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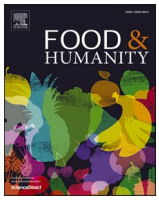

The role of agrobiodiversity and diverse causes of its losses and methods of conservation: A review

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ABSTRACT

Agrobiodiversity implies the diversity of living forms in agricultural systems and is critical for food security, ecosystem health, and resilience to climate change. It includes a wide range of crops, livestock, and microorganisms that help to increase nutritional diversity while also improving ecosystem functions like pollination and soil fertility. However, agrobiodiversity is under threat from industrial agriculture, urbanization, climate change, pesticide use, globalization, and the loss of traditional knowledge. Therefore, this review article emphasizes the importance of agrobiodiversity in sustainable agriculture and the urgent need for integrated measures to combat its loss. To achieve this objective, different reputable journal articles that were published in the past 11 years and scope were collected, screened, and compiled systematically. Most of the reviewed articles stated that agrobiodiversity contains all the components of biological diversity that are relevant to agricultural ecosystems. It has an essential role in the sustainable development of agricultural systems, which provide food, fiber, fuel, fodder, medicines, and other products for subsistence. Monoculture techniques and land conversion reduce genetic variety, while market dynamics favor a small number of high-yield varieties, further marginalizing local crops. By fostering sustainable practices, maintaining genetic diversity, and supporting traditional agricultural knowledge, we can assure the future of agrobiodiversity and ensure resilient food systems.

1. Introduction

Agrobiodiversity incorporates the variety of species and genetic resources in agricultural systems. It plays an essential role in ensuring global food security, enhancing ecosystem resilience, and supporting sustainable agricultural practices. It includes a wide variety of crops, livestock, and microorganisms that provide diverse food sources, contribute to nutritional balance, and sustain cultural heritage. The benefits of agrobiodiversity extend beyond food production; it also underpins vital ecosystem services such as pollination, pest control, and soil health, which are essential for maintaining productive agricultural landscapes (Corrado et al., 2019; Maskell et al., 2023; Xie and Wang, 2024). Genetic diversity within crops and livestock breeds is critical for adapting to changing climatic conditions. Traditional varieties often possess traits that confer resilience to drought, pests, and diseases. As climate change intensifies, preserving agrobiodiversity can help safeguard agricultural productivity.

Despite its importance, agrobiodiversity is gradually threatened by various anthropogenic and environmental factors. The change toward industrialized agriculture, characterized by monocultures and the dominance of a few high-yield varieties, has led to major genetic erosion and reduced resilience against pests and diseases (Khatri et al., 2024). Urbanization and land use changes intensify this loss by changing agricultural lands into urban areas, disturbing local ecosystems and traditional farming practices (Dadashpoor et al., 2019). Climate change poses a growing challenge, altering weather patterns and impacting the feasibility of crops and livestock. The extensive use of chemical pesticides and herbicides also contributes to the decline of agrobiodiversity by damaging beneficial microorganisms and reducing ecosystem diversity (Babafemi et al., 2022). Globalization and market pressure are also undermining the cultivation of traditional varieties that have adapted to local conditions (Nugroho et al., 2021). The absence of traditional agricultural knowledge further compounds these issues as communities shift away from practices that have sustained agrobiodiversity for generations (Nemogá, 2019).

The main issue in tropical land management is meeting the increasing demand for agricultural goods, conserving biodiversity, providing ecosystem services, and sustaining rural communities. This

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issue is particularly serious in an area of high biodiversity hotspot, where traditional farming systems are declining, ecological degradation is occurring, and human populations are growing quickly (Harvey et al., 2020). Agricultural intensification reduces biodiversity predominantly to a few genetically homogenous species. Many abundant species have become scarce as a result of increased agricultural intensification and the subsequent loss of natural landscape components. The loss of agrobiodiversity in farming landscapes has been particularly prominent in many countries, highlighting the agriculture policy's considerable environmental impact. Agricultural intensification is currently considered the most prominent cause of agrobiodiversity losses (Kehoe et al., 2017; Zabel et al., 2019).

At the landscape level, the management of biophysical variability becomes important to understanding the relationships between genetic resources, abiotic and biotic settings, and management approaches (Sanchez et al., 2023). The biophysical diversity and livestock grown are susceptible to different levels of control. Understanding the critical role of agrobiodiversity and the multifaceted causes of its loss is essential for developing effective strategies to promote sustainability in agriculture (Ruiz-González and Vicente, 2023). Thus, the aim of this review is to explore the significance of agrobiodiversity, the drivers behind its decline, and potential pathways for conservation and sustainable management.

2. Methodology

2.1. Literature search and selection criteria

This review activity entails investigating, reading, screening, analyzing, and summarizing scholarly material, primarily journal articles and books related to the topic. To accomplish this review objective, a comprehensive literature search from March to August 2024 using key terms such as agrobiodiversity role, management of agricultural biodiversity, causes of biodiversity loss, agricultural sustainability, agrobiodiversity and ecosystem services, the method of solving the loss of biodiversity etc. related published journal articles and books were used. Accordingly, journal articles and books were used to examine the role of agrobiodiversity, causes of its losses, and sustainable management of agrobiodiversity in landscape ecology. Removing the duplicate papers was done in the selection process. Google Scholar and Scopus citation databases were other criteria that were utilized to narrow down the pool of publications (Fig. 1). Additionally, I established the inclusion criteria (studies focusing on agrobiodiversity in agriculture, research addressing the causes of agrobiodiversity loss and peer-reviewed articles, grey literature, and relevant reports from the last 11 years) and exclusion criteria (studies not focused on agricultural contexts and reviews that were published before 2013) to get reputable journal articles for this review. Lastly, 63 journal articles from different countries were selected and reviewed (Appendix 1) from the total of 1231 initially recorded publications from both databases, which is acceptable according to Abdeta (2022) and Getachew and Mulatu (2024). {{{Table 1}}}

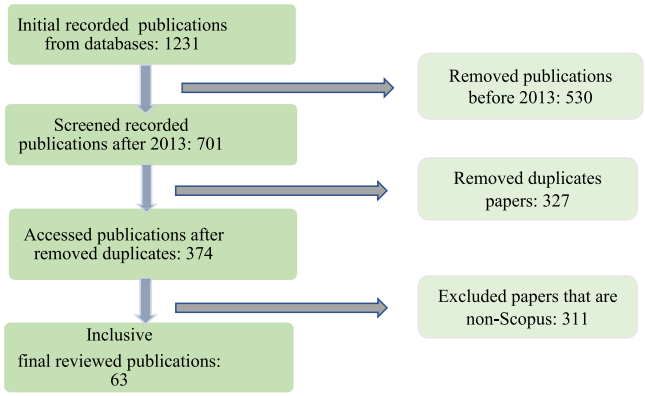

Fig. 1. A flow of review diagram and screening method of literature.

3. Result and discussion

3.1. The concept and role of agrobiodiversity

Agrobiodiversity describes the variety of living forms in agricultural systems and is vital for supporting food security, ecosystem health, and resilience to climate change (Jackson et al., 2013; Maskell et al., 2023; Nemogá, 2019; Xie and Wang, 2024). In some cases, it is extended to cover all creatures found in agricultural landscapes. **Biodiversity** explains the diversity of life forms on Earth that contain plants, animals, microorganisms, genes, and the ecosystems they make. It relates to genetic variance, environmental variation, and biological diversity within a biome (Gaston and Spicer, 2013; Rawat and Agarwal, 2015). Both terms are related to each other; however, biodiversity is vaster than agrobiodiversity.

The variability within and between agroecosystems is tremendous. The spatial structure of agrobiodiversity change can be seen on a daily, monthly, and long-term basis, from the broad landscape level to individual farmed plots. Uncertainty, regional variability, multifarious nonstability, and nonlinear biological flexibility emphasize the significance of dynamic reactions and adaptive natural resource management, with domestic agricultural biodiversity users having critical roles in analysis, planning, and negotiating. This necessitates a considerably higher appreciation for domestic agricultural activities and knowledge employed by pastoral communities to maintain agrobiodiversity in different ecologies such as forests, wetlands, croplands, rangelands, coastal land, and freshwater systems (Corrado et al., 2019).

Farmers, pastoralists, forest dwellers, fishermen, and gardeners, as well as their descriptions of health, priorities, rights, capabilities, and knowledge, influence the functioning of the agroecosystem. Social objectives such as economic, cultural, aesthetic qualities, and biological output, depending on the conditions, refer to the immediate returns of the specific productivity of a restricted crop or diverse production (DeClerck, 2015; Nugroho et al., 2021). These have an impact on sustaining agrobiodiversity, from the range of a severed production part to the larger landscape, which is regularly changing due to the interface between human intervention and ecological processes. Natural events and human activities have led to the perpetuation of a wide range of species, both genetic and ecological. Agrobiodiversity serves socioeconomic and environmental functions, as detailed below. {{{Fig. 2}}}

3.2. Agricultural biodiversity for livelihood and food security

The livelihood systems in rural areas are diverse based on the various cultural groups (Van Ginkel et al., 2013). They typically rely on a combination of wild fruit, agricultural output, trade, and wage work. The observed data from a variety of perspectives reveals farmers in rural

Table 1
Searching terms and number of registered publications.

	Searching term	Number of articles	
		Scopus	Google scholar
1	Agrobiodiversity role	133	187
2	Management of agricultural biodiversity	112	156
3	Causes of biodiversity loss	103	132
4	Agricultural sustainability	56	121
5	Agrobiodiversity and ecosystem services	42	74
6	Method of solving the loss of biodiversity	23	65
7	Agricultural biodiversity and income diversification	11	16
	Total	480	751

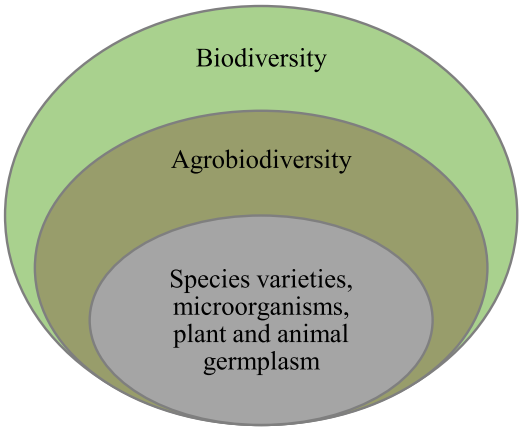

Fig. 2. The relation between biodiversity and agrobiodiversity.

areas are involved in diverse activities to increase income collection. Contrary to popular belief, agriculture's importance for livelihood, which is fairly modest nowadays, is rapidly altering pastoral communities. While in most of Northern Africa, the non-farm income dependency ranges from 30 % to 50 %, it can reach 80–90 % in Southern Africa (Davis et al., 2017). Farmers' assessments always adjust to their natural surroundings, native budgets, and government institutions. At the advanced stages, it is just difficult to imagine the interactions among agriculture and rural farmers, mainly in the scarce resource areas with considerable biological and social diversity (Van Ginkel et al., 2013).

Several types of farming are employed by farmer around the world to sustain livelihood strategies (Mijatović et al., 2013). A range of factors, including money, capability, age, and authority, were considered when employing agricultural activities in pastoral civilization. For instance, natural resources are critical to the diet and living safety of poor communities, particularly during times of anxiety like drought, land fluctuation, and environmental change (Mondal and Palit, 2022). These clusters typically have less access to land, labor, and capital, necessitating a greater reliance on existing natural diversity. Poor individuals in most developing countries receive around 20 percent of their entire income from communal resources, while the richer families receive only 1 percent (Ravallion, 2015).

Several rural groups regard specific biologically diverse sections of terrestrial and aquatic areas as sacred. Sanctified groves are areas of plantation that are protected for spiritual purposes in different parts of the world (Arjjumend et al., 2018). Sacred sites in landscapes are frequently linked to agrobiodiversity roles that may improve and sustain ecosystem health because they are rich in biodiversity. There is also notable variation within species of plants and animals that have been domesticated for agricultural and animal production by resourceful pastoral societies. Farmers' crop varieties, or landraces, are highly diverse for cross-fertilized species like millet and maize (Shuro, 2017). Individual varieties of self-pollinated crops like rice and barley, as well as vegetatively propagated crops, are less diverse. A diversified investigation of livelihoods is required for each economic and ecological situation to grasp what a certain livestock contribution is worth, to whom, when, and in what way. In general, animal diversity produces a variety of products and services, including food, clothing, cutlery, transportation, fertilizers, income, insurance, and so on.

3.3. The role of agrobiodiversity to production, combating climate change, and environmental sustainability

Agrobiodiversity connects every species in network of energy and material movements (Yousefi et al., 2020). Every ecosystem may have different environmental niches such as producers, consumers and decomposers. The constituents of agriculture and biodiversity in general have many functions, which include contributing to the flexibility of manufacturing techniques while also offering conservation benefits in different ways. There is evidence that all ecosystems have various functions and a wide range of species, all of which can be linked to a few key structural mechanisms (Oliver et al., 2015).

Agricultural biodiversity is employed in the food chain, production and protected by indigenous peoples, and makes an important contribution to feeding the globe. Despite the large population growth during the last 150 years, agrobiodiversity alteration has brought massive nutrition and health welfare benefits, particularly through agricultural production. A healthy human diet is best attained through agrobiodiversity approaches that provide a diverse food supply while remaining ecologically sustainable. Agrobiodiversity food-based approach is a key solution to increase agricultural production, cultivate more resistant crops to disease and stress, nutritionally enrich crops, and protect other nutritional agriculture relationships (Ayyam et al., 2019).

The high effort of farming is based on crop yield as well as agricultural varieties, which contributes to the conservation of numerous purposes such as organic matter, fertilization, and insect resistance (Kumar et al., 2022). In the United States and Australia, farmers mostly manage vegetation cover to preserve terrestrial and aquatic landscape features. Forests may provide feed for livestock and support a high level of interior biodiversity. The following examples highlight and serve as a reminder of the various purposes of agricultural biodiversity.

- Soil decay and nutrient cycling functions.
- Both soil and water preservation functions
- Pest resistance functions
- Plant pollination and seed dispersion functions
- Natural diversity preservation functions
- Climate regulating functions
- Functions in the water cycle

Agrobiodiversity is essential to enhancing ecosystem resilience to the negative effects of climate change, such as changing weather patterns, a greater incidence of extreme events, and the emergence of pests and diseases (Agnoletti and Santoro, 2022; Ravera et al., 2019). It boosts resilience by providing a variety of genetic features that can be used to produce crops and livestock that are more adaptable to changing climates. For instance, certain crop varieties may be more drought-resistant, helping farmers maintain yields even in adverse conditions. Furthermore, diversified cropping systems might lower the probability of total crop failure since various species react differently to environmental stressors. This resilience benefits local communities that rely on stable food supplies, as it helps to ensure that food systems can adapt to changing conditions.

Another important aspect of agrobiodiversity is that it significantly contributes to soil health and carbon sequestration. Diverse cropping systems frequently improve soil structure and fertility through mutually beneficial interactions between plant species. Certain legume plants can fix atmospheric nitrogen, thereby enriching the soil for subsequent crops. Intercropping, or cultivating two or more crops together, can improve soil health, minimize insect pressures, increase output, and nurture a more balanced ecosystem (Wang et al., 2024). This not only decreases reliance on synthetic fertilizers but also promotes a healthier environment capable of absorbing more carbon dioxide from the atmosphere. Consequently, sustainable agriculture techniques that are practiced in agrobiodiversity can reduce greenhouse gas emissions as well as increase productivity.

Furthermore, agrobiodiversity helps to stabilize agroecosystems by serving as a buffer against biotic stresses triggered by pests and diseases (Wang, 2020). A wide variety of plant species can interrupt pest life cycles and minimize outbreaks via natural predation and competition mechanisms. Farmers can construct resilient farming systems that can survive climatic shocks by supporting polyculture rather than

monoculture approaches. Thus, embracing agrobiodiversity is critical for ecological sustainability and increasing adaptive capacity in a period of climatic variability. Agrobiodiversity contributes to adaptation and mitigation efforts by facilitating the adoption of climate-resilient agricultural practices (Vernooy, 2022). These approaches encourage agrobiodiversity, which can result in optimized carbon storage in soils and vegetation. Agroforestry systems, which incorporate trees into agricultural landscapes, can improve carbon storage. Similarly, traditional farming practices that combine local varieties and landraces can be critical for adjusting to local climate conditions because these varieties are frequently better adapted to the specific environmental problems that farmers confront. Farmers who embrace these traditional ways can establish further sustainable agricultural systems are naturally more adaptable to climate change.

3.4. Agricultural biodiversity for rural development

Agricultural biodiversity can lead to rural development opportunities through ecotourism activities that generate income for the local communities by creating jobs for them. Various historical areas in the world, particularly in Europe, South America, Australia, and Asia, are gaining popularity for their visual and historic reasons (Moreno et al., 2016). For instance, the steep slopes in Asia have been transformed into productive lands that help with the production of different crops. Many lands occur as both archaeological places and living areas that are managed and provide benefits for communities. The majority of stakeholders recognize that they need to manage these cultural landscapes. The inputs of agro-ecosystems are valued by urban residents who are willing to pay for the pleasure of a rural vacation in Europe. Globally, the genetic importance of traditional areas and knowledge gained from system interactions with humans have resulted in a plan for identifying, evaluating, and conserving specific regional landscapes related to the World Heritage Convention (Cave and Negussie, 2017; Rössler and Lin, 2018).

Furthermore, local communities receive a small share of the income created by the sale of products containing their knowledge and resources (Herman, 2023). For example, fewer local individuals are getting income from medicine plant species that possess a wealth of unique knowledge. Several codes of conduct and recommendations have been produced to assure more justice, recompense, and fair profit sharing between bioprospecting businesses and local communities (Chennells, 2015). Such types of native rural improvement contribute to the sustainability of independently organized pastoral economic enterprises based on indigenous modified agrobiodiversity awareness and knowledge, as well as established partnerships between local populations and government organizations. In developing and wealthy countries, efforts to recover the diversity of pastoral improvement frequently rely on redeveloping livelihood systems and local economies depending on health and prosperity.

4. Diverse causes of agrobiodiversity losses

The rate of agrobiodiversity loss varies depending on the biological and economic contexts. The loss of genetic, species, and agro-ecological diversity is putting local livelihoods and environmental processes at risk. The primary reasons for agrobiodiversity loss include land use change, habitat conversion to other land uses, pollution, unsustainable natural resource use, climate change, and the introduction of invasive species (Singh et al., 2021). It is important to consider the cause that has overlooked and damaged the beliefs and purposes of agrobiodiversity in order to conserve our natural resources. {{{Fig. 3}}}

4.1. Ignoring of native management system

Locally native approaches to understanding, respecting, and organizing the biosphere are sometimes overshadowed by globalization. Indigenous knowledge is being lost as a result of modernization and ongoing transformation processes (Gadgil et al., 2021). Furthermore, the developments of modernizing initiatives and disregard for indigenous knowledge have surpassed the continued existence of formal and informal organizations that raise important concerns about the sustainable management of agrobiodiversity. The introduction of current commercial agriculture technology from the West removes traditional practices as well as indigenous knowledge. These types of technologies have an impact on the agrobiodiversity of natural landscapes.

Local organizations and indigenous institutions have played a vital role in promoting a joint achievement and coordinating the management of agriculture and biodiversity across several spatial ranges. Native experience in natural resource management is admirable for active management and sustainable uses. Rural people provide valuable information for managing and enhancing agrobiodiversity. Those good practices and actions are actual and fruitful in environmental, economical, and social approaches, as well as methodologically promising, fundamentally participative, reproducible, and adaptable, and have been demonstrated to function well and provide positive consequences for biodiversity management (Joshi et al., 2020). These structures evolved to meet local demands, and precise knowledge enabled humans to adapt to social and environmental change.

4.2. Unequal tenure and lack of resource management

Absence of management and lack of rights to exploit natural resources are major causes of the loss of agrobiodiversity because they decrease the incentive to maintain biodiversity and jeopardize the security of native livelihoods. Secure land tenure promotes food security, economic growth, and natural resource management while mitigating the effects of conflict and climate change (Hunsberger et al., 2017). Western notions of private property fail to appreciate indigenous rural peoples' intellectual contributions and informal innovations in modifying, conserving, and managing wild animals and environments. Most

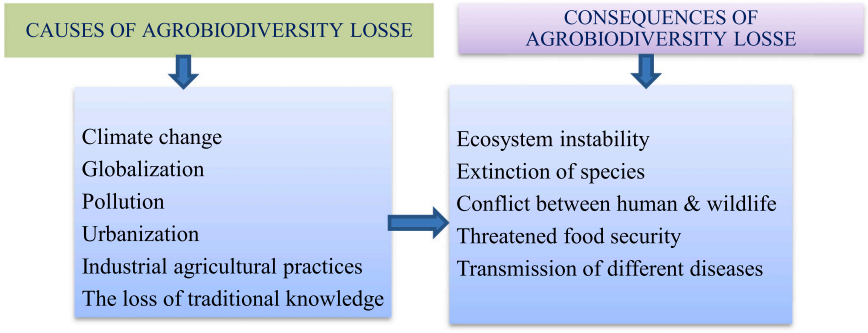

Fig. 3. The main cause and consequences of agrobiodiversity loss (Dadashpoor et al., 2019; Khatri et al., 2024; Nemogá, 2019; Nugroho et al., 2021; Singh et al., 2021).

inherited resources are from underdeveloped nations, and a few are from northern parts that need the majority of assistance from employing them in breeding projects and the production of new natural resources.

Furthermore, the goal of most countries is not to hinder the introduction of an international access and profit allocation system under the Biological Diversity Convention, but to limit the application of "common" management principles to a high number of critical food crops (Mani et al., 2021). Lawful industrial rights and other rational personal rights enable firms and northern organizations to retain unbalanced management of agricultural biodiversity, genetic resources, and advantages. Local societies and rural farmers who first cultivated genetic diversity have rarely been acknowledged and rewarded for their inventions. Inadequate distributions of land and resources, insecure rights, and disregarding and restricting livelihood systems have continuous impacts on food security and environmental integrity that result in increased conflict and instability.

4.3. Market pressures and under-valuation

Agricultural biodiversity has many values, which allows it to serve a variety of roles. However, it is underestimated and overlooked in conservative economic valuations due to the difficulty of valuing many functions in economic relations. These have skewed conservative natural resource management development in favor of key food crop species with marketable relevance in urban areas. Global market development and trade liberalization have a suppressing effect on agrobiodiversity by standardizing the production and consumption of food crops (Borsellino et al., 2020). It frequently requires uniform foods, which are increasingly manufactured and distributed by large-scale firms and tailored to the food preferences of moderately wealthy urban customers. This commercial force frequently pushes farmers to fulfill the demand with regularity.

Moreover, the costs of agrobiodiversity loss, such as pest buildup, the elimination of beneficial insects, and the loss of ecosystem services, are difficult to assess. They are consistently overlooked in analyses of yields, productivity, and market value. However, the off-farm merits and public advantages of agricultural biodiversity are rarely reflected in economic analyses. Not only governments, but also markets, fail to recognize the societal benefits of agrobiodiversity on a large scale. These considerations and the extensive reliance on economic implementation and decision-making have little incentive to deliberate agrobiodiversity gains and losses (Kuchibhotla and Chakrabortty, 2022). Some research implies that biodiversity principles can be included in climate change estimations based on non-use assessments of agrobiodiversity threats (Nobel et al., 2020). To avoid anthropogenic negative impacts on agrobiodiversity, non-use conservation rules generated from specified preference studies that account for a wide range of agrobiodiversity threats are critical.

5. Management of agrobiodiversity and it functions

5.1. Strengthening the management of agrobiodiversity

Agrobiodiversity is composed of a variety of plants, animals, and microorganisms that are found on Earth and employed for fuel, construction materials, food, fodder, and other different products and services. Different methods of employing natural resources for production and diversity that affect human connections at all levels are the consequence of the interaction of the environment, genetic resources, management systems, and local societies (Kantanen et al., 2015). It is the result of traditional knowledge and advancements made by farmers, herders, and fishermen. Agrobiodiversity also includes non-harvested natural resources, including soil microorganisms, predators, and pollinators, in the wider environment that provides agricultural systems (Duruigbo et al., 2013).

Improving agricultural biodiversity management requires close coordination among farmers, officials, conservation experts, and policymakers (Maas et al., 2021). Administrative activities, land use planning, and agricultural research and development operations carried out at the level of actual resource users or beneficiaries are compatible with efficiency and accountability. Agrobiodiversity management involves strengthening native societies and organizations by decentralizing resources and reducing managerial barriers to native planning and development.

Human activity has been causing the loss of plants and animals for many years; nevertheless, we have only lately started to comprehend the effects of this loss on the composition and functionality of ecological systems at the biome scale (Murray et al., 2020). The importance of restoring and conserving the entire ecosystem was recognized by relevant biodiversity conservation factors, but their priorities and interventions are still centered on scales too small to address the functions of the biome as a whole. There is a persistent debate over the necessity of a new worldwide endeavor to tackle the historical and present-day depletion of plants, animals, and their functional units. To hold back the loss of agrobiodiversity around the globe, using the two biodiversity conservation strategies (in-situ and ex-situ) is the main solution. {{{Fig. 4}}}

5.2. Increase the participation of community in agrobiodiversity management

The concept of agrobiodiversity can be based on a cooperative conversation about the private health of society and how indigenous livelihoods are constructed. The foremost experts must be inclined to base their private classifications and significance on local and ecosystem management. Predominantly, their perspectives on the poor's realities and what might be done have typically been formed from a distance. Adaptive management is an interdisciplinary and collaborative approach to ecosystem governance that tests and revises institutional arrangements and ecological knowledge through a dynamic, ongoing, and self-organized process of learning from experience (Mas-Tur et al., 2021). The livelihood policies frequently include different members in a variety of activities and sources of assistance throughout the year.

Agricultural biodiversity improvement for land use development must begin with empowering local communities particularly poor farmers, to perform their analyses and significances. These technical attitudes are critical to achieving the objectives of parity, productivity, accountability, and sustainability. The learning process approach suggests that managing agricultural biodiversity is a sustainable way of managing biodiversity resources. This approach also advocates for a unique effectiveness that incorporates new ideas, principles, participative procedures, and conduct (Hughes and Hughes, 2013). Farmers, herders, fishermen, and forest dwellers participate in the creation of land use and agricultural procedures, as well as the generation of technology. Encourage the use of social and gender-specific local indicators for monitoring and evaluation. These indicators will help direct future policy alterations, technical support, and the distribution of scarce resources for agricultural biodiversity management. {{{Fig. 5}}}

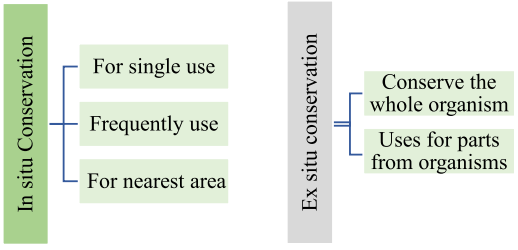

Fig. 4. In situ and Ex situ approaches of agrobiodiversity conservation (Engels and Ebert, 2021; Trajkova et al., 2021; Zegeye, 2017).

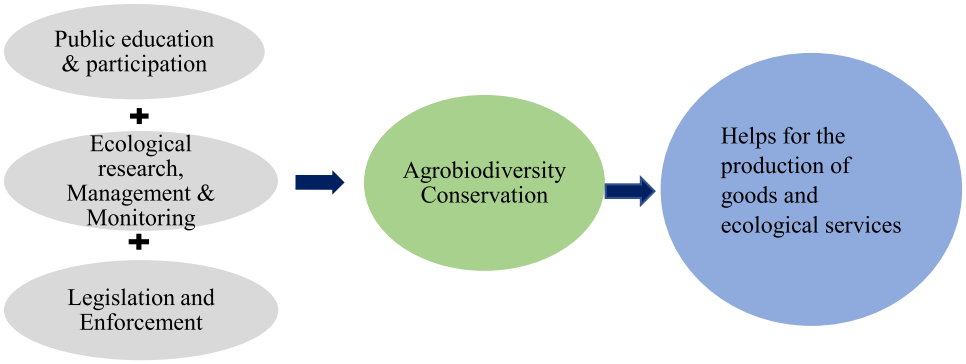

Fig. 5. The effective agrobiodiversity conservation and its consequences.

5.3. *Strengthen local rights and tenure property*

Landscapes are reinterpreted as the product of community and environmental histories, which highlights the acceptability of local communities to tenure property and local rights for agrobiodiversity management. These outcomes support a rights-based approach to participatory management, which is critical for food security, agriculture, and livelihoods. Furthermore, they have important implications for national plans guiding the distribution of income derived from the use of landscapes, agrobiodiversity, and services. In this regard, ensuring farmers' rights to conserve and use seeds and livestock is critical (Tsioumani, 2014). Benefit-sharing agreements are predicated on the modification of laws and regulations governing the rights to use resources and the management of natural resources, including water, forests, and genetic resources, to protect the rights of producers and indigenous peoples (Sundaram, 2015).

There is a close relationship between conservation of landscapes, local rights, and tenure property (Chiaravalloti et al., 2017). The user group is motivated to take part in preserving and restoring the productivity and ecological services of their lands on the secured tenure property. However, biodiversity declines due to uncertain tenure and resource neglect. The majority of developing countries lack appropriate land registration, which would take many years to rectify. Therefore, as tenure property is essential to enhancing landscape restoration, alternative options are preferable. Tenure property should be considered when establishing programs and plans to assist ecosystem management and reduce land degradation (Reed et al., 2015). Achieving natural resource management is the primary goal of tenure governance, as it improves food security, a healthy ecosystem, and human wellbeing.

Decisions are not successful without the participation of the local community, which has the right to use and control natural resources (Palacios-Abrantes et al., 2022). A substantial number of land governance groups may have relatively secure property rights over their resources. In the context of national food security, responsible tenure has the right to argue for the decision-making and implementation of natural resource management at all levels. Traditional land governance institutions usually extend into rural communities and activate more successfully at the community level. The strengthening or development of local rights and tenure property rights on natural resources offered local populations better control over the resources on which their livelihoods were dependent (Sikor et al., 2017).

6. Conclusion and recommendation

In conclusion, agrobiodiversity is the variety of life forms in agricultural systems. It is a keystone of sustainable agriculture, vital for ensuring food security, enhancing ecosystem services, and fostering resilience in the face of climate change. It's also diverse genetic resources that provide essential tools for adjusting to environmental stresses, supporting nutritional diversity, and sustaining cultural heritage. However, the alarming decline of agrobiodiversity poses significant challenges that must be addressed immediately. All reviewed publications discussed that the primary drivers of agrobiodiversity loss, including industrial agricultural practices, urbanization, climate change, pesticide use, globalization, and the loss of traditional knowledge, interact in complex ways that worsen the issue. Also, I found that 60 % of the publications argued that the increase in monoculture led to a decrease in biodiversity, while 40 % of publications discussed that increasing monoculture has more benefits in terms of food security for a high number of populations in the world. Various scholars agreed that to mitigate these threats, it is imperative to implement integrated strategies that promote sustainable agricultural practices, conserve genetic diversity, strengthen local rights and tenure property, and revive traditional knowledge systems.

Future efforts should focus on creating policies that encourage the cultivation of diverse crops and livestock, invest in agroecological practices, and enhance community engagement in agrobiodiversity conservation. Collaboration between governments, NGOs, and local communities is critical to creating a comprehensive approach to maintaining biodiversity and agrobiodiversity for future generations. By prioritizing agrobiodiversity, we can ensure more resilient food systems capable of meeting the requirements of a growing global population while preserving the planet's ecological integrity. The path forward lies in recognizing the invaluable contributions of agrobiodiversity to both our food systems and the health of our ecosystems.

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Author contribution

The author has responsibility for the following activities: study beginning and proposal, collecting reputable articles, analysis and summarizing of literature, and review writing.

CRediT authorship contribution statement

Fekadu Hailu: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Conceptualization.

Declaration of Competing Interest

The author declare that there is no conflict of interests.

Appendix 1. Different titles, Countries and years of publications used in the review

No	Title	Country	Year
1	Willingness to pay for forest conservation in developing countries	Ethiopia	2022
2	Agricultural heritage systems and agrobiodiversity	Globally	2022
3	International Overview of Sacred Natural Sites and Indigenous and Community Conserved Areas (ICCAs) and the Need for Their Recognition	North America	2018
4	Alternative Farming Systems for Diversification and Conservation of Agro-biodiversity	Tropical Countries	2019
5	Advantages and potential threats of agrochemicals on biodiversity conservation	Nigeria	2022
6	Agri-food markets towards sustainable patterns	Italy	2020
7	World Heritage conservation	Globally	2017
8	Equitable access to human biological resources in developing countries	Globally	2015
9	Sustainability and Land tenure	Brazil	2017
10	Food waste accounting methodologies: Challenges, opportunities, and further advancements	Globally	2019
11	Land use change, urbanization, and change in landscape pattern in a metropolitan area	Iran	2019
12	Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa	Africa	2017
13	Biodiversity And ecosystem Services of Agriculture	Italy	2015
14	Integrated remediation strategies for sustaining agrobiodiversity degradation in Africa	Africa	2013
15	A critical review of the current global ex situ conservation system for plant agrobiodiversity	Globally	2021
16	Indigenous knowledge: From local to global:	India	2021
17	Biodiversity: an introduction	Globally	2013
18	Sciendo. Journal of Landscape Ecology	Globally	2024
19	The evolution of a tropical biodiversity hotspot	Tropical countries	2020
20	Green growth and innovation in the Global South	Globally	2023
21	Professionalism and professional institutions in times of change	United Kingdom	2013
22	Climate change mitigation, land grabbing and conflict	Myanmar& Cambodia	2017
23	Agrobiodiversity. *Encyclopedia of Biodiversity*	Globally	2013
24	Good practices for agrobiodiversity management	Nepal	2020
25	Utilization of farm animal genetic resources in a changing agro-ecological environment in the Nordic countries	North Europe	2015
26	Biodiversity at risk under future cropland expansion and intensification	Brazil	2017
27	Understanding the intertwined nature of rising multiple risks in modern agriculture and food system	India	2024
28	Moving beyond sub-Gaussianity in high-dimensional statistics: Applications in covariance estimation and linear regression	Globally	2022
29	Impact of Fertilizer Consumption on Soil Health and Environmental Quality in India	India	2022
30	Divergent farmer and scientist perceptions of agricultural biodiversity, ecosystem services and decision-making	Germen &Australia	2021
31	Land degradation in South Africa: Justice and climate change in tension	South Africa	2021
32	Successful entrepreneurial learning: success factors of adaptive governance of the commons	Spain	2021
33	Functional agro-biodiversity: an evaluation of current approaches and outcomes	Europe	2023
34	The role of agricultural biodiversity in strengthening resilience to climate change: towards an analytical framework	Globally	2013
35	Challenges in natural resource management for ecological sustainability	India	2022
36	Exploring the causes of high biodiversity of Iberian dehesas: the importance of wood pastures and marginal habitats	Spain	2016
37	Myanmar's terrestrial ecosystems: Status, threats and conservation opportunities	Myanmar	2020
38	Indigenous agrobiodiversity. Agrobiodiversity: integrating knowledge for a sustainable future	Globally	2019
39	Are biodiversity losses valued differently when they are caused by human activities? A meta-analysis of the non-use valuation literature	Globally	2020
40	The impacts of economic globalization on agricultural value added in developing countries	Developing Countries	2021
41	Biodiversity and resilience of ecosystem functions	Globally	2015
42	Managing biodiversity in the Anthropocene: discussing the Nature Futures Framework as a tool for adaptive decision-making for nature under climate change	South Africa	2022
43	The idea of antipoverty policy	Globally	2015
44	Gendered agrobiodiversity management and adaptation to climate change: differentiated strategies in two marginal rural areas of India	India	2019
45	Biodiversity: Concept, threats and conservation	India	2015
46	Reorienting land degradation towards sustainable land management: Linking sustainable livelihoods with ecosystem services in rangeland systems	Botswana	2015
47	Cultural landscape in world heritage conservation and cultural landscape conservation challenges in Asia	Asia	2018
48	Agrobiodiversity: Conservation, Threats, Challenges, and Strategies for the 21st Century	Globally	2023
49	Improving the use of plant genetic resources to sustain breeding programs' efficiency	Globally	2023
50	Review paper on approaches in developing inbred lines in cross-pollinated crops	Globally	2017
51	Property rights regimes and natural resources: a conceptual analysis revisited	China	2017
52	The principal factors responsible for biodiversity loss	Globally	2021
53	Analysis of TRIPS Agreement and the justification of international IP rights protection in the WTO's multilateral trading system, with particular reference to pharmaceutical patents	Globally	2015
54	The role and importance of agrobiodiversity for agriculture	Globally	2021
55	Exploring Benefit-Sharing from the Lab to the Land (Part I): Agricultural Research and Development in the Context of Conservation and Sustainable Use	Globally	2014
56	An integrated agro-ecosystem and livelihood systems approach for the poor and vulnerable in dry areas	Developing Countries	2013
57	Does crop diversification lead to climate-related resilience	Globally	2022
58	Strategies to improve soil health by optimizing the plant–soil–microbe–anthropogenic activity nexus	Globally	2024
59	Agrobiodiversity and Agroecosystem Stability	Globally	2020
60	The impact of biodiversity on crop growth and ecosystem service	Globally	2024
61	An energy-landscape integrated analysis to evaluate agro ecological scarcity	Iran	2020
62	Global impacts of future cropland expansion and intensification on agricultural markets and biodiversity	Globally	2019
63	In situ and ex situ conservation: complementary approaches for maintaining biodiversity	Ethiopia	2017

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