stunting, but we are unable to identify key mediating factors due to limited methods and metrics (3). Despite many international development reports predicting that Low- and Middle-Income Countries (LMIC) populations will be most vulnerable to climate change (1), existing synthesis has identified a lack of research on ANH and climate change linkages in these countries (4,5). There have also been obvious gaps identified in food systems perspectives in evaluating the co-benefits and risks of adaptation and mitigation strategies (4,6). The lack of systematic and accessible data and measurement systems for the reciprocal relationship between food system and climate are also frequently discussed (2,3,7). While many studies acknowledge unequal in the distribution of climate vulnerability to adverse health outcomes, there is a gap in equitable research including and representing these vulnerable groups as crucial decision-makers (8).

The recommendations for future research are diverse and rapidly changing with the proliferation of evidence. Building on the work of recent systematic reviews to consider research requirements for evidence, methods and metrics across the ANH nexus in the context of climate change would support a more systematic prioritisation of research to effectively address the pressing need to adapt food systems in a changing climate.

2. SCOPE

2.1 Aim

The aim of this project is to produce an agenda-setting summary of recent recommendations for research that examines the impacts of climate change on ANH, ANH responses to climate change, and the tools, methods and metrics available for measuring these relationships, whilst advancing the understanding of equity considerations in climate-ANH nexus. The conclusions of the review should provide clear guidance on next steps and priorities for research, including suggestions for how the IMMANA programme, in particular, could strengthen data, metrics and evidence within this nexus.

2.2 Activities

Activity 1: Summarize conclusions on the state of evidence and recommendations for future research on climate change and ANH, as reported in literature reviews and key organisation reports, conducted within the last 5 years. This would specifically evaluate the bi-directional relationship between climate change and ANH as well as the role of ANH in adapting to or mitigating climate change effects. This rapid review would be conducted using 2 broad scope scientific databases and purposive sampling of key organisation websites and publication sources. The literature search will be global in scope but limited to the last 5 years and to publications in English language. Guiding questions could be:

- In terms of the evidence of climate change and equity impacts on ANH, ANH responses to climate change, and the tools, methods and metrics available for measuring these relationships, what are the key conclusions and recommendations for research in systematic reviews within the last 2-5 years?

Activity 2: Conduct a stakeholder consultation to review and supplement the findings of Activity 1, further refining recommendations for research on climate change and ANH. IMMANA will provide guidance on the selection of stakeholders. Guiding questions could be:

- Are the conclusions of the literature review valid in light of stakeholder knowledge of other sources of evidence, existing and/or upcoming programmes and research efforts?
- What, if any, are the missing themes in terms of priorities for climate change and ANH research that have not been highlighted in the review of literature?
- How would stakeholders characterise the gaps in the field of climate change and ANH and what would their suggested priorities include to inform evidence-based actions?

Activity 3: Prioritize key gaps in data, methods, and metrics for evaluating both impact of and responses to climate change in the ANH nexus.

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- This activity should summarise the findings of the literature review combined with the stakeholder consultation, synthesising results thematically to provide a comprehensive overview of the research requirements for climate change and ANH, and key priorities. This summary should reflect on equity considerations, highlighting how equity features in, and might be influenced by, current recommendations
- Review synthesised research requirements against IMMANA's core objectives and expertise and suggest research priorities specific to the IMMANA programme

2.3 Outputs & Outcomes

This rapid review and the stakeholder consultation will be led by a researcher over a 3-month period, commissioned by the IMMANA programme and supported by the IMMANA team. IMMANA will facilitate the publishing of this output and use it to feed back into its programme evaluation and planning (March 2023).

The review will produce, with support from IMMANA, at least one contribution to a peer-reviewed publication. The main output will be a rapid meta-review and a stakeholder research gap analysis, which can be supplemented with editorial or commentary pieces (depending on time constraints). IMMANA will use these outputs to evaluate and plan programme activities as well as encourage and support development of new research through the ANH Academy and other channels.

3. ROLES

This review will consist of:

- Lead Researcher(s): An expert(s) in areas of climate change and agriculture, nutrition, or health with enough experience to confidently complete this review in the given timeframe (3-months).
- Research Assistant(s): Researchers aiding the lead in the completion of this rapid systematic review of reviews.
- Stakeholders: A small group of high-level experts on climate change and/or ANH who will review the technical brief and provide feedback to the research team on overlooked gaps.
- IMMANA Researcher: Research staff to be the point of contact for this commissioned piece of work, to discuss and approve the protocols, to receive updates and to ensure that deadlines are met. They will aid in the write-up and dissemination of the technical output.

4. ADMINISTRATIVE & TECHNICAL SUPPORT

IMMANA will provide the administrative and technical support required (within available resources) for this review. External researchers will be expected to plan their own research meetings, but IMMANA can offer a virtual platform for 'bigger picture' meetings, and the identification of stakeholders for the stakeholder analysis. IMMANA

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staff will also assist with the production and dissemination of technical outputs upon completion and feed outputs back into IMMANA program planning.

5. METHODS OF WORK AND DELIVERABLES

The main method for addressing the set objectives will be to complete a rapid meta-review of literature linking climate change and ANH, with a specific focus on data, methods, and metrics – through an equity lens. This will be enhanced by a stakeholder analysis of review gaps to identify overlooked intersections to be included in the synthesized piece. The main deliverable of this project will be one synthesis output, to be published in a peer-reviewed journal. The rapid review, stakeholder analysis and final output will be delivered by the Lead Researcher and Research Assistants, with organisational support from the IMMANA Researcher over a 3-month period.

Additionally, the rapid review will feed back into the on-going evaluation of IMMANA program planning. Specifically, the review will enable IMMANA to map previous outputs against identified gaps and plan future activities in climate change research.

6. MEETINGS

Members of the review will meet as necessary to keep all parties informed. We envision weekly meetings between IMMANA staff and the researchers involved in this work.

7. COSTS

Potential consultants interested in working on this project should submit an expression of interest to anh-academy@lshtm.ac.uk by the 2nd December 2022 at the latest. Expressions of interest may come from individuals or groups of researchers interested in either the lead researcher or research assistant roles, and should specify:

- A. the candidate or research groups' extent of availability, as approximate hours per week during the project period, which is January 3rd – March 31st, 2023;
- B. suggestions for specific protocols, timelines and approaches for the literature review and stakeholder consultation, with citations to precedents for this type of mixed methods review;
- C. initial hypotheses, if any, regarding questions that might be answered through this literature review and stakeholder consultation;
- D. proposed compensation, as fixed fees or daily rates for the proposed individuals or team;
- E. a curriculum vitae and supporting statement of how their experience, knowledge and skills will contribute to this review.

Terms of Reference

8. REFERENCES

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4. Niles MT, Ahuja R, Barker T, Esquivel J, Gutterman S, Heller MC, et al. Climate change mitigation beyond agriculture: a review of food system opportunities and implications. *Renewable Agriculture and Food Systems*. 2018 Jun 13;33(3):297–308.
5. Berrang-Ford L, Sietsma AJ, Callaghan M, Minx JC, Scheelbeek PFD, Haddaway NR, et al. Systematic mapping of global research on climate and health: a machine learning review. *Lancet Planet Health*. 2021 Aug;5(8):e514–25.
6. Sixt GN, Hauser M, Blackstone NT, Engler A, Hatfield J, Hendriks SL, et al. A new convergent science framework for food system sustainability in an uncertain climate. *Food Energy Secur*. 2022 Oct 4;
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