https://doi.org/10.1038/s43016-024-00966-3

Knowledge democratization approaches for food systems transformation

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Current narrow views of what constitutes evidence have left blind spots in food system decision-making. Yet, alternative ways of facilitating the production and exchange of transdisciplinary knowledge enable key lessons for more equitable and informed policy processes.

Traditional, Indigenous and place-based knowledges offer essential insights for sustainable pathways, yet they are regularly excluded from decision-making about agricultural and food system funding, policies and actions. Centring a diversity of knowledges and ways of knowing is critical to deepening democracy in agricultural research, innovation and implementation to address these issues and improve outcomes. Diversifying our epistemological base requires a marked shift in evidence-based decision-making practices where only narrowly defined versions of evidence and expertise are considered legitimate.

Calls to incorporate wider evidence bases, such as that from traditional, Indigenous and place-based knowledge, into food system transformation have been made for years[1–4]. In order to co-create and legitimize these wider knowledge sets, participatory and transdisciplinary processes are fundamentally important. Through repeated observation, testing and adaptation, local actors produce place-specific knowledge, often developed over generations of experimentation. Participatory methods that bring together such 'deep' knowledge with 'shallow but broad' scientific knowledge[5] can generate both more locally relevant research questions as well as rigorous and contextually relevant evidence across scales. This shift towards a dialogue of transdisciplinary knowledges that brings together not only multiple disciplines, but also local, Indigenous and place-based knowledges, is critical to the pursuit of equitable and sustainable food systems transformation.

Here, we build on principles for democratic engagement in food system transformation[1] to call for a move towards more decentralized, participatory and community-led research[2]. Drawing from examples of Indigenous, organic, regenerative and agroecological knowledge practices from Africa, Asia, Latin America, Oceania, Europe and North America, we present cases that shift how evidence is produced, understood and taken up. While this list is not exhaustive, the innovative approaches highlighted have been chosen to present a variety of projects from a mix of geographical locations. Such approaches reveal insights necessary to inform transformations towards food systems that nourish populations and regenerate agricultural and surrounding ecosystems. The strategies and examples we outline will be of particular value to policymakers, research institutions and funders addressing food systems' ecological, health, social and economic impacts, as well as the wider community of food systems practitioners, researchers and scientists.

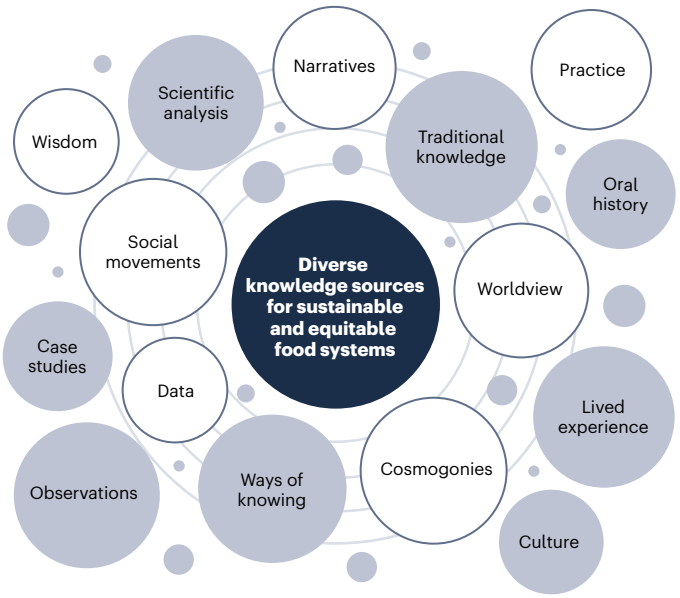

Fig. 1 | Diverse knowledge sources for sustainable and equitable food systems. Adapted with permission from ref. 12, Copyright © 2021 Global Alliance for the Future of Food.

Principles for democratizing knowledge–policy processes

An abundance of knowledge (Fig. 1) gets overlooked due to narrow views of what constitutes evidence, the politics of what is seen as valid evidence and preferences for globalized solutions despite the local realities of food systems. Relying on limited sets of evidence provided through summary reports and meta-analyses, the exclusion of texts published in languages other than English, and bypassing knowledge transmitted in unwritten form (for example, orally), are routine ways in which a narrow approach to knowledge is seen in food systems

decision-making. These exclusions are just a small example of the breadth of knowledge left out of decision-making. To address this concern, we suggest the following three principles as key for shifting how knowledge is understood:

- Epistemic or cognitive justice: cognitive justice promotes the recognition of alternative knowledge systems and paradigms as valuable in their own right and encourages dialogue between often incommensurable knowledges to inform decision-making[6].
- Intercultural co-creation: diverse ways of knowing and being are grounded in different geographical, institutional and epistemic cultures. Thus, intercultural co-creation enables different ways of learning, constructing and passing on knowledge (for example, scientific and Indigenous) to coexist and enrich each other.
- Knowledge mutualism and exchange: tensions and frictions will also exist between different knowledge-making communities, which is why relationship-building, constructive dialogue and material practices such as data sovereignty contracts and fair compensation are critical to enable deeper exchange and the long-term solidarity needed to enhance knowledge.

Holding these principles as central to knowledge use and development will help to address some of the underlying biases currently seen in knowledge generation in and about food systems. The examples outlined below demonstrate these principles in action.

Co-creating knowledge

Decades of impactful collaborative food systems initiatives have offered insight into how to better co-create knowledge that supports locally adapted innovations and more sustainable and equitable outcomes. Transdisciplinarity, participatory action research, intercultural co-creation and research co-design approaches, among others, are key ways that researchers can generate questions and results that are more locally relevant and equitable[7].

By involving diverse stakeholders as knowledge co-producers, these approaches build research based on the priorities and participation of local communities, laying the conditions for the democratization of research and knowledge. With care and respect, researchers can learn to work closely with farmers, Indigenous peoples, pastoralists and others to understand traditional systems; this collaboration can strengthen existing capacity for innovation and adaptation in ways that lead to more equitable outcomes and policy nuance. Such approaches also enable the recognition of deep, sometimes tacit, ecological knowledge that only those who are connected to these ecosystems possess. Rather than 'including' stakeholders as research subjects, this kind of approach to knowledge production engages these food systems actors from the outset as co-agents in a more democratic process of knowledge creation[8].

In implementing these research approaches, systemic barriers to participation and power dynamics need to be addressed. These include exclusions and oppressions based on gender, race, caste, vulnerability to violence and economic circumstances. An example of how to address this is to fairly compensate non-researchers for their research participation, such as paying farmers to lead and participate in the farmer research networks outlined below. More fundamentally, researchers in positions of privilege and power need to intentionally seek and build more horizontal relationships with the people with whom they work. Further, to effectively contribute to food system transformation, research needs to be embedded in longer-term commitments, motivated by intercultural co-development of ideas, and directly tied to wider processes of societal mobilization for change. Institutional incentives and cultures for research need to change to value participatory, long-term (>10 years) approaches rather than extractive short-term engagement with communities. Policy and funding structures also need to shift to prioritize these non-extractive, participatory approaches. In terms of data equity, communities need to have decision-making rights over data sets and indicator systems and, most importantly, over the design and implementation of resulting development trajectories.

These approaches to research take more time, commitment and resources, as they require investment in long-term relationship building to counter extractive research approaches. However, the findings result in better outcomes as they are more easily implemented and have higher relevance for local communities and environments[9]. We present several examples below.

Farmer-managed natural regeneration is an effort developed by farmers in sub-Saharan Africa, in partnership with Groundswell International, to mitigate the destructive impact of cutting trees and burning land to create 'clean' land for farming. Working closely with farmers led to the incorporation of experiential factors based on community-led Indigenous methods of experimentation and testing of new practices, which are often left out of scientific analyses. For example, data and evidence about dietary diversity, household well-being, community cohesion and equity, joy and long-term resilience were highlighted by farmers as important and are now being collected and documented. In addition, including farmers in the project and research design provided opportunities for farmers to learn from their peers and from their own observations. This strategy is much more convincing for farmers than supplying a pre-set package of instructions and inputs, which often do not suit local realities.

The 1,000 Farms initiative based in South Dakota, USA, emphasizes farmer-, rancher- and beekeeper-driven research questions, and directly centres producers by involving them in research projects — from systems design to guided citizen science. Knowledge about regenerative practices, roadmaps for transition pathways and specific production methods in rangeland, dairy, orchards, perennial and annual crops, and honeybees are generated and disseminated in a context-specific way. The initiative is embedding scientific staff into farming communities around North America to oversee research and disseminate information relevant to local and regional contexts. Their aim is to reimagine how agricultural science is done using ecological principles based on relationship-intensive, systems-level, farmer-driven research that crosses geographical and food system borders.

The McKnight Foundation's Global Collaboration for Resilient Food Systems' farmer research networks combine scientific knowledge with Indigenous traditional and/or local knowledge in communities of practice that span ten countries in the high Andes and Africa. This approach promotes a transition from looking at statistical averages to embracing and trying to understand variability. For example, in Bolivia, a farmer research network gathers local information and data about weather patterns and climate, provides forecasts for farmers and builds a knowledge base that brings together scientific and traditional Indigenous knowledge. In the experience of the McKnight Foundation's Global Collaboration for Resilient Food Systems, when research is developed and conducted by farmers, it becomes more relevant to rural communities' concerns, needs and interests. With greater engagement and ownership of the research, farmers are more

likely to share and engage with others in 'farmer-friendly' ways, such as through farmer-to-farmer demonstrations and dissemination of educational resources on techniques for solving agricultural problems of relevance to smallholders. Power dynamics are negotiated among farmers and scientists in a more horizontal way, so that both can design and co-create research and knowledge dissemination practices.

The Hua Parakore system is a food sovereignty and food production system of the Māori from Aotearoa New Zealand. Based on Māori cultural values, it supports food-secure futures for Indigenous communities and involves farmers, producers, cooks and bakers. Established by Te Waka Kai Ora (the National Māori Organics Authority) in 2001, Hua Parakore has developed its own Indigenous validation and verification system, which is adapted by producers to their local circumstances and is based on principles such as knowing the origins of all inputs, experiencing and learning from the natural environment, building soil diversity and health, and using food production as a place of learning. Te Ao Māori (Māori worldview) is intertwined with Western concepts to promote a unique system for food production that integrates people and nature[3].

Knowledge dissemination and uptake

Approaches such as peer-to-peer exchanges, intercultural learning, transmedia communication, multi-actor advocacy initiatives and popular education can enable knowledge to be taken up by food system actors to accelerate transitions. Smallholders, Indigenous peoples, pastoralists and others need an authoritative seat at policy tables from which they are often excluded, as well as a role in fostering links between localized efforts and national and international networks and policy processes. High-level policy decisions will be more relevant and will gain more traction when informed by grounded experience. Whole systems-focused evaluation provides a comparative analytical framework for multifaceted food system outcomes in different settings. There are many successful examples of linking localized knowledge production with higher-level governance.

Farmer-to-farmer and woman-to-woman learning processes are at the core of the Andhra Pradesh Community-Managed Natural Farming programme in India. Champion farmers act as trainers of agroecological and regenerative practices, with one farmer-trainer supporting roughly 100 farmers. This farming is knowledge intensive and not input intensive. The programme has developed long-term knowledge-sharing programmes where experienced farmers support farmers making the transition to natural farming. Women's self-help groups play a critical role in collective action, knowledge dissemination, supporting each other during transition, financing members to purchase the inputs required for natural farming, monitoring and managing the programme. Andhra Pradesh Community-Managed Natural Farming has found that long-term knowledge-sharing programmes are necessary to provide the support to farmers over the years. This programme has seen significant scaling, increasing from the participation of 40,000 farmers in 2016 to 700,000 farmers and farm workers in 2021, with the objective of expanding to even more farmers with the support of the state agricultural department.

Soils, Food and Healthy Communities (SFHC) is an organization of Malawian farmers supporting more than 6,000 smallholder farming households in building sustainable, healthy, equitable and resilient communities, using a participatory research model, farmer-to-farmer exchange and farmer-led experimentation. SFHC supports farmers to develop agroecological farming techniques, revitalize Indigenous crops, affirm Indigenous knowledge and address gender equity at household, community and national levels. Their work has led to transformed practices and formed the development of a curriculum, leading to greater household food security, income and nutrition alongside more sustainable land management. SFHC has also affected policy. For example, farmers in the programme have contributed to innovative doubled-up legume agroecology research that has become an official technology promoted by Malawi's national agricultural extension programme. Farmers report that they have regained control over their seeds, fertilizer, land and labour, and the initiative has been found to reinforce social support practices such as food and seed sharing.

The Food and Agriculture Organization (FAO) Tool for Agroecology Performance Evaluation (TAPE) was developed through a multi-stakeholder collaboration with practitioners, local organizations, researchers, technical institutions, governments, communities, farmers and the FAO, and was notably improved by community end-user testing and feedback in Mali and Cambodia, among other countries. Co-developed assessment tools like these, designed to foster a more participatory approach, are useful in gathering and sharing qualitative and quantitative evidence about agroecological transitions even if they cannot meet all local needs. They also provide a multi-dimensional systems-based framework to assess and understand localized knowledge in international policy contexts, and they allow comparing and linking that knowledge to advocacy processes. TAPE is based on the ten elements of agroecology, as proposed by the FAO, yet remains flexible to respect diverse knowledge systems and differing interpretations of concepts. Thus, the assessment process begins by taking time to discuss varying definitions and understandings of each principle before proceeding. The local understanding and relevance of each concept is vital towards building bridges between cultures and designing and managing sustainable food systems. The FAO's application of TAPE has provided substantial evidence that farmers in different countries adopting ecological practices have improved food production and security outcomes compared with neighbouring farmers using more conventional techniques[10].

Conclusion

Adopting more complex and nuanced approaches to knowledge co-creation is challenging, as it can take more time, requires patience, humility and reflexivity, and is often harder to communicate in the usual scientific fora. However, as demonstrated in the initiatives described above, these approaches can have deep and significant impacts. Mounting scholarship recognizes the value of using knowledge and transdisciplinarity to navigate complex systems (for example, see refs. 4,10,11). Coupling transdisciplinary scientific methods with local, traditional and Indigenous forms of knowledge through participatory and intercultural processes contributes to making rigorous evidence that is contextually relevant and immediately useful in processes of food system transformation. Even efforts to democratize knowledge need to be critically examined to confront the wider inequities that shape knowledge production and that can nevertheless reinscribe systems of power, including racism, heteropatriarchy, coloniality and economic injustice. It is through ongoing critical reflection on the relationship between structural power and knowledge production that we can continuously work towards deepening democracy in the co-construction of knowledge. Such issues require a more in-depth discussion beyond the scope of this commentary, but decolonization of knowledge must be a long-term objective given the systems of power and privilege that have historically created and benefited from narrow concepts of evidence. In the short term, we know where to begin:

processes that engage different knowledges and knowledge holders will lead to better outcomes for communities who feed the world and steward the environment, yet whose knowledge is largely marginalized. The kinds of innovations presented here need to be scaled out. To this end, we make three recommendations intended for those who fund, design and carry out food systems research:

- Support research that focuses on system-wide change, rather than on narrowly defined quantitative criteria such as, for example, agricultural yields. This will entail looking beyond what is easily quantifiable to incorporate broader social, cultural and ecological drivers and consequences.
- Build capacity and support for transdisciplinary, participatory, farmer-led and Indigenous-led research, funding training as well as the maintenance of locally governed repositories of knowledge.
- Support knowledge and evidence mobilization and communication, such as peer-to-peer research and networking, multi-actor advocacy coalitions and the participation of farmers, Indigenous peoples and their organizations in research, policy and decision-making.

As we collectively strive for food systems that are capable of nourishing populations and regenerating ecosystems, incorporating a diversity of knowledges into decision-making can advance innovative and time-tested solutions to food systems transformation.

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Published online: 09 May 2024

References

1. Duncan, J. et al. *Nat. Food* **3**, 183–186 (2022).
2. Pimbert, M. in *Food Sovereignty, Agroecology and Biocultural Diversity: Constructing and Contesting Knowledge* (ed. Pimbert, M.) 259–321 (Routledge, 2017).
3. *Realising Food Secure Communities in Aotearoa* (Kore Hiakai Zero Hunger Collective, 2023); https://go.nature.com/4aNvtgS
4. Cundill, G. N. R., Fabricius, C. & Marti, N. *Ecol. Soc.* **10**, 8 (2005).
5. Vandermeer, J. & Perfecto, I. *Agroecol. Sustain. Food Syst.* **37**, 76–89 (2013).
6. Visvanathan, S. The search for cognitive justice. *India Seminar: Knowledge in Question* (2009); https://go.nature.com/3vLsbM1
7. Méndez, V. E., Bacon, C. M. & Cohen, R. *Agroecol. Sustain. Food Syst.* **37**, 3–18 (2013).
8. Liboiron, M. *Nat. Geosci.* **14**, 876–877 (2021).
9. Balazs, C. L. & Morello-Frosch, R. *Environ. Justice* **6**, 9–16 (2013).
10. *The White/Wiphala Paper on Indigenous Peoples' Food Systems* (FAO, 2021); https://doi.org/10.4060/cb4932en
11. The Global-Hub on Indigenous Peoples' Food Systems *Nat. Food* **2**, 843–845 (2021).
12. *The Politics of Knowledge: Understanding the Evidence for Agroecology, Regenerative Approaches, and Indigenous Foodways* (Global Alliance for the Future of Food, 2021); https://go.nature.com/3TR0ucB

Competing interests

The authors declare no competing interests.

Additional information

Peer review information *Nature Food* thanks the anonymous reviewers for their contribution to the peer review of this work.