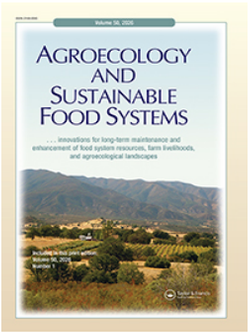

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Key narratives around agroecological transitions. A systematic literature review of the current debate

Jonathan Mockshell[a], Godfrey Omulo[b,c], Francisco Hidalgo[a,b], Marcela Quintero[a], Thea Ritter[a], Guillermo Orjuela[a], and Frank Place[d]

[a]International Center for Tropical Agriculture (CIAT), Cali, Colombia; [b]Department of Social and Institutional Change in Agricultural Development, University of Hohenheim, Stuttgart, Germany; [c]Food and Agriculture Organization of the United Nations (FAO), Rome, Italy; [d]International Food Policy Research Institute (IFPRI), Washington, District of Columbia, USA

ABSTRACT

As agrifood systems face mounting socio-ecological challenges, agroecology is increasingly viewed as a comprehensive approach to achieving sustainability. However, the public debate over whether this is the most suitable approach or whether it is viable at a large scale remains open. Examining how this debate unfolds is crucial as it can shape the future of agrifood systems. This paper contributes by conducting a systematic literature review to identify key perspectives and actors shaping the public debate around agroecology. Perspectives are framed around three narratives labeled "supportive," "skeptical," and "pragmatic." These narratives are articulated across sub-narratives in six highly debated areas: (1) initial transition costs, (2) input use and supply chain systems, (3) yield potential, (4) labor, (5) scalability, and (6) market access. The review also accounts for a broad group of actors participating in the debate from multiple – sometimes ambiguous and fluid – perspectives. The review shows that mobilizing the debate to enable agroecological transitions requires an integrative approach underscored by knowledge co-creation and collective learning. Based on insights from participatory approaches, we provide considerations for making these processes work and highlight areas that require further examination.

KEYWORDS

SDG 2: zero hunger; agroecology; narratives; sustainable agrifood systems; knowledge co-creation

Introduction

As global concerns about climate change, food security, biodiversity loss, and the sustainability of agrifood systems intensify, a critical debate has emerged in the public, political, and scientific spheres about the most suitable agricultural model (Bezner Kerr et al. 2021; Ong and Liao 2020; van der Ploeg 2021). Over time, the debate has prompted some sectors of society to question the validity of conventional agricultural systems and explore the potential of alternative models like agroecology as a more promising path forward (Bezner Kerr and Wynberg 2024; Blesh and Wolf

CONTACT Jonathan Mockshell j.Mockshell@cgiar.org International Center for Tropical Agriculture (CIAT), Km 17, Recta, Cali-Palmira, Valle del Cauca, Colombia

2014; Coolsaet 2016; Dumont et al. 2013; Price et al. 2022). The debate is not any less complex since actors differ in their concept and vision of farming, and the economic, ecological, and social approaches to agricultural sustainability (Mockshell and Kamanda 2018). This is reflected by multiple agricultural approaches such as organic agriculture, climate-smart agriculture, sustainable intensification (SI), permaculture, agroforestry, or agroecology (Bernard and Lux 2017).

Although these approaches have been proposed to address sustainability challenges in agriculture, some of them have been criticized for presenting a productivist focus and for neglecting social and political dimensions such as power imbalances and undemocratic governance of agrifood systems (Altieri and Toledo 2011; Anderson et al. 2019; Bernard and Lux 2017; van der Ploeg 2021). Numerous authors (including us) agree that here resides a distinctive feature of agroecology. As a framework centered on synergistic socio-ecological relationships and profound democratization of agrifood systems, agroecology departs from current dominant agrifood systems (Anderson et al. 2019). Accordingly, agroecology is presented as a concrete transition pathway toward sustainability (HLPE 2019), a change in social relations in food production (van der Ploeg 2021), and a tool to achieve food sovereignty (Ajates Gonzalez, Thomas, and Chang 2018). The debate, however, remains open. In broad terms, some people believe agroecology cannot feed the world, while others believe that, in the future, it will be impossible to feed the world without agroecology (HLPE 2019). Concurrently, the question of whether agroecology can be scaled up remains open (Bernard and Lux 2017). As futures are the result of human decision-making and action influenced by present social expectations and imaginings (Gidley 2017), the way this debate unfolds can shape the future of agrifood systems (Lanka, Khadaroo, and Böhm 2017; Price et al. 2022).

To better understand the terms of this debate, this paper examines and systematizes multiple perspectives around agroecology and articulates them around three key narratives. The reasoning behind this articulation is grounded in the capacity of narratives to make sense of complex cognitive systems. This analytical process is embodied by storylines that coherently connect existing ways of reasoning around agroecology. Narratives have synthesis and communication potential when used in this way. Previous cognitive studies on agroecology have also recognized this potential. It is the case of the comparison between discourses and narratives rendering the paradigms around agriculture and sustainability in SI and agroecology (Bernard and Lux 2017; Fischer et al. 2024; Mockshell and Kamanda 2018), or studies on the role of discursive power in shaping agroecological transformations (Kelinsky-Jones, Niewolny, and Stephenson 2023; Rivera-Ferre 2018). To build on this body of literature, we develop a systematic understanding of the debate around agroecology with a focus on its transformative potential, viability, and scalability prospects. The work is based on a systematic review of literature around agroecology and food systems transformation toward agroecological approaches at different scales

(farm, landscape, and food system). By unpacking key perspectives and actors shaping the current debate around agroecology from this literature, we draw on this depth of knowledge to pinpoint the potential, challenges, and pathways toward agroecological approaches. By embracing multiple and often contrasting viewpoints, we aim to move the debate forward. In summary, the objectives of this study are to articulate key narratives and actors shaping the current debate around agroecology and examine how these narratives can inform a transformation of agrifood systems toward more sustainable approaches.

Based on ongoing academic discussions, we identified six thematic areas where heated discussions around agroecology are taking place. These areas are as follows: (1) initial transition costs (Dittmer et al. 2023; Guerra et al. 2017); (2) input use and supply chain systems (Dittmer et al. 2023; Falconnier et al. 2023; Tilzey 2021); (3) yield potential (Falconnier et al. 2023; Guerra et al. 2017; Volken and Bottazzi 2024); (4) labor (Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024); (5) scalability (Mier y Terán Giménez Cacho et al. 2018; van der Ploeg 2021); and (6) market dynamics (Bezner Kerr et al. 2023; Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024). These areas, in turn, serve as the guiding structure for articulating the narratives and actor coalitions around agroecology. Moreover, they frame the discussion around the viability and scaling potential of agroecological approaches.

In light of the interactions between the narratives identified – labeled in this paper as "supportive," "skeptical," and "pragmatic" - and insights drawn from participatory approaches, we identified the concepts of knowledge co-creation and collective learning as key elements for transitioning from a state of mere coexistence or competition between perspectives to the more productive dynamic of complementarity. The remainder of the paper is structured as follows. In the second section, we present the methodology based on a systematic literature review. Section 3 discusses key narratives, actor coalitions, and considerations for knowledge co-creation and collective learning. The last section presents conclusions and future research recommendations.

Methods

We employed a systematic review to identify relevant perspectives on agroecology from relevant literature on food systems transformation toward agroecological approaches at different scales (farm, landscape, and food system). The review followed the PRISMA 2020 guidelines (Page et al. 2021) shown in Figure 1. Searches were conducted across four academic databases: Science Direct, Google Scholar, Scopus, and CAB Abstracts. The search covered publications in English from 2000 to 2024 and was undertaken between February 14–29, 2024, using keywords like "agroecology," "agroecological transition," "industrial agriculture," and others outlined in Table 1. The use of keywords presented

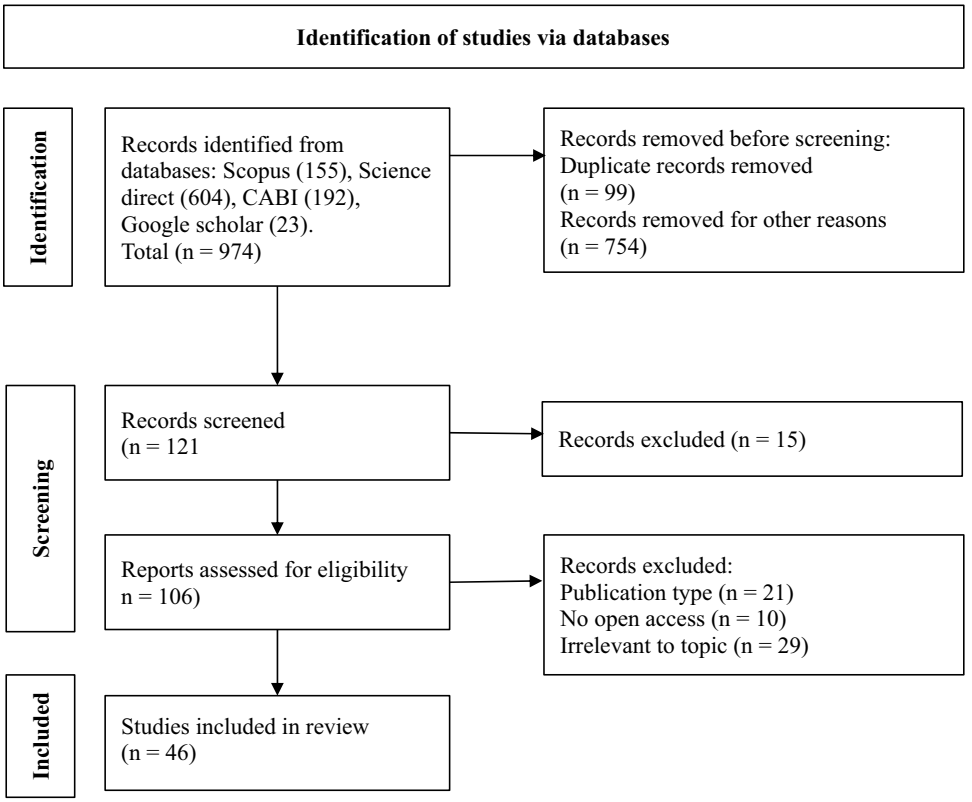

Figure 1. The process of article selection following the PRISMA 2020 flow methodology.

Table 1. Summary of search terms.

Database	Keywords and search strings
Scopus	(TITLE ("agroecolog*" OR "agroecolog* transition*") AND TITLE-ABS-KEY ("input use" OR "input suppl*" OR "scalability" OR "yield*" OR "practice*" OR "business case" OR "business model" OR "market access" OR "commodity market*" OR "global market*" OR "external market*") AND TITLE-ABS-KEY ("narrativ*" OR "polic*" OR "politic*" OR "political economy" OR "agroecolog* narrativ*" OR "discours*") AND TITLE-ABS-KEY ("fertilizer*" OR "ecolog*" OR "pesticid*" OR "machine*" OR "mechanization" OR "herbicid*" OR "biodiversit*"))
Science Direct	("agroecology" OR "agroecological transitions") AND ("political economy" OR "politic" OR "agroecology narrative" OR "discourse") 2000–2023
CABI	[[ab: "political economy"] OR [ab: "politics"]] AND [[ab: "agroecology"] OR [ab: "agroecology transition*"] OR [ab: "agroecological transition*"] OR [ab: "agroecology narrative*"] OR [ab: "agroecological narratives"] OR [ab: "agroecology transitions narratives"] OR [ab: "transitions narrative*"] OR [ab: "narrative*"]] AND [Publication Date: (01/01/2010 TO 01/31/2024)]
Google Scholar	political OR economy OR politics OR agenda OR AND OR agroecology OR agroecology OR transition OR narrative OR agroecology OR agroecological OR transition OR politic "agroecology OR agroecological transition OR political economy OR politic OR narrative OR discourse"

slight variations across databases given differences in indexing, search functionality, and thesaurus structures. However, conceptual equivalence was maintained.

The review process began with an initial retrieval of 974 articles. Inclusion and exclusion criteria were systematically applied to the initial retrieval. Articles were

included if they explicitly addressed agroecology (conceptually or in a practical way) and were published in peer-reviewed journals. Articles were excluded if they did not focus on agroecology, were inaccessible, or did not correspond with the focal publication types. To target perspectives that carry more weight in the academic debate and inform policy and practice more directly, commentaries, editorials, and non-scholarly sources were excluded. A total of 121 articles met the initial inclusion criteria. Further screening eliminated: 15 articles for lacking a specific focus on agroecology, 21 based on their publication type, 10 due to inaccessibility, and 29 for being irrelevant to the current analysis. This process resulted in a final sample of 46 articles for analysis. The manuscripts from the final sample were imported into MAXQDA2022 software (MAXQDA Analytics Pro 2022 Release 22.8.0) for analysis.

An iterative process of mixed coding (deductive and inductive) was applied to the manuscripts in order to uncover different perspectives on agroecology, articulate narratives, and identify actors in the debate. We started by analyzing each publication searching for words or phrases indicating opportunities, challenges, limitations, and requirements for agroecology implementation in six previously identified key thematic areas (initial transition costs, input use and supply chain systems, yield potential, labor, scalability, and market dynamics). Coding was carried out independently by two authors with regular cross-checks. To enhance reliability, preliminary coding on a subset of articles was conducted to align interpretations and refine the codebook. Afterward, the coding was systematized into a table and discussed by all the researchers until consensus was reached on the cross-cutting narratives encompassing the key storylines identified in the literature. A post-hoc check was conducted to identify the representation of narratives across databases. The analysis revealed that narratives were represented in all databases without significant variation. Finally, the manuscripts were analyzed to determine actors' positions regarding the narratives, whether authors directly expressed their position toward agroecology or reported the position of other actors. To complement the analysis, information about actors' participation in agroecology as a scientific discipline, practice, and social movement (Wezel et al. 2009) was examined, as well as information that allowed us to elucidate actors' role in the identified narratives (proposition, echo, and instrumentalization).

Results and discussion

Narratives around agroecology

The analysis of the 46 papers included in the sample revealed multiple perspectives on agroecology. These diverse perspectives can broadly be grouped into three narratives. We labeled these narratives as "supportive,"

"skeptical," and "pragmatic." Before describing these narratives in more detail, it is necessary to emphasize that they are an analytical synthesis of the diverse perspectives around agroecology. In reality, the perspectives provided in the analyzed papers are nuanced and present a high degree of variability, and sometimes ambiguity. Correspondingly, we contend that these narratives must be understood as analytical constructions to make sense of this multiplicity rather understood as natural structures of knowledge construction and representation.

The supportive narrative portrays agroecology as the pathway toward holistic sustainability in agrifood systems. Agroecology is described as a reimagining of agricultural systems based on ecological and emancipatory principles. Simultaneously, agroecology is presented as a critic and alternative to conventional agricultural models based on chemical inputs, monocultures, and corporate regimes, which have severe environmental and social consequences (Levidow, Sansolo, and Schiavinatto 2021; Pimbert 2018; Ong and Liao 2020; Orozco-Meléndez and Paneque-Gálvez 2022). Correspondingly, this narrative highlights the potential of agroecology to solve global challenges across ecological, social, and political dimensions, reflecting the growing recognition of agroecology as a holistic approach to sustainable development (Bendfeldt, McGonagle, and Niewolny 2021). The ecological dimension is associated, for example, with a transformation of farms and landscapes to support the provision of key ecosystem services and more efficient use of resources, as well as to respond to environmental challenges, including climate change and biodiversity loss (Altieri 1983; Carlisle et al. 2019; Gliessman, Friedmann, and Howard 2019; Pimbert 2018; Rosset and Altieri 2017; Wezel et al. 2020). Agroecology intersects with socio-political transitions, integrating social struggles such as justice, food sovereignty, democratic governance, and participation in agrifood systems (Altieri and Toledo 2011; Coolsaet 2016; Levidow, Sansolo, and Schiavinatto 2021; Ong and Liao 2020; Tilzey 2021; Walthall et al. 2024; Wezel et al. 2020).

The skeptical narrative argues that conventional agriculture is best suited to meet current and future food demands and to secure food access democratization via low food prices and globalized supply systems. The focus of this narrative is on food security and intensification. Furthermore, it portrays agroecology as an unviable approach that is inadequate to meet food demands and support smallholder farmers in overcoming poverty. The growing global population and subsequent requirements for increasing food production are arguments presented to advocate for intensification approaches and caution against the risks of transforming agriculture into low-input systems (Falconnier et al. 2023). This narrative presents an environmental dimension, arguing that reduced productivity in low-input agriculture would exacerbate environmental degradation because of expanding the agricultural frontier (Falconnier et al. 2023; Röös et al. 2022). It is described that technological

advances in conventional agriculture have contributed to reducing food insecurity on a global scale. However, there remain areas (such as sub-Saharan Africa SSA) where yield gaps can be reduced through intensification such as by increasing input use (Falconnier et al. 2023).

The pragmatic narrative recognizes both the harmful impacts of conventional agriculture and the potential contribution of agroecology to sustainability. However, integrating agroecology and maximizing the potential of agroecological approaches depends on undertaking transformations at different scales, implementing integral approaches and building synergies among different actors. The pragmatic narrative also indicates that the functionality of agroecology and the outcomes of implementation are highly contextual. It describes how the implementation of agroecology occurs through processes of regeneration of both landscapes and society (Steinhäuser 2020). To engage in agroecology, farmers need access to land, natural resources, and social and financial capital (Dittmer et al. 2023; Ong and Liao 2020). Access to these resources, in turn, is influenced by existing policies, social status, race, and gender (Barraclough 2009). This narrative highlights that implementing agroecology requires policies that address social disparities, institutional barriers, financial constraints, and knowledge asymmetries (Dittmer et al. 2023; Falconnier et al. 2023; Machado 2023; Van den Berg, Behagel et al. 2022). Political support for conventional industrial models, on the other hand, ought to be reexamined (Lanka, Khadaroo, and Böhm 2017). Farmers, indigenous groups, and grassroot organizations are key players in the transformation of agrifood systems toward agroecology. However, building the conditions for their effective participation requires articulating partnerships with other actors (e.g., governments, NGOs, academia, and companies) (Orozco-Meléndez and Paneque-Gálvez 2022). In addition, the implementation of agroecology needs to be supported by research (Lanka, Khadaroo, and Böhm 2017). Research, for example, can provide and integrate knowledge from extension systems, farmer-to-farmer exchanges, or enabling market dynamics. This research needs to integrate the biophysical and environmental aspects of agriculture with its social dimensions to understand the complexity of socio-ecological systems (Méndez, Bacon, and Cohen 2012; Ong and Liao 2020). The pragmatic narrative also stresses the relevance of tailoring agroecological practices, while acknowledging that the performance of agroecological innovations varies across places and agricultural systems (Brumer et al. 2023; Dittmer et al. 2023).

From a political economy standpoint, the supportive narrative explicitly challenges corporate-driven food systems and the self-regulated market vision of neoliberal capitalism (Muñoz et al. 2021; Orozco-Meléndez and Paneque-Gálvez 2022). Meanwhile, it advocates for agroecology as a way to redistribute power and resources in favor of smallholder and marginalized farmers and local communities through enhanced democratization of agrifood systems and

the development of alternative social, political, and economic institutions (Altieri and Toledo 2011; Coolsaet 2016; Dagoudo et al. 2023; Hilmi 2019; Levidow, Sansolo, and Schiavinatto 2021; Lianu, Radulescu, and Lianu 2024; Lockie and Carpenter 2011; Mehrabi, Perez-Mesa, and Giagnocavo 2022; Muñoz et al. 2021; Ong and Liao 2020; Tilzey 2021; Timmermann and Félix 2015; Torres 2023; Walthall et al. 2024; Wezel et al. 2020). In line with liberalization and market-driven perspectives, the skeptical narrative appeals to low food prices and globalized supply systems. These globalized supply systems not only refer to food production and consumption structures, but also to agricultural technologies and inputs predominantly synthetic fertilizers and pesticides) (Lamine et al. 2021; Lanka, Khadaroo, and Böhm 2017; Lockie and Carpenter 2011; Tilzey 2021). With a focus on food security, intensification, and technification, the skeptical narrative overlooks power asymmetries in agrifood systems. For example, within this narrative, farmers' struggle for food sovereignty and the political dimensions of technology development and deployment remain unexamined. The pragmatic narrative acknowledges the uneven distribution of resources necessary to adopt agroecology (e.g., land, water, knowledge, and capital) and the need for political acts to redistribute them (Cusworth, Garnett, and Lorimer 2021; Guerra et al. 2017; Machado 2023; Price et al. 2022; Van den Berg, Behagel et al. 2022). Without explicitly challenging the industrial model of production, the pragmatic narrative calls to reexamine the political and economic structures that sustain this model (Muñoz et al. 2021; Orozco-Meléndez and Paneque-Gálvez 2022), while emphasizing the need for strengthening local governance (Bezner Kerr et al. 2018; Guerra et al. 2017; Mier y Terán Giménez Cacho et al. 2018; Nicol 2020; Orozco-Meléndez and Paneque-Gálvez 2022; Price et al. 2022).

Actor coalitions around the three narratives

The reviewed literature accounts for a broad group of actors participating in agroecology as a scientific discipline, practice, and social movement. This group includes different types of farmers, indigenous groups, grassroots organizations, NGOs, governments, development organizations, companies, extension workers, and researchers. These actors hold different positions across the three narratives. However, our discourse coalition analysis identified that actors' positions across the narratives are not rigid and that there is heterogeneity, ambiguity, and fluidity in the way actors articulate their perspectives.

Farmers, Indigenous groups, and grassroots organizations form the main coalition aligned with the agroecology-supportive narrative. By integrating socio-ecological relationships and emancipatory practices, these partnerships shape the political dimension of agroecology, while enabling place-based agroecological innovations (Ameur, Amichi, and Leauthaud 2020; Bezner

Kerr et al. 2018; Lanka, Khadaroo, and Böhm 2017; Orozco-Meléndez and Paneque-Gálvez 2022). Some segments of academia (more prominently from the social sciences) and NGOs also converge in this narrative, echoing the perspectives of agroecological social movements and mobilizing knowledge and other resources to support these movements.

The literature review shows that the skeptical narrative mainly aligns some sectors of academia from the natural sciences. Although the skeptical narrative also draws on economic analyses, for example, regarding transition costs or the loss of supportive structures operating in conventional systems (Dittmer et al. 2023; Guerra et al. 2017; Iles 2021). This narrative also reflects some concerns of certain groups of farmers who worry about the potential economic trade-offs of transitioning to agroecological production (see Falconnier et al. 2023; Guerra et al. 2017). Extension workers trained in the Green Revolution's precepts are prone to reenacting this narrative. The skeptical narrative is instrumental for actors such as agrifood transnationals and supermarkets who emphasize their role in modernizing agriculture and supporting global access to food at a low cost. This argument has been used to rationalize the corporate food regime (Friedman and McMichael 1989) and the process of food commoditization (Van den Berg, Teixeira et al. 2022). Governments and development organizations also align with this narrative, especially when they promoted market liberalization and industrialization as pathways to reduce poverty and hunger (see Guerra et al. 2017; Lanka, Khadaroo, and Böhm 2017; Orozco-Meléndez and Paneque-Gálvez 2022; Tilzey 2021; Yeleliere et al. 2022).

Several sectors of academia, NGOs, development organizations, and governments align with the pragmatic narrative when recognizing the value of agroecology, its challenges and limitations, as well as by working to enable a transformation toward agroecological systems. When adopting an agroecological perspective on agrifood systems, these actors become allies of the agroecological social movement, which needs partnerships to implement and scale up its strategies (Orozco-Meléndez and Paneque-Gálvez 2022). Farmer participation in these partnerships can be strengthened through the formation of associations, cooperatives, and non-governmental extension programs that integrate agroecological perspectives (Guerra et al. 2017). However, these groups are not necessarily free from dependence on conventional production and conventional markets (see Lanka, Khadaroo, and Böhm (2017). From an academic perspective, developing a pragmatic narrative requires an understanding of complex socio-ecological systems, which requires multidisciplinary approaches and contextualized knowledge (Dittmer et al. 2023; Méndez, Bacon, and Cohen 2012; Ong and Liao 2020). The literatures describe a gradual shift in government and development organizations toward agroecological perspectives (Falconnier et al. 2023; Guerra et al. 2017; Lamine et al. 2021; Pimbert 2018; Röös et al. 2022; Tilzey 2021; Yeleliere et al. 2022). However, there are instances in which governments have neglected the

political dimension of agroecology, depriving it of its more transformative potential and proposing weaker interpretations (Levidow 2018; Tilzey 2021).

Sub-narratives around key debated areas

Literature analysis revealed six key thematic areas where heated discussions around agroecology take place. These areas correspond to (1) initial transition costs (Dittmer et al. 2023; Guerra et al. 2017), (2) input use and supply chain systems (Dittmer et al. 2023; Falconnier et al. 2023; Tilzey 2021), (3) yield potential (Falconnier et al. 2023; Guerra et al. 2017; Volken and Bottazzi 2024), (4) labor (Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024), (5) scalability (Mier y Terán Giménez Cacho et al. 2018; van der Ploeg 2021); and (6) market access (Bezner Kerr et al. 2023; Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024). These areas represent the space in which the three narratives (articulated as sub-narratives) coexist, compete, or complement one another to form a general perspective on agroecology. The sub-narratives described below also contribute to clarifying the debate about the viability and scalability of agroecological approaches.

Initial transition costs

The supportive narrative emphasizes the economic benefits of diversifying farming systems and the synergies between ecosystem services and productivity. Diversification creates synergies between economic goals and long-term benefits such as ecological resilience (Durand et al. 2017; McKay, Nehring, and Catacora-Vargas 2024). Diversified systems provide multiple income streams Dittmer et al. 2023; Lamine et al. 2021; Lanka, Khadaroo, and Böhm 2017; Ong and Liao 2020). Meanwhile, a reduced reliance on external inputs can also reduce production costs (Ameur, Amichi, and Leauthaud 2020; Durand et al. 2017; McKay, Nehring, and Catacora-Vargas 2024). Additionally, since agricultural productivity is a function of soil health, agroecological practices that enhance soil health can contribute to profitability (Cusworth, Garnett, and Lorimer 2021).

Conversely, the skeptical narrative describes initial investment costs and delayed economic benefits as a significant barrier to implementing agroecological farming systems. This is particularly critical for resource-constrained farmers (Dittmer et al. 2023; Guerra et al. 2017). Transition costs are associated with the required transformation of the system, for example, in terms of enhancing ecological conditions, accessing new technologies, and adapting to new markets (Falconnier et al. 2023; Ong and Liao 2020). Therefore, transition costs are determined by the preexisting status of the system (Durand et al. 2017). Furthermore, the transition to agroecological farming may result in farmers losing access to economic incentives, such as chemical fertilizer input subsidies

(Lockie and Carpenter 2011). These arguments highlight the relevance of gradual transformations and replacing conventional subsidies with agroecology-oriented incentives that can offset transition costs.

Concurrently, the pragmatic narrative argues that supportive policies and rewarding environmental stewardship can assist farmers in bearing transition costs (Cusworth, Garnett, and Lorimer 2021; Machado 2023). The pragmatic narrative also describes complex and highly contextual trade-offs between reduced use of external inputs and upfront investments. A study by Guerra et al. (2017) presents mixed evidence regarding the economic performance of conventional and agroecological systems. This evidence highlights the need to understand the conditions under which reduced production costs can balance transition costs.

Input use and supply

The supportive narrative is critical of the economic and social consequences of relying on external inputs for agricultural production and discusses the environmental benefits of using agroecological principles as an alternative. The cost of fertilizers is argued to prevent farming profitability (Lanka, Khadaroo, and Böhm 2017). Conversely, input supply chains are considered to be a threat to sovereignty, as well as a source of power imbalances. Local, farmer-centric, and decentralized input systems are advocated, emphasizing their potential to redistribute political and economic resources within the agrifood system. These alternative input supply chains are aligned with agroecology principles such as local empowerment and ecological justice (Guerra et al. 2017). It is argued that smallholder farmers should have access to organic and biological inputs without relying on corporate supply chains (Bezner Kerr et al. 2023; De Molina 2013; Petersen 2022). On the other hand, it is expressed that organic soil amendments and integrated cropping systems improve soil health in the long run (Guerra et al. 2017; Ong and Liao 2020).

The skeptical narrative establishes a link between soil fertility, productivity, and environmental spillovers. It is indicated that agroecology cannot meet crop nutrient demands without incorporating external input sources, particularly in nutrient-depleted soils like the case of SSA (Falconnier et al., 2023; Röös et al., 2022). It is expressed that yields are penalized without external inputs and that reduced productivity can promote agricultural land expansion, exacerbating environmental degradation (Falconnier et al., 2023; Röös et al., 2022). Regarding institutionality, it is expressed that farmers seeking to transition to agroecological farming face structural barriers due to a lack of supporting structures and institutions like the ones existing in conventional agriculture (e.g., government subsidies and well-established supply networks) (Lamine et al., 2021; Lanka, Khadaroo, and Böhm, 2017; Tilzey, 2021).

The pragmatic narrative emphasizes the need to balance ecological sustainability with the practical realities of maintaining long-term agricultural

productivity (Yeleliere et al. 2022; Falconnier et al. 2023). In this narrative, the need for reorganizing input supply chain systems toward increased local control is emphasized. This reorganization, however, demands coordinated efforts from diverse stakeholders and the organization of alternative networks (Guerra et al. 2017). This narrative also points out that understanding the benefits and constraints of agroecology requires more research on the trade-offs of nutrient availability and sustainability at the farm and landscape levels (Falconnier et al. 2023).

Yield potential

The supportive narrative points to empirical evidence of agroecology's capacity to maintain or even increase yields to address food and nutrition security through diversification and optimization of biological processes while enhancing ecosystem services (Dittmer et al. 2023; Nyantakyi-Frimpong et al. 2016; Röös et al. 2022). In addition to yields, this narrative reiterates the wider benefits of agroecology, such as improved food sovereignty, resilience, biodiversity, and climate change adaptation (Carolina, Alejandra, and Nadine 2024; Dittmer et al. 2023; Nyantakyi-Frimpong et al. 2016; Volken and Bottazzi 2024). Thus, this narrative balances production goals with broader social and environmental concerns.

The skeptical narrative advocates intensification approaches by arguing that yields need to be substantially increased to meet the current and future food demands of the growing population. As previously described, a positive correlation between yield and mineral fertilizers and concerns over increased land demand in agroecological production are arguments used to highlight the limitations of agroecological production (e.g., Falconnier et al. (2023). Farmers' perspectives can resonate with this description. For example, Guerra et al. (2017) describe groups of farmers in Brazil expressing concerns about reduced yields during and after transitions to agroecological farming. Nevertheless, some groups described yield drops during the transition, but improvements in the following years (Guerra et al. 2017). Coupled with the dynamics of transition costs, yield dynamics suggest that the transition period is a particularly critical stage that requires special attention and oriented management. Technology (mainly synthetic fertilizers, but also improved seeds, pesticides, and machinery) is emphasized in this narrative as a positive factor in productivity, food security, and environmental protection. However, the discussion of the political dimensions of such technological systems predominantly dominated by agritech firms is omitted.

The pragmatic narrative asserts that agroecology may not always achieve win–win outcomes (Dittmer et al. 2023). This narrative argues that yield effects are variable and depend on the context. For example, it is expressed that yield dynamics in agroecological systems depend on the phase of transition, ecological status, land use history, and cropping system (Dittmer et al.

2023). Although the pragmatic narrative acknowledges the potential immediate adverse yield effects of transitioning to agroecological farming, it also recognizes the importance of agroecological principles such as recycling and diversity enhancement to improve soil health and nutrient-use efficiency in the long run (Falconnier et al. 2023).

The narratives around yield effects suggest that the assessment of agroecology's outcomes is highly influenced by the status at the point of transition (e.g., soil conditions) and time horizons under consideration. The skeptical narrative highlights the immediate shocks of transitioning to agroecological farming, to which small producers in unfavorable settings are especially vulnerable, whereas supportive and pragmatic narratives emphasize long-term perspectives and adaptative approaches.

Labor

The supportive narrative focuses on the positive attributes of labor-intensive systems such as agroecological farming. This narrative looks to redefine labor in agriculture, shifting from efficiency-focused paradigms to systems that prioritize creativity, skill development, and social equity through mutual recognition among farmers (Timmermann and Félix 2015). Labor-intensive agroecological systems are presented as a pathway to "contributive justice," which offers meaningful dignity and enriches agricultural work (Wezel et al. 2020). This transformation in labor relations aligns with agroecological principles that seek to enhance farming's social benefits, fostering stronger, more resilient rural communities (Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024). Correspondingly, this narrative links labor-intensive agroecological systems with elements such as food security, skills acquisition, and stronger rural economies (Guerra et al. 2017; McKay, Nehring, and Catacora-Vargas 2024; Nyantakyi-Frimpong et al. 2016).

The skeptical narrative highlights that agroecology's high labor demands are a barrier to adoption, particularly in regions with an aging farming population or a shortage of labor (Guerra et al. 2017). It is expressed that agroecological practices have helped build community engagement and sustainable livelihoods, yet high labor demands remain a challenge (Van den Berg, Teixeira et al. 2022). Correspondingly, labor demands and associated costs are presented by farmers as a major constraint. For example, Guerra et al. (2017) identify that agroecological farmers and transitioning farmers in Brazil report higher labor demands than those engaged in conventional farming. As a result of labor scarcity in the area, farmers cited labor demand as a major barrier to agroecological farming (Guerra et al. 2017).

The pragmatic narrative outlines the conditions and transformations required to overcome transition barriers associated with the higher labor demands of agroecological systems. To successfully transition from conventional to agroecological systems, it is necessary to build social capital. It is

expressed that this can be achieved through the support of other farmers, consumers, community members, and the local government (Carlisle et al. 2019). This narrative underscores the need for a balanced approach that embraces technological innovations and supportive policies that can alleviate labor burdens while maintaining the socio-ecological benefits of agroecological practices (Walthall et al. 2024). As part of this narrative, challenging patriarchal norms, embracing collective action, and securing equitable access to land are presented as relevant elements to redefine labor in the context of sustainable transitions (Van den Berg, Teixeira et al. 2022).

Scalability

The supportive narrative highlights transformations at a global scale while acknowledging the interconnection of local practices with global systems. Aligned with agroecology principles, strategies such as minimizing food waste and shifting diets are presented as strategies that can produce broad socio-environmental shifts (Mayer et al. 2022; Röös et al. 2022). On the other hand, agroecological grassroots innovations are portrayed as adaptive mechanisms that tailor agroecological principles to local contexts while countering dominant corporate food systems (Orozco-Meléndez and Paneque-Gálvez 2022). The supportive narrative elaborates that building social coalitions and effective knowledge co-creation are foundational elements to scaling up agroecology (Ameur, Amichi, and Leauthaud 2020).

According to the skeptical narrative, agroecology lacks supportive structures and institutions that allow scalability beyond local levels. It has been expressed, for example, that shifts in agricultural public policies toward agroecology have not enabled the necessary coordinated changes at farm, agroecosystem, and agrifood system scales (Lamine et al. 2021). This ineffectiveness is attributed to the lack of a comprehensive vision and strategy to integrate agroecological farmers with upstream and downstream stakeholders in agricultural value chains (Lamine et al. 2021). Scaling up agroecological innovations is also constrained by the fact that often they are developed by marginal communities confronted by dominant socioeconomic, political, and cultural structures (Orozco-Meléndez and Paneque-Gálvez 2022). Moreover, these communities have limited power to mobilize beyond the local level (Orozco-Meléndez and Paneque-Gálvez 2022).

The pragmatic narrative points out that significant structural challenges, including land tenure issues, limited market access, and power imbalances, hinder scaling efforts, disproportionately affecting smallholder farmers and indigenous communities (Guerra et al. 2017; Price et al. 2022). This narrative also draws attention to the historical legacies of colonialism and neoliberal policies as ongoing obstacles to scaling agroecology (Iles 2021). It is argued that scalability depends on appropriate institutionalization and coherent policy frames (Duru, Therond, and Fares 2015; Van den Berg, Behagel et al. 2022).

The key role of grassroots organizations and community-based strategies needs to be strengthened through building coalitions and enabling local governance (Bezner Kerr et al. 2018; Mier y Terán Giménez Cacho et al. 2018; Nicol 2020; Orozco-Meléndez and Paneque-Gálvez 2022; Price et al. 2022). Furthermore, scaling up agroecological innovations requires knowledge co-creation and learning processes (Dupré, Michels, and Le Gal 2017; López-García and Carrascosa-García 2023; Miller et al. 2022; Van den Berg, Behagel et al. 2022).

Market dynamics

The supportive narrative challenges conventional market dynamics and the logics of commodity capitalism, outlining alternative value systems that underpin social exchanges in agrifood systems. This narrative also advocates active civil society engagement in food networks that enable citizenship and social justice. In addition to distributing monetary value, it is described that markets are places where actors dispute identities, values, and lifestyles (Muñoz et al. 2021). This narrative argues that agroecology is a pathway to equitable market participation and local empowerment through mechanisms such as solidary economies, collective knowledge systems, and participatory approaches that prioritize social and environmental goals over profit (Hilmi 2019; Lianu, Radulescu, and Lianu 2024; Lockie and Carpenter 2011; Torres 2023). From a political economy perspective, these arguments are consistent with polycentric food systems where communities deliberate about food production, distribution, and consumption. Social innovations, such as participatory guarantee systems, thrive in such solidary exchange systems, enabling farmers to gain access to markets dominated by industrial agriculture and building mutual support between farmers and consumers (Dagoudo et al. 2023; Lockie and Carpenter 2011; Muñoz et al. 2021). The concepts of "civic food networks" (Muñoz et al. 2021) and "food citizenship" (Mehrabi, Perez-Mesa, and Giagnocavo 2022) are employed to describe the active engagement of producers and consumers in new trading circuits that challenge conventional market dynamics.

The skeptical narrative contends that, in contrast to conventional systems, agroecological exchange systems lack the scale, reach, and functioning necessary to provide democratic access to food. This narrative draws on the argument that agroecological production is aimed at middle- and upper-class consumers, leaving out the poorest population who must rely on conventional markets (Muñoz et al. 2021). It has been expressed that agroecological production tends to be distributed through localized and niche markets that are absent in large-scale circuits (Guerra et al. 2017). The skeptical narrative states that conventional systems that consistently produce low-cost agricultural products (Ong and Liao 2020) are better suited to meeting the needs of low-income populations. Moreover, it is expressed that the scale of alternative food markets tends to be insufficient to absorb the full stock of agroecological

production (Muñoz et al. 2021). This situation, for instance, has been reported by (Guerra et al. 2017) in a public food procurement program in Brazil.

The pragmatic narrative highlights persistent barriers, such as underdeveloped markets and limited possibilities of price differentiation for agroecological products (Guerra et al. 2017; Muñoz et al. 2021). It is expressed that alternative networks are ineffective when there are critical disconnections between economic and social dimensions due to social inequalities and physical and cultural separation between production and consumption (Muñoz et al. 2021). Another theme of this narrative relates to the dominance of conventional agricultural systems, which strongly constrain systemic change (Muñoz et al. 2021; Orozco-Meléndez and Paneque-Gálvez 2022). It is described that the scalability of agroecological markets depends on institutional support, market incentives, and robust agricultural networks that effectively connect consumers and producers. This support is required, for example, to facilitate widespread market demand and address structural challenges, such as accessibility, price structures, economic incentives, and meeting industry standards e.g., sustainability certifications); (Cusworth, Garnett, and Lorimer 2021; Guerra et al. 2017). However, market institutions require open and democratic governance and independence from fluctuating political coalitions (Muñoz et al. 2021). Participatory guarantee systems advocated by proponents of agroecology fit into this idea. Policy incentives like public procurement programs aimed at agroecological production can also encourage the implementation of agroecology but require broader institutionalization (Guerra et al. 2017).

Knowledge co-creation and collective learning

Regarding the question on how the narratives can inform a transformation of agrifood systems toward more sustainable approaches, it became evident that as multiple perspectives regarding agroecology coexist, it is important to integrate processes of knowledge co-creation and collective learning to drive a sustainable and responsible transformation. There are multiple stances in which these two processes are clearly linked to the three narratives and six analyzed thematic areas. For example, knowledge co-creation and collective learning processes have been described as core elements for building social networks to scale up agroecology (Ameur, Amichi, and Leauthaud 2020; Dupré, Michels, and Le Gal 2017; López-García and Carrascosa-García 2023; Miller et al. 2022; Van den Berg, Behagel et al. 2022). Knowledge co-creation and collective learning in participatory spaces have also been identified as essential elements in the development of new market dynamics and collaborative economies required for agroecological transitions (Hilmi 2019); Lianu, Radulescu, and Lianu 2024; Lockie and Carpenter 2011; Torres 2023). Additionally, building supportive policies requires open discussions between stakeholders engaged in democratic processes (De Molina 2013; Parmentier 2014).

Across the narratives, there is a consensus that scaling up agroecology requires bringing together multiple actors (e.g. Brumer et al. 2023; Orozco-Meléndez and Paneque-Gálvez 2022; Van den Berg, Behagel et al. 2022). There is also a general agreement that agroecological innovations need to be contextualized to local realities and inclusive of multiple worldviews (e.g. Ameur, Amichi, and Leauthaud 2020; Bendfeldt, McGonagle, and Niewolny 2021; Brumer et al. 2023; Orozco-Meléndez and Paneque-Gálvez 2022; Steinhäuser 2020). As a result of these conditions, different types of knowledge need to be brought into conversation, for example, by integrating local and traditional knowledge, scientific knowledge, and policymaking. This exchange is also conducted with the support of external allies (e.g., NGOs and development organizations), acting as mediators to balance viewpoints. Strengthening grassroots autonomy is also considered to be a relevant focus of this mediation (Orozco-Meléndez and Paneque-Gálvez (2022). Multistakeholder platforms and transdisciplinary research networks with participation of local actors, therefore, configure relevant spaces to advance knowledge co-creation and collective learning.

Competing value and knowledge systems can make it challenging to foster knowledge co-creation and collective learning Stevenson (2004). We argue, however, that integrating the different narratives around agroecology is valuable to enabling agroecological transitions. As part of the larger picture, transforming political and economic systems to enable more sustainable and equitable food systems requires major thinking shifts and alternative imaginaries (Kelinsky-Jones, Niewolny, and Stephenson 2023). This requires engaging contrasting narratives in the more productive dynamic of complementarity. The articulation around the three narratives can contribute to nuanced debates and comprehensive learning. The supportive narrative, for example, clearly articulates the systemic problems of dominant agrifood systems. In turn, this narrative proposes an alternative model, describing opportunities of agroecology from a comprehensive perspective (linking farms, agricultural landscapes, value chains, and political systems). Conversely, the skeptical narrative identifies the challenges and risks of agroecological transitions, bringing to the fore common concerns of some segments of society (e.g., some groups of farmers and consumers) and thus presenting valid arguments to consider for a transformation toward agroecology. In the meantime, the pragmatic narrative helps identify the necessary changes and pathways to realize the promising potential of agroecology. In addition, the pragmatic narrative emphasizes the contextual nature of agroecological innovations and the outcomes of agroecological systems. Based on the perspectives articulated around the three narratives, a plausible outcome of the learning process would be the idea that a responsible transition should take place gradually, with support structures being implemented and trade-offs being managed responsibly. Another plausible outcome of the learning

process associated with coalition building is to recognize the relevant role of the participants. For example, governments are often blamed for hindering agroecological transitions through unfavorable policies or lack of political will. However, there is good evidence that governments are also engaged in supporting agroecological transitions, particularly in co-evolution with economic and political context transformation. Brazil's public procurement programs, the European Green Deal, the Farm to Fork Strategy, and Cuba's broad institutionalization of agroecology are some examples. These initiatives can be showcased in collective discussions to foster a more balanced perspective. However, collective learning can also serve to scrutinize proposed transformations to identify and prevent political and economic co-optation and instrumentalization.

Narratives also need to be examined critically as they present elements that preclude transformation or reduce the scope of possibilities to attain sustainability. The supportive narrative, for example, is prone to perceive approaches to sustainable agriculture outside agroecology as illegitimate. This condition promotes radicalization and adversarial positions, preventing dialog between approaches. Additionally, it prevents a critical self-perspective of agroecology. The skeptical narrative, on the other hand, fails to acknowledge systemic power imbalances and socio-ecological injustices as powerful drivers of unsustainability. By adopting technocentric and productivist approaches and neglecting social and political dimensions, this narrative overlooks necessary system transformations while being instrumental to dominant actors seeking to maintain the status quo. Meanwhile, the pragmatic narrative can be immobilizing if it does not transcend a discourse of contextualization and finds general patterns, or if it emphasizes the multidimensional transformations that agroecology requires without advancing on clear strategies for implementing these transformations.

New knowledge emerges by blending diverse and even contrasting viewpoints, rather than reproducing inherited forms of thinking through knowledge silos. More open and democratic processes of knowledge exchange bring up novel categories of knowledge, priorities, and definitions of problems and solutions to deliver change (Gaventa and Cornwall 2006). Knowledge co-creation and collective learning can give voice to actors holding knowledge based on local realities (Gaventa and Cornwall 2006), while also offering opportunities for powerful actors to reflect and change (Chambers 2006). Knowledge co-creation and collective learning is linked to the notion of learning presented by Fernández-Giménez et al. (2019), which refers to the interaction of individuals with divergent perspectives, whose perceptions, norms, and relationships change as a result of their interactions. Thus, knowledge co-creation and collective learning transcend knowledge transfer, as they involve the development of complementary goals, insights, and interests through interaction (Röling 2002).

However, as knowledge is socially constructed, learning requires a collective understanding of the social structures where knowledge is embedded and their power dynamics (Hall 1992). Previous work on Participatory Action Research PAR) has acknowledged that participatory processes may reinforce power relations if they are conducted without taking into account the exclusionary attributes of participation and addressing power imbalances among participants (Cullen et al. 2014; Gaventa and Cornwall 2006; Resnick and Birner 2010). These dynamics are key in the context of knowledge co-creation and collective learning for agroecological transitions as this process brings together actors with different levels of influence (e.g., farmers, government officers, scientists, and companies). Without addressing issues of inclusion and power imbalances, instead of influencing meaningful change, knowledge co-creation and collective learning have the risk of becoming mere tokenism.

Authors working on participatory approaches have provided guidelines for addressing power imbalances in knowledge co-creation, social learning, and innovation systems. Listed below are four considerations from this literature that can foster complementarity and inclusiveness between narratives with consideration of power dynamics. First, narratives should not monopolize the debate or be imposed over the narratives of grassroots communities (Borda 1996). In this regard, these communities should be recognized as experts. Second, narratives should be critically examined in terms of their relationship to dominant interests. This includes reflecting on "how and by whom" the narrative is put forth and how this affects the definition of problems and solutions (Cronin et al. 2024). Conversely, there should be an integration of counter-narratives that advance social struggles for sovereignty and justice (Borda 1996). Third, powerful actors (e.g., the government, firms, donors, research centers) should be open to using participatory spaces to reflect and change their own narratives (Chambers 2006). Fourth, following the idea of institutional fit on multistakeholder platforms (Osei-Amponsah, Van Paassen, and Klerkx 2018), complementarity should be understood as developing alternative perspectives and new understandings, rather than total convergence and agreement between narratives.

Conclusions

This systematic literature review identified multiple perspectives and actors shaping the current debate around agroecology. These perspectives analytically articulated around three narratives (supportive, skeptical, and pragmatic) have also been applied to inform the transformation of agrifood systems toward more sustainable approaches. By articulating these narratives, we provide a deeper understanding of how evidence, expectations, and beliefs coexist, compete, and complement one another to shape the general debate on agroecology. This understanding is key as this debate influences the future of

agrifood systems. The review also accounts for a broad group of actors participating in agroecological transitions and holding different positions in the debate. These positions, however, are not unequivocal and co-evolve with economic and political contexts. The synthesis and communication potential of narratives can be harnessed to move the debate forward. However, this requires paying attention to power dynamics in knowledge construction and the risk of appropriation by dominant actors. Throughout the narratives, knowledge co-production and collective learning emerged as cross-cutting concepts to enable agroecological transitions at multiple scales. Following these concepts and insights from participatory approaches, we provide four recommendations to facilitate complementarity between narratives with power dynamics under consideration. Nonetheless, we recognize the need for further development of a critical perspective on agroecology narratives. Furthermore, perspectives on the intersection of agroecology, youth, and gender remain underexplored in the literature. However, these areas also influence the debate. A systematic analysis focused on these themes will provide a more profound understanding of the debate shaping the transformation toward sustainability.

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