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Agrobiodiversity, food culture, and traditional agricultural systems: state of the art, conflicts, coexistence, and research agenda

Agrobiodiversidade, cultura alimentar e sistemas agrícolas tradicionais: estado da arte, conflitos, coexistência e agenda de pesquisa

Agrobiodiversidad, cultura alimentaria y sistemas agrícolas tradicionales: estado actual, conflictos, coexistencia y agenda de investigación

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ABSTRACT
Objective - This article maps international scientific production addressing the intersection of agrobiodiversity, food cultures, and traditional agricultural systems, aiming to identify key threats, structural dynamics, and research gaps shaping their interrelations. Methodology - The study adopts an exploratory and descriptive qualitative approach based on a Systematic Literature Mapping (SLM). Data collection was conducted through bibliographic procedures in Scopus and Web of Science, and the analysis was performed using content analysis. Contribution - The results reveal a limited and fragmented body of literature (21 articles) simultaneously addressing the three domains. The *corpus* highlights a dual dynamic: on one hand, the recognition of traditional systems as fundamental for biocultural diversity, food sovereignty, and resilience; on the other, the documentation of pressures associated with the expansion of agro-industrial models, including genetic erosion, landscape simplification, and loss of traditional knowledge. Rather than evidencing balanced coexistence, the findings indicate that interactions between food system models are predominantly structured by asymmetrical power relations and conflict. This study identifies a critical analytical gap regarding the conditions shaping these interactions and advances a research agenda grounded in four interconnected themes. These themes synthesize dispersed research gaps into a coherent framework to guide future studies on agrobiodiversity, food cultures, and traditional agricultural systems, contributing to a more relational and systemic understanding of contemporary food system transformations.

Keywords: biocultural diversity, food sovereignty, agrobiodiversity, systematic literature mapping, research agenda.

RESUMO
Objetivo - Este artigo mapeia a produção científica internacional que aborda a interseção entre agrobiodiversidade, culturas alimentares e sistemas agrícolas tradicionais, com o objetivo de identificar as principais ameaças, dinâmicas estruturais e lacunas de pesquisa que moldam suas inter-relações. Metodologia - O estudo adota uma abordagem qualitativa exploratória e descritiva baseada em um Mapeamento Sistemático da Literatura (MSL). A coleta de dados foi realizada por meio de procedimentos bibliográficos no Scopus e no Web of Science, e a análise foi realizada utilizando a análise de conteúdo. Contribuição - Os resultados revelam um *corpus* de literatura limitado e fragmentado (21 artigos) que aborda simultaneamente os três domínios. O *corpus* destaca uma dinâmica dupla: por um lado, o reconhecimento dos sistemas tradicionais como fundamentais para a diversidade biocultural, a soberania alimentar e a resiliência, por outro, a documentação das pressões associadas à expansão de modelos agroindustriais, incluindo a erosão genética, a simplificação da paisagem e a perda de conhecimento tradicional. Em vez de evidenciar uma coexistência equilibrada, os resultados indicam que as interações entre os modelos de sistemas alimentares são predominantemente estruturadas por relações de poder assimétricas e conflitos. Este estudo identifica uma lacuna analítica crítica em relação às condições que moldam essas interações e propõe uma agenda de pesquisa fundamentada em quatro temas interconectados. Esses temas sintetizam lacunas de pesquisa dispersas em um

quadro coerente para orientar estudos futuros sobre agrobiodiversidade, culturas alimentares e sistemas agrícolas tradicionais, contribuindo para uma compreensão mais relacional e sistêmica das transformações contemporâneas dos sistemas alimentares.

Palavras-chave: diversidade biocultural, soberania alimentar, agrobiodiversidade, mapeamento sistemático da literatura, agenda de pesquisa.

RESUMEN
Objetivo: este artículo realiza un mapeo de la producción científica internacional que aborda la intersección entre la agrobiodiversidad, las culturas alimentarias y los sistemas agrícolas tradicionales, con el fin de identificar las principales amenazas, las dinámicas estructurales y las lagunas de investigación que configuran sus interrelaciones. Metodología: el estudio adopta un enfoque cualitativo exploratorio y descriptivo basado en un mapeo bibliográfico sistemático (SLM). La recopilación de datos se llevó a cabo mediante procedimientos bibliográficos en Scopus y Web of Science, y el análisis se realizó mediante análisis de contenido. Aportación: los resultados revelan un *corpus* bibliográfico limitado y fragmentado (21 artículos) que aborda simultáneamente los tres ámbitos. El *corpus* pone de relieve una dinámica dual: por un lado, el reconocimiento de los sistemas tradicionales como fundamentales para la diversidad biocultural, la soberanía alimentaria y la resiliencia, por otro, la documentación de las presiones asociadas a la expansión de los modelos agroindustriales, incluyendo la erosión genética, la simplificación del paisaje y la pérdida de conocimientos tradicionales. En lugar de evidenciar una coexistencia equilibrada, los hallazgos indican que las interacciones entre los modelos de sistemas alimentarios están estructuradas predominantemente por relaciones de poder asimétricas y conflictos. Este estudio identifica una laguna analítica crítica en relación con las condiciones que configuran estas interacciones y propone una agenda de investigación basada en cuatro temas interconectados. Estos temas sintetizan las lagunas de investigación dispersas en un marco coherente para orientar futuros estudios sobre agrobiodiversidad, culturas alimentarias y sistemas agrícolas tradicionales, contribuyendo a una comprensión más relacional y sistémica de las transformaciones contemporáneas de los sistemas alimentarios.

Palabras clave: diversidad biocultural, soberanía alimentaria, agrobiodiversidad, mapeo sistemático de la literatura, agenda de investigación.

1 INTRODUCTION

Agrobiodiversity refers to the portion of biodiversity used by humans for food and agriculture (FAO, 2010). It encompasses intra- and interspecific genetic diversity, ecosystems and their services, agroecosystems, food systems, and cultural practices, articulating ecological, sociocultural, political, and economic dimensions fundamental to sustainability and food sovereignty (FAO, 1997, 1999, Convenção, 2000, Altieri, 2012, Toledo, Barrera-Bassols, 2015, Brush, 2005).

Peasant family farmers, indigenous peoples, and traditional communities are central actors in the development, adaptation, and conservation of agrobiodiversity, often recognized as its "guardians" or managers of genetic resources (Brush, 2005). Through their practices, agrobiodiversity is expressed in species and varieties - native or introduced - managed across diverse environments and embedded in specific food systems, landscapes, and biocultural territories.

These systems are sustained by complex bodies of traditional knowledge accumulated over long historical processes, constituting a significant ecological and cultural legacy (Toledo, Barrera-Bassols, 2015, Koohafkan, Altieri, 2010). As a result, diverse cultural contexts have given rise to equally diverse agroecosystems, shaped by both material and immaterial dimensions (FAO, 1997, 1999, Convenção, 2000, Altieri, 2012, Toledo, Barrera-Bassols, 2015). Such systems are widely recognized for their biodiversity, complexity, and resilience, and are often considered potential pathways to address the challenges posed by industrial agriculture (Posey, 1985, Toledo, 2001, Brush, 2005, Altieri, 2012, Toledo, Barrera-Bassols, 2015).

In recognition of their global importance, FAO established the Globally Important Agricultural Heritage Systems (GIAHS) program in 2002, aimed at safeguarding agricultural biodiversity, knowledge systems, landscapes, and cultures, while supporting their dynamic evolution. These systems are understood as living socio-ecological systems whose longevity reflects their adaptive capacity in the face of changing environmental and technological contexts.

Closely linked to these systems, food culture transcends biological needs, encompassing social, historical, and symbolic dimensions that connect human groups to their environments and contribute to the maintenance of agrobiodiversity and food sovereignty (Fischler, 1995, Mintz, 2001).

However, the literature indicates that the expansion of agro-industrial models - based on high-yielding varieties and monocultures - acts as a major pressure on biocultural diversity (Giuliani *et al*., 2011, Ivanova *et al*., 2021, Korpelainen, 2023). Processes of homogenization, territorial conflict, and the devaluation of local knowledge have been associated with agrobiodiversity loss and erosion of traditional knowledge, with direct impacts on food and nutritional security (Cely-Santos, Hernández-Manrique, 2021, Ekesa *et al*., 2022, Blundo-Canto *et al*., 2020, Aziz *et al*., 2022).

This dynamic has been conceptualized as a "triple monotony" in the global agri-food system, characterized by the concentration of production, the standardization of diets, and the expansion of ultra-processed foods, with implications for public health and sustainability (Abramovay *et al*., 2025).

Within this context, the coexistence between industrial and traditional agricultural systems is frequently marked by tension, asymmetries, and territorial disputes, raising critical questions regarding the sustainability and equity of contemporary food systems (Toledo, Barrera-Bassols, 2015, Grisa *et al*., 2022).

Considering these dynamics, this article aims to systematize and analyze international scientific production on the relationships between agrobiodiversity, food culture, and traditional agricultural systems. Through a systematic literature mapping (SLM), it seeks to: (i) examine contributions, threats, and opportunities identified in the literature, (ii) identify key research gaps, and (iii) propose themes for a medium- and long-term research agenda to support the protection of agrobiodiversity and traditional systems.

2 METHODOLOGY

This article is exploratory and descriptive, using a qualitative approach and bibliographic procedures. The methodological design follows Tranfield *et al*. (2003) for the systematic mapping stages and Ferreira (2002) and Paul *et al*. (2021) for knowledge dissemination. The process is organized into three stages: planning, systematic mapping implementation, and knowledge dissemination.

The first stage (planning) involved defining data sources and search terms aligned with the research questions. The Scopus and Web of Science databases were selected due to their broad academic coverage (Thelwall, Sud, 2022). Scopus includes over 7,000 publishers and more than 1.8 billion cited references (Elsevier, 2023), while Web of Science indexes over 34,000 journals and 1.89 billion cited references (Clarivate, 2023).

Search strings were designed to capture terms related to "agrobiodiversity", "food culture", and "traditional agricultural systems", including synonyms, applied to titles, abstracts, and keywords. The final search strategy is summarized in Table 1.

Table 1: Journal databases, research criteria, string, and quantitative results of papers

Journal Database	Criterion	String	Result
Scopus	TIT-KEYS-ABS	(“Agrobiodiversity” OR “local varieties” OR “biodiversity for food” OR “landraces” OR “biocultural diversity” OR “creole varieties” OR “on-farm conservation” OR “crop diversity”) AND (“food culture” OR “traditional food” OR “dietary diversity” OR “food and nutrition security” OR “local food systems” OR “culinary heritage” OR “sustainable food systems”) AND (“traditional agriculture systems” OR “traditional agroecosystem” OR “traditional communities” OR “family farming” OR “indigenous farming communities” OR “Globally Important Agricultural Heritage Systems (GIAHS)” OR “local communities”)	15
Web of Science	Topic	(Same as above)	15
Total			30

Source: Authors (2023).

The second stage consisted of systematic mapping implementation. No inclusion filters were applied due to the novelty of the topic. Exclusion criteria removed duplicates across databases (9 papers), followed by full-text screening for thematic adherence, resulting in a final *corpus* of **21 articles**.

The third stage (knowledge dissemination) concerns the presentation of results from systematic literature mapping (Tranfield *et al*., 2003). Beyond synthesis, this study also provides a state-of-the-art analysis and content interpretation. Following Paul *et al*. (2021), a “stimulus agenda” is used to identify research gaps and propose medium- and long-term research directions.

Research agenda construction combined insights from primary studies with Bardin’s (2011) content analysis, comprising pre-analysis, material exploration, and treatment of results (inference and interpretation). Pre-analysis and exploration were integrated into the planning and implementation stages of the mapping (Tranfield *et al*., 2003).

Result interpretation was based on full-text analysis, as bibliographic metadata and abstracts alone may not capture methodological and empirical depth (Ferreira, 2002). For studies conducted in UNESCO World Heritage Sites, GIAHS/FAO areas, or other recognized territories, complementary secondary information was collected from institutional databases.

Finally, the conceptual framework/infographic (Figure 1) was generated using a generative AI tool (Gemini/Google Image Generator), based on structured prompts derived from

the systematic *corpus* analysis. The output was reviewed to ensure consistency and accuracy with the scientific content of the study.

3 RESULTS AND DISCUSSIONS

3.1 STATE-OF-THE-ART CONTRIBUTIONS

In general, the total *corpus* of this work, consisting of 21 articles, reveals integrated and multilevel research and analysis approaches. These scales range from landscapes, biocultural territories, and agroecosystems to agrobiodiversity management subsystems - such as biodiverse and resilient production systems, home gardens, and domestic backyards - reaching down to inter- and intraspecific diversity.

The *corpus* encompassed research conducted in the following continents: Europe (Italy/Mediterranean, Bulgaria/Eastern Europe, and Denmark/Northern Europe), Asia (Western and Southern India, Pakistan/South Asia, Tajikistan/Central Asia, and China/East Asia), Oceania (Fiji), Africa (Uganda/Central Africa and Senegal/West Africa), and the south-central portion of the American continent (Peru, Costa Rica, Brazil, and Colombia). Two papers provided global reviews of home gardens and underutilized plants.

More specifically, authors point out that the introduction of high-yielding varieties, which are often poorly adapted to local conditions, threatens agrobiodiversity and the food and nutritional security of families at different scales (Giuliani *et al.*, 2011, Ivanova *et al.*, 2021, Korpelainen, 2023). This occurs through the replacement of locally adapted and genetically diverse local varieties, and due to the technical and technological requirements of high-yielding varieties that are often decontextualized from local conditions.

Cely-Santos and Hernández-Manrique (2021) analyze the effects of the Colombian armed conflict (1997–2010) and oil palm expansion in the María La Baja region on family farming livelihoods in the Colombian Caribbean. They report changes in agrarian structures, agrobiodiversity loss, disruptions in production and food seasonality, and unequal access to resources between men and women. These dynamics spatially marginalized women, who responded to reduced access to land and water and declining harvests and income by diversifying subsistence strategies (Cely-Santos and Hernández-Manrique, 2021).

Ekesa *et al*. (2022) report that conflicts in Uganda - linked to agricultural expansion, habitat fragmentation, changes in land ownership, and rebel insecurity - affect food and nutritional security by reducing access to wild food species previously obtained through hunting and gathering. The number of edible wild plants and animals declined from 91 in Acholi and 103 in Teso to about 109 species (based on a 2017 assessment reflecting conditions 20 years earlier).

The authors emphasize the need to improve access to these resources, highlighting their importance not only for food security but also for their social and cultural value (Ekesa *et al*., 2022).

An analysis of impact assessment studies of projects involving neglected and underutilized species (NUS) identified a key lesson: research and development approaches must be sensitive to local food culture and traditions rather than being primarily economic-focused (Padulosi *et al.*, 2013). These authors reinforce the central role of women in the use and conservation of NUS and the need for greater support for their initiatives. To circumvent genetic erosion and increase the resilience of agroecosystems to climate change, the authors highlight the need for participatory *on-farm* conservation strategies integrated with *ex-situ* conservation.

Diop *et al*. (2018) describe fonio (*Digitaria exilis*) as a neglected West African cereal with cultural, nutritional, and economic relevance, cultivated by smallholder farmers in diversified subsistence systems dependent on local seed exchange networks. In Senegal, its production varies by context: in more mechanized areas, varieties are also commercialized and mechanized, while in food-insecure regions, early and late-maturing varieties contribute more directly to food security. The authors note that its importance varies across agroecological zones, ethnicities, and genders, with greater relevance for women, and report a general decline in cultivation areas, calling for integrated conservation and promotion strategies.

Jayashree and Aram (2020) report a decline in traditional knowledge in Kolli Hills (Tamil Nadu, India) related to the conservation and use of local millet varieties by community leaders known as Oor Goundars. These leaders select planting varieties through the Oor Mugatham ritual, which marks the agricultural season’s start. Although the practice persists, trust in these leaders as knowledge sources has decreased due to rising education levels and market influences. The authors suggest that strengthening cultural practices, rituals, and social norms may help prevent the loss of millet-related traditional knowledge.

Branca *et al.* (2013) highlight the food role (human and animal) of *Brassica oleracea* L. convar. *acephala* (DC.) Alef., known as kale, cultivated in home gardens and peri-urban rural communities in European countries. This specie may be the oldest ancestor of other *B. oleracea*. The authors state that local kale varieties are disappearing due to changes in local social and economic conditions and the introduction of new cultivars and other *Brassica* crops with higher yields. The authors emphasize the importance of local kale variety diversity for genetic improvement.

Zhang *et al*. (2022) analyze wild Orchidaceae species in China, highlighting their ecological, ornamental, medicinal, edible, cultural, and scientific value. The authors report that all linguistic groups maintain traditions of use, management, and conservation of orchids, both wild and cultivated, including their use as medicinal foods, remedies, and in cultural practices such as gifting. They argue that traditional knowledge on orchids should be valued for its contribution to the conservation of biological and cultural diversity, the development of new resources and products, and broader sustainability initiatives such as rural revitalization and ecological civilization in China.

Giuliani *et al*. (2011), studying apples, apricots, and mulberries in the Tajik Pamir Mountains (a UNESCO site and Slow Food “Presidia”), found that the introduction of exotic, market-oriented varieties poorly adapted to local conditions threatens agrobiodiversity and household food security.The authors recommend income-generating strategies based on local varieties, including awareness of their nutritional and medicinal value, improved pest management, and the formation of farmer cooperatives, rather than approaches focused primarily on external markets.

Korpelainen (2023) highlights home gardens as key systems for family farmers worldwide, supporting food security, local food systems, and on-farm adaptation, and complementing ex situ conservation in the context of climate change. These spaces host domestication processes and the cultivation of wild crop relatives, with frequent presence of neglected and underutilized species.

The author proposes four main strategies to strengthen conservation in home gardens: monitoring and documenting diversity and threats, expanding knowledge on genetic and functional value, enlarging gene bank coverage to include backyard materials, and improving access to these resources for on-farm use and formal breeding programs (Korpelainen, 2023).

Ivanova *et al*. (2021) warn that high-yielding varieties threaten local agrobiodiversity and associated food and cultural practices in southern and northwestern Bulgaria. In 65 home gardens, they identified 145 taxa of cultivated and semi-cultivated plants used for food, medicine, aromatics, and fodder, with six taxa (*Allium cepa*, *A. sativum*, *Capsicum annuum*, *Cucumis sativus* L., *Lycopersicon esculentum* Mill., and *Petroselinum crispum* Mill.) present in all gardens, reflecting their sociocultural importance.

The authors conclude that these home gardens function primarily as subsistence systems oriented to household consumption, and that traditional Bulgarian cuisine, based on garden produce and animal resources, contributes to the maintenance of traditional ecological knowledge on wild edible plants and local breeds (Ivanova *et al*., 2021).

Regarding diversity conserved in traditional systems, Geraci *et al.* (2018) found 253 local plant taxa, mostly consumed cooked in Sicilian food. Field data were compared with citations from other countries for the inclusion of the Mediterranean diet as UNESCO Intangible Cultural Heritage. The research showed that 72 taxa are consumed only in Sicily and another 12 in all Mediterranean countries. Widely known vegetables were cited, as well as "ancient" vegetables such as *Onopordum illírico*, *Centaurea calcitrapa*, *Nasturtium officinale*, *Scolymus* spp., and *Smyrnium rotundifolium* (Geraci *et al*., 2018).

Pandey *et al*. (2022) describe the Jhum shifting agroforestry system in India as a traditional practice that supports crop and dietary diversity and contributes to the food and nutritional security of Garo communities. Although included in India's UNESCO tentative heritage list (2018), the system is being increasingly replaced by monoculture-based intensive agriculture.

The authors document 39 cultivated plant species and four livestock breeds, complemented by extractivism, forming a diverse endogenous food system. They recommend maintaining Jhum practices, alongside measures to ensure community economic viability, and suggest that food security policies could be informed by its dietary diversity (Pandey *et al*., 2022).

The Parque de la Papa in the Peruvian Andes is a biocultural food diversity territory managed by Indigenous communities. Based on this case, Argumedo *et al*. (2021) argue that food security, sustainability, resilience, and food system transformation can be enhanced through the conservation, use, and valorization of biocultural diversity.

The authors emphasize that biocultural territories represent long-standing human systems that continue to sustain food provision under environmental change. They highlight that strengthening and protecting these communities through collaborative networks involving local, national, and international actors is key to achieving food security on community-defined terms. They also underscore the importance of building local capacities through knowledge exchange among communities facing similar challenges, as well as advancing research on the value, function, and status of biocultural diversity in food systems and improving the dissemination of this knowledge (Argumedo *et al*., 2021).

Studying the role of biocultural diversity in sites across Asia, Latin America, and Europe, Singh *et al.* (2021) emphasize that traditional knowledge developed by native and indigenous peoples can provide the basis for addressing current challenges related to food security, sovereignty, and natural resource sustainability in the context of global environmental changes. They highlight that this biocultural diversity is threatened by socioeconomic and climate changes at a global level and that the industrialization of food systems, when it denies or neglects traditional means of food sovereignty, jeopardizes long-term biocultural sustainability (Singh *et al.*, 2021).

Considering the specificities of Pacific island countries to circumvent threats to main food crops produced in Fiji's agroforestry systems, Palanivel and Shah (2021) recommend that, given the impacts of climate change and the limitations inherent to islands and high costs of conventional plant breeding, research programs focus on identifying, conserving, documenting, and disseminating information on unique landraces, community seed banks, the introduction of new resistant genotypes, and the maintenance and expansion of allelic diversity.

Bisht *et al.* (2018) discuss results from two dense case studies on documenting and registering agrobiodiversity and local production/dietary diversity, focusing on health promotion, in rural communities of the Uttarakhand Hills, northwest India. The authors highlight the nutritional contribution of farmers' varieties and the use of native species from local production and food systems in promoting community health. They record the need for establishing alliances between communities and their partners, including the government, to create a research agenda and protect farmers' rights, supporting agrobiodiversity and local food systems and landscapes to promote food sovereignty.

Blundo-Canto *et al*. (2020) conducted a 15-year longitudinal study (2000-2015) with 53 farming families in Ucayali, Peruvian Amazon, to assess whether market-oriented agricultural expansion is associated with deforestation, reduced agrobiodiversity, and changes in food access. The results indicate a shift from diversified systems with broader food access to specialized, market-oriented systems with reduced dietary diversity and increased deforestation linked to oil palm expansion. Their analysis shows that higher income and market integration did not improve food security, instead, diets became more dependent on protein- and fat-rich and ultra-processed foods, while access to diverse foods declined.

The authors conclude that the homogenization of diets and agricultural systems represents a key risk, requiring interdisciplinary research and integrated landscape policies addressing food access, agrobiodiversity, land use, forest cover, and health to support sustainable and inclusive food systems (Blundo-Canto *et al*., 2020).

Integrated and multidimensional food and nutritional security (FNS) approaches have contributed to assessing the importance of agrobiodiversity for families. Rodríguez-Gonzalez *et al.* (2020), evaluating how the articulation between different FNS dimensions impact the food and nutritional status of 34 farming families in the municipality of Coto Brus, Costa Rica, concluded that the nutritional dimension, within a multidimensional and multiscale approach, should be considered an indicator of agri-food system sustainability and, therefore, recognized in rural development policies. The authors observed that 68% of the visited families were in a state of food insecurity and noted that the families' intrinsic relationship with nature favors more sustainable practices.

Methodological and policy strategies can protect farmers, their territories, and the biodiversity they maintain, thereby strengthening food and nutritional security and sovereignty. Aziz *et al*. (2022), in a study conducted in the Yasin Valley (Gilgit-Baltistan, Pakistan), identified a decline in the intergenerational transmission of local ecological knowledge related to the food use of native plants. The authors note that the centralized school curriculum neglects local ecological and cultural knowledge, contributing to students' disconnection from indigenous knowledge systems. As an alternative, they propose place-based education grounded in biocultural heritage as a framework for revitalizing traditional knowledge. They further suggest school-based initiatives such as field trips, traditional food celebrations, herbarium development, art activities, and food knowledge exploration. The study emphasizes the need for policymakers

to address the erosion of local ecological knowledge and integrate it into development programs aimed at sustainability and the support of mountain communities (Aziz *et al*., 2022).

Lacerda *et al.* (2020) present a case study with a transdisciplinary approach to develop solutions for integrated landscapes that value and include the experience and knowledge of local communities. Their study was conducted with family farmers in southern Brazil who use traditional agroecological practices for yerba mate (*Ilex paraguariensis*) production. The results point to a methodology that seeks to value and document local practices and ecological knowledge, proposing and monitoring locally optimized models of yerba mate agroforestry systems with the potential to configure diverse and resilient agroecological landscapes, with expanded forest cover and increased biodiversity and ecosystem services.

Swensson and Tartanac (2020) highlight the growing role of public food procurement programs in benefiting local producers, communities, and consumers, and in reshaping food consumption and production patterns to transform local food systems. Based on experiences from Brazil (PAA and PNAE) and Denmark (Organic Action Plan and Policy), they argue that such programs influence what food is purchased, from whom, and under which production systems.

The authors emphasize criteria such as local, diverse, nutritious, culturally appropriate, and sustainably produced food from family farming, women and youth, and small and medium enterprises, noting their potential to strengthen agrobiodiversity and its links with agroecology, organic production, and socio-biodiversity (Swensson and Tartanac, 2020).

3.2 PERSPECTIVES ON THE *CORPUS*

The scope of this *corpus* highlights tensions arising from the coexistence of different agri-food system models. Three analytical dimensions emerge.

First, there is a structural opposition between two macro-categories: industrial systems and traditional, community-based systems. While both encompass internal diversity and may represent points along a continuum, the literature reveals contrasting logics. Industrial models are often associated with economic performance and contributions to national trade balances (Pengue, 2009), whereas the studies analyzed here predominantly document their negative externalities at local levels, including ecosystem degradation and agrobiodiversity loss. This

finding aligns with Altieri and Toledo (2011), who identify public health and environmental impacts as inherent costs of specialized industrial agriculture.

Conversely, traditional systems - characterized by biocultural diversity and embeddedness in local markets - are increasingly framed as sources of resilience and sustainability. Rather than representing residual or backward systems, they are positioned as complex and adaptive configurations aligned with agroecological principles and food sovereignty (Pengue, 2009, Altieri, Toledo, 2011, Denevan, 1995, Koohafkan, Toledo, Barrera-Bassols, 2015, Grisa *et al*., 2022).

Second, the *corpus* reflects a predominance of research focused on threats to agrobiodiversity and the defense of traditional knowledge systems. This trend is consistent with the argument by Toledo and Barrera-Bassols (2015), who note that such research often adopts a paradigmatic stance aimed at safeguarding biocultural knowledge against market-driven pressures.

Third, regarding the viability of coexistence between these models, the literature reviewed provides limited evidence of virtuous or synergistic interactions. While some authors acknowledge the possibility of coexistence or transition within the same territory (Grisa *et al*., 2022), the studies analyzed here predominantly emphasize conflict, asymmetry, and incompatibility. This may reflect both the structural dominance of industrial systems and a lack of research focused on relational dynamics between models.

This mapping therefore reveals a critical research gap concerning the conditions under which coexistence, complementarity, or transition pathways may emerge in agri-food systems integrating agrobiodiversity, food culture, and traditional knowledge.

3.3 OPPORTUNITIES AND CONTRIBUTIONS

The *corpus* evidences a set of practices, knowledge systems, and institutional arrangements that contribute to the protection of agrobiodiversity and the strengthening of food and nutritional security, food sovereignty, and cultural continuity in traditional systems. These contributions can be analytically grouped into three interconnected dimensions

First, processes of valorization and knowledge production emphasize the importance of recognizing the social, cultural, nutritional, and economic value of agrobiodiversity. This

includes the promotion of local varieties and biodiverse production systems, the documentation and monitoring of species and practices, and the expansion of knowledge regarding genetic, nutritional, and medicinal properties (Giuliani *et al*., 2011, Padulosi *et al*., 2013, Bisht *et al*., 2018, Diop *et al*., 2018, Geraci *et al*., 2018, Ivanova *et al*., 2021, Palanivel, Shah, 2021, Zhang *et al*., 2022, Korpelainen, 2023, Argumedo *et al*., 2021).

Second, institutional and policy mechanisms play a key role in enabling these systems. The literature highlights the importance of public policies related to health, nutrition, and environmental management, including food procurement programs and legal frameworks that support farmers' rights and biodiversity conservation (Bisht *et al*., 2018, Blundo-Canto *et al*., 2020, Rodríguez-González *et al*., 2020, Swensson, Tartanac, 2020, Pandey *et al*., 2022, Argumedo *et al*., 2021).

Third, social organization and local agency emerge as central elements for sustaining these systems. This includes community networks, knowledge exchange processes, intergenerational transmission, and the central role of specific actors, particularly women, in managing agrobiodiversity and food practices. Spaces such as home gardens and traditional kitchens are highlighted as key sites for experimentation, conservation, and cultural reproduction (Padulosi *et al*., 2013, Diop *et al*., 2018, Argumedo *et al*., 2021, Aziz *et al*., 2022, Cely-Santos, Hernández-Manrique, 2021, Ivanova *et al*., 2021, Korpelainen, 2023).

These dimensions demonstrate that the contributions of traditional systems extend beyond production, encompassing integrated socio-ecological processes that link biodiversity, knowledge, institutions, and cultural practices.

3.4 TRENDS TOWARD THE HEGEMONY OF THE GLOBAL AGRO-INDUSTRIAL MODEL AND DIFFICULTIES FOR COEXISTENCE

The literature analyzed identifies a consistent set of pressures threatening the continuity of traditional agri-food systems and associated knowledge. These pressures are primarily linked to changes in land use and control, the expansion of monocultures, and the fragmentation of ecosystems (Diop *et al*., 2018, Blundo-Canto *et al*., 2020, Cely-Santos, Hernández-Manrique, 2021, Ekesa *et al*., 2022).

In contexts marked by conflict or rapid socio-economic change, these dynamics result in reduced access to land and natural resources, undermining the material basis for the reproduction of local food systems and associated cultural practices (Giuliani *et al*., 2011, Pandey *et al*., 2022). These processes often exacerbate existing inequalities, particularly affecting women (Cely-Santos, Hernández-Manrique, 2021).

The introduction of high yielding, externally developed, or poorly adapted varieties is also consistently identified as a major driver of agrobiodiversity loss. This impact is not inherent to species exchange itself, but to the conditions under which it occurs - namely, when driven by policies and market dynamics that favor standardization and displace locally adapted systems (Giuliani *et al*., 2011, Ivanova *et al*., 2021, Korpelainen, 2023, Padulosi *et al*., 2013).

Two main mechanisms structure this process. The first is technical and cultural substitution, whereby local varieties and practices are replaced by standardized systems requiring external inputs and technologies. The second is market integration, which promotes homogenized production and consumption patterns, reducing dietary diversity and increasing dependence on external markets (Blundo-Canto *et al*., 2020, Palanivel, Shah, 2021, Pandey *et al*., 2022, Diop *et al*., 2018).

Climate change further intensifies these pressures, reinforcing the urgency of protecting agrobiodiversity and associated knowledge systems (Padulosi *et al*., 2013, Palanivel, Shah, 2021, Singh *et al*., 2021, Korpelainen, 2023).

Overall, the evidence indicates that the relationship between agri-food models is predominantly characterized by asymmetry and dispute rather than complementarity. These dynamics result in multidimensional losses, including genetic erosion, dietary simplification, and the erosion of cultural and ecological knowledge, reinforcing the need to advance analytical and policy frameworks capable of addressing these structural tensions.

3.5 RESEARCH AGENDA: PATHWAYS AND PRIORITY ISSUES

The systematic literature mapping identified a heterogeneous *corpus* of 21 studies on agrobiodiversity, food cultures, and traditional agricultural systems, primarily focused on processes of erosion, resilience, and local strategies to sustain biocultural diversity.

The review indicates that these systems are embedded in broader agri-food dynamics shaped by agro-industrial expansion, generating persistent tensions over land, resources, knowledge, and market integration. Although frequently reported, these interactions are rarely treated as a central analytical object. When framed as "coexistence," the evidence points mainly to asymmetrical relations, conflict, and subordination, highlighting a gap in understanding the structural conditions that enable or constrain more balanced interactions.

In this sense, coexistence emerges less as an established field and more as an open analytical problem, inseparable from the socio-political, ecological, and material conditions shaping biocultural systems.

The proposed research agenda synthesizes recurring gaps in the literature into four interconnected analytical lenses. It prioritizes: (i) key knowledge gaps on interaction dynamics and transformation processes, (ii) documentation of socio-ecological and institutional change, (iii) multi-scalar learning across knowledge systems, and (iv) strengthening collective action through evidence-based approaches. Together, these directions aim to deepen understanding of agrobiodiversity and traditional systems while critically examining the conditions that shape their trajectories in contemporary food systems (Figure 1).

3.5.1 How to research?

The methodological pathways presented below are derived from approaches identified across the reviewed studies. Although not all articles explicitly address methodological implications, the literature converges on the need for differentiated research designs to investigate biocultural food systems. Rather than prescribing a single framework, this synthesis highlights common orientations.

Overall, the literature points to the need for multi-, inter-, and transdisciplinary, as well as pluri-epistemological and dialogical approaches. The main methodological pathways include: culture-sensitive Research and Development (R&D), attentive to gender and local food traditions (Padulosi *et al*., 2013), multi-stakeholder and participatory approaches, including multi-actor platforms (Padulosi *et al*., 2013), multiscale and multidimensional frameworks for analyzing food and nutritional security (Rodríguez-González *et al*., 2020), transdisciplinary and integrated landscape approaches that incorporate local ecological knowledge and oral histories (Lacerda *et*

al., 2020), longitudinal and systemic analyses of socio-ecological dynamics (Blundo-Canto *et al*., 2020), and ethnobotanical methods for documenting local agrobiodiversity (Geraci *et al*., 2018).

These orientations emphasize the need for research designs capable of capturing the complexity, diversity, and power relations that shape biocultural food systems.

3.5.2 What to research?

Based on the suggested methodological pathways, the analysis of the *corpus* enabled the identification and consolidation of research gaps and opportunities highlighted across the reviewed studies. These elements were synthesized into four priority themes, each articulated through a set of research questions (RQ) designed to guide a future research agenda.

While the research questions are grounded in gaps, limitations, and future research directions identified in the literature, they were not originally formulated as such by the authors. Instead, they result from an interpretative and analytical process conducted in this study, through which dispersed and implicit research needs were systematized, reformulated, and articulated into coherent research questions.

The grouping of these questions into four themes represents an additional level of synthesis, aimed at structuring a research agenda that strengthens the understanding of agrobiodiversity, food cultures, and traditional agricultural systems as interconnected domains. Rather than constituting isolated research directions, these themes should be understood as complementary analytical dimensions through which the main challenges and transformation pathways affecting biocultural food systems can be investigated.

3.5.3 Theme 1: Socio-institutional conditions of biocultural resilience

This theme examines the socio-institutional, cultural, and ecological conditions underpinning biocultural resilience in traditional and indigenous food systems, focusing on the roles of local actors, governance arrangements, and everyday practices in maintaining agrobiodiversity, as well as the structural factors that enable or constrain their continuity under environmental, socio-economic, and territorial pressures.

RQ 1.1: What role does biocultural diversity play in shaping the nutrition, resilience, and adaptive capacity of indigenous and traditional peoples in the face of global environmental change, and how are these dynamics sustained over time? (Argumedo *et al*., 2021)

RQ 1.2: Under what institutional and policy conditions can indigenous and traditional peoples be effectively recognized and supported as custodians of agrobiodiversity and food diversity? (Pandey *et al*., 2022)

RQ 1.3: What economic, ecological, and social conditions support the viability of traditional land-use systems (including home gardens), and what complementary measures are required to sustain them? (Pandey *et al*., 2022, Korpelainen, 2023)

RQ 1.4: What roles do women play in the use and conservation of neglected and underutilized species (NUS), and what forms of institutional support are needed to strengthen their contributions? (Padulosi *et al*., 2013)

RQ 1.5: How do home gardens contribute to the maintenance of traditional food practices and local seed systems, and how do they function within broader economies of agrobiodiversity? (Ivanova *et al*., 2021)

RQ 1.6: How does the erosion of local ecological knowledge affect the continuity and resilience of traditional food systems? (Aziz *et al*., 2022)

3.5.4 Theme 2: Dynamics and integration of agrobiodiversity conservation systems

This theme focuses on the interactions between *in situ*/*on-farm* and *ex situ* conservation strategies, examining how different forms of knowledge, institutions and practices contribute to the maintenance, transformation, and enhancement of agrobiodiversity. It emphasizes the need to understand conservation as a dynamic, multi-scalar process embedded in broader socio-ecological systems and territorial configurations.

RQ 2.1: How can agrobiodiversity conservation be framed within broader perspectives of food sovereignty, health, and sustainability? (Bisht *et al*., 2018)

RQ 2.2: How do integrated landscape approaches influence access to land, agrobiodiversity, and food, and what are their implications for sustainable and inclusive food systems? (Blundo-Canto *et al*., 2020)

RQ 2.3: How can local *in situ*/*on-farm* conservation dynamics (including farmer networks and seed exchange systems) be strengthened through participatory monitoring to enhance resilience to climate change? (Padulosi *et al*., 2013)

RQ 2.4: In what ways can the monitoring and documentation of agrobiodiversity support stronger integration between gene banks, *on-farm* conservation, and formal breeding programs? (Korpelainen, 2023)

RQ 2.5: What is the role of introducing new resistant genotypes in sustaining and expanding genetic diversity within community seed systems? (Palanivel & Shah, 2021)

RQ 2.6: How can locally adapted agroforestry and silvopastoral systems contribute to landscape diversification, biodiversity conservation and ecosystem service provision? (Lacerda *et al*., 2020)

RQ 2.7: What is the role of wild and underutilized species in local diets and food systems, and how can they contribute to nutritional diversity and resilience? (Ekesa *et al*., 2022)

3.5.5 Theme 3: Production, circulation, and valuation of knowledge on agrobiodiversity

This theme addresses the processes through which knowledge about agrobiodiversity is produced, transmitted, transformed, and valued across different actors, scales and systems of knowledge. It highlights the importance of understanding how scientific, local and traditional knowledge interact, and how the visibility, recognition, and communication of biocultural values influence food systems, practices, and policies.

RQ 3.1: What is the social, cultural, and nutritional value of wild and local species in food systems, and how can this value be better recognized and communicated? (Ekesa *et al*., 2022)

RQ 3.2: What are the most effective strategies to promote local species and varieties, considering their social, economic, and agronomic roles? (Diop *et al*., 2018)

RQ 3.3: How can knowledge about the nutritional and medicinal properties of local varieties be expanded and disseminated among producers and consumers? (Giuliani *et al*., 2011)

RQ 3.4: How can the value, functions and status of biocultural diversity in food systems be better understood, monitored, and communicated? (Argumedo *et al*., 2021)

RQ 3.5: How can knowledge of the genetic characteristics of local materials support conservation, breeding, and sustainable use strategies? (Korpelainen, 2023)

3.5.6 Theme 4: Local capacities, agency and collective action dynamics

This theme explores the capacities of local actors to act, adapt and organize collectively in the context of changing socio-ecological conditions. It focuses on processes of learning, knowledge exchange, institutional support and network formation that shape the ability of communities to sustain and transform their food systems.

RQ 4.1: What is the priority capacity-building needs for farmers in traditional systems, particularly in relation to production, organization and resource management? (Giuliani *et al*., 2011)

RQ 4.2: How can local capacities be strengthened through exchanges of experiences related to resilience, climate adaptation, equity, and livelihoods? (Argumedo *et al*., 2021)

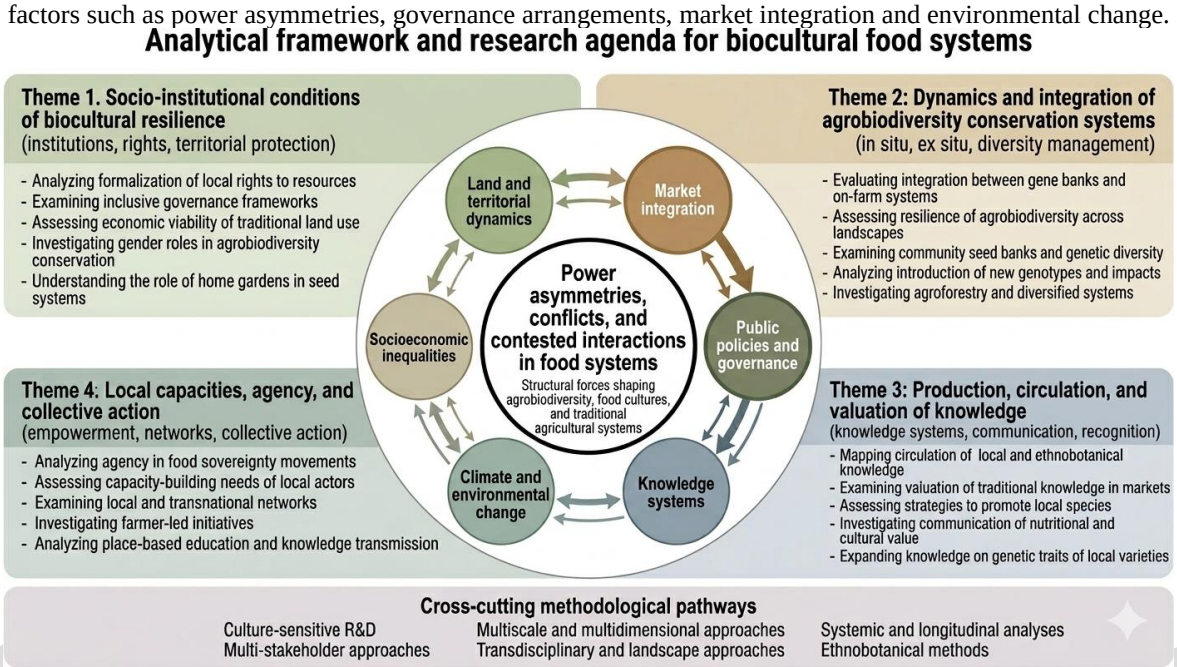
RQ 4.3: What strategies are most effective in reversing the erosion of local ecological knowledge and strengthening intergenerational knowledge transmission? (Aziz *et al*., 2022)

RQ 4.4: How can local, national, and transnational networks be strengthened to support collective action around biocultural food diversity? (Argumedo *et al*., 2021)

RQ 4.5: What forms of institutional and policy support are needed to strengthen farmer-led initiatives in terms of income generation, production, and regulatory constraints? (Lacerda *et al*., 2020)

RQ 4.6: How can place-based education contribute to valuing and transmitting biocultural heritage in food systems? (Aziz *et al*., 2022)

Figure 1. Analytical framework and research agenda for biocultural food systems.
The figure synthesizes the main findings of the systematic literature mapping and organizes them into a research agenda structured around four interrelated themes: (1) socio-institutional conditions of biocultural resilience, (2) dynamics and integration of agrobiodiversity conservation systems, (3) production, circulation, and valuation of knowledge, and (4) local capacities, agency, and collective action. These themes are articulated around a central analytical focus on interactions, tensions, and transformation pathways in food systems, shaped by structural factors such as power asymmetries, governance arrangements, market integration and environmental change.



Source: Authors (2026) - image generated with AI assistance, based on prompts and structural logic provided by the authors.

Figure 1 presents the research agenda as an integrated framework organized around a central analytical problem: the interactions, tensions and transformation pathways shaping biocultural food systems. The four themes are conceived as interconnected analytical lenses, rather than isolated domains, offering complementary entry points to examine the structural conditions, constraints and possibilities for sustaining agrobiodiversity, food cultures and traditional agricultural systems. This articulation also shows the transition from empirical gaps in the literature to a more integrated, problem-oriented research framework.

4 CONCLUSION - FROM CRITIQUE TO A PROPOSAL FOR TRANSFORMATION

The systematic mapping of the 21 selected studies confirms the central role of biocultural diversity as an irreplaceable pillar for food and nutritional sovereignty, highlighting the urgency of valuing traditional knowledge, practices and actors for its maintenance. At the same time, the analysis reveals a limited and fragmented body of literature, predominantly focused on processes

of erosion, resilience and localized responses, with comparatively less attention given to the broader structural dynamics shaping these systems.

Rather than supporting the assumption of harmonious coexistence, the evidence gathered in this study indicates that interactions between agri-food models are predominantly marked by asymmetrical power relations, territorial disputes and processes of subordination. Market-oriented agricultural policies and development pathways contribute to the homogenization of production systems, diets and landscapes, driving interconnected impacts such as land and resource concentration, intensification of socio-environmental conflicts and the erosion of agrobiodiversity and associated knowledge systems.

These dynamics result in multiple and interrelated forms of loss: increased agrarian and environmental conflicts, the marginalization of vulnerable groups, particularly women and youth, and the progressive disappearance of biocultural heritage, with direct implications for food sovereignty and system resilience. In this sense, what is often framed as coexistence emerges, in practice, as a condition structured by inequality and constraint, rather than balance or complementarity.

The main contribution of this article lies in moving beyond a purely descriptive perspective by providing an interpretative synthesis of dispersed and often implicit research gaps identified across the literature. By systematizing these gaps into research questions and organizing them into a coherent analytical framework (Figure 1), this study advances a structured research agenda grounded in the intersections between agrobiodiversity, food cultures and traditional agricultural systems.

Within this framework, the four proposed themes should be understood not as independent research domains, but as interconnected analytical lenses through which the central dynamics of interaction, tension and transformation in food systems can be examined. This articulation reinforces a shift from the analysis of isolated systems toward a relational and systemic understanding of biocultural food systems and their trajectories. Empirically, this approach can be operationalized through territorial case studies combining multi-method data collection and relational analysis across production, biodiversity, cultural practices, and consumption dynamics.

From this perspective, the question of coexistence is not treated as a predefined or normative objective, but as an open and unresolved analytical problem emerging from the

structural conditions identified in the literature. This also points to a key research question: under what conditions - material, political, social, cultural and ecological - could more balanced or non-subordinated forms of interaction between agri-food systems emerge?

The research agenda proposed in this study therefore points to three priority directions: (i) investigating the conditions that confer autonomy and resilience to traditional systems under structural pressure, (ii) analyzing the modalities and consequences of interactions between different agri-food models across diverse contexts, and (iii) examining how consumption patterns and access dynamics, shaped by broader socio-economic structures, influence the maintenance, erosion, or revitalization of agrobiodiversity and food cultures.

The findings also suggest relevant implications for public policies, particularly regarding food procurement strategies, the integration of nutritional dimensions of agrobiodiversity, and the protection of territories and local actors, as highlighted across the reviewed studies.

Ultimately, the contribution of this mapping is not only to document processes of loss or resilience, but to provide analytical foundations for understanding the structural dynamics that shape food systems. In doing so, it contributes to repositioning biocultural diversity not merely as an object of preservation, but as a central dimension for analyzing and informing the transformation of contemporary food systems.

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