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REVIEW

# Agroecology in Zimbabwe: A country-level review with regional lessons for Southern African Development Community (SADC)

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**Abstract** Southern Africa faces worsening climate extremes, threatening food security particularly in Zimbabwe, where rain-fed agriculture dominates. Conventional models struggle under these pressures, yet agroecology, a resilient alternative, remains fragmented and weakly integrated into national policy. This review synthesizes evidence from 94 sources to examine agroecological practices, institutional arrangements, and socio-ecological outcomes in Zimbabwe, situating these findings within the broader Southern African Development Community context. Drawing on resilience and socio-ecological systems theories, the analysis demonstrates that agroecology enhances yield stability, promotes biodiversity, and strengthens household food security, frequently outperforming input-intensive systems under climate stress. Despite these advantages, scaling agroecology is hindered by policy gaps and limited public investment. Lessons from Malawi and Tanzania, however, illustrate viable pathways for national-level integration. This comprehensive synthesis provides a roadmap for mainstreaming agroecology, offering both practical insights for African food systems and theoretical contributions towards building adaptive capacity in the face of climate change.

**Keywords** Agroecology · Climate resilience · Food systems transformation · Indigenous knowledge · Policy frameworks · Sustainable agriculture

## INTRODUCTION: AGROECOLOGY IN ZIMBABWE-A PATHWAY TO CLIMATE-RESILIENT FOOD SYSTEMS

Southern Africa is facing an intensifying of climate extremes, ecological degradation, and worsening food insecurity threats that jeopardize agricultural sustainability and rural development (IPCC 2022; World Bank 2022; FAO 2023). Countries such as Zimbabwe, Malawi, Zambia, and Mozambique are experiencing recurrent droughts, erratic rainfall patterns, and heat stress that degrade soil fertility and undermine vulnerable rural livelihoods (FAO 2023). In Zimbabwe, where more than 70% of the rural population depends on rain-fed agriculture, these climatic challenges have directly contributed to severe food insecurity, affecting over 2.7 million people in 2022 due to crop failures and declining soil productivity (FAO 2023). These realities expose the limitations of conventional, input-intensive agricultural models and underscore the urgent need for approaches that restore ecosystems while building smallholder resilience.

Agroecology offers a holistic and promising framework for addressing these interconnected crises. It integrates ecological science, Indigenous and Traditional Knowledge (ITK), and social equity principles to strengthen climate resilience, reverse biodiversity loss, and improve rural livelihoods (HLPE 2019; Wezel et al. 2020). The approach is grounded in principles such as diversity, knowledge co-creation, system resilience, and farmer autonomy, which align closely with Zimbabwe's predominantly smallholder farming systems and those of the wider Southern African Development Community (SADC) (Ewert et al. 2023; Mouratiadou et al. 2024).

Despite its strong cultural roots in traditional practices such as mixed cropping, composting, and local seed conservation, agroecology remains politically and institutionally marginalized in Zimbabwe. Many farmer-led initiatives operate outside formal policy frameworks and receive little government support. Regional initiatives such as the SADC Food and Nutrition Security Strategy and the

African Union's Ecological Organic Agriculture Initiative promote agroecological values. However, implementation across member states remains fragmented and inconsistent (Biovision Africa Trust 2025).

Research on agroecology in Zimbabwe is scarce and fragmented, often focusing on isolated case studies, specific practices, or short-term civil society projects (Mashapa et al. 2020; Mapfumo et al. 2022). To our knowledge, no prior study has systematically combined empirical evidence, policy analysis, and regional comparisons to evaluate agroecology as an integrated national strategy within the SADC context. This gap limits both policy learning and the scaling of successful models.

This paper addresses that gap by presenting the first comprehensive country-level review of agroecology in Zimbabwe. It explicitly situates the analysis within the SADC regional framework. It examines the persistent disconnect between grassroots innovation and national institutional support, shaped by historical policy biases, governance fragmentation, and chronic underinvestment. Comparative insights are drawn from other SADC countries particularly Malawi and South Africa where agroecology has achieved varying degrees of policy uptake.

The objectives of the paper are twofold: (1) to critically assess the state of agroecology in Zimbabwe across farming practices, policy frameworks, institutional arrangements, and socio-ecological outcomes; and (2) to identify actionable lessons for scaling agroecology as a resilience-oriented agricultural development pathway across Southern Africa. In doing so, the study explicitly situates agroecology within broader ecological theory, particularly resilience theory and socio-ecological systems frameworks. It moves beyond definitional use by examining how specific farmer-led practices (e.g., polycultures, water harvesting, and farmer-managed seed systems) operationalize core resilience concepts, such as building functional diversity, strengthening adaptive capacity, and managing slow variables (like soil organic matter) to maintain system functions under climate stress. This theoretical lens enables the findings to speak not only to Zimbabwe's national context but also to global debates on how agroecological transitions reshape coupled human–natural systems.

## REVIEW METHODOLOGY

This review adopted a thematic synthesis approach (Thomas and Harden 2008) to provide a comprehensive, country-level analysis of agroecology in Zimbabwe. The review's purpose was to identify, synthesize, and critically evaluate the existing evidence from various sources. The search strategy was guided by the twofold aim of the paper.

The review, therefore, focused on published peer-reviewed academic literature, as well as grey literature. To ensure credibility, the grey literature was limited to documents from reputable sources such as UN agencies (FAO, UNDP), international research centres (ICRAF, World Agroforestry), and well-established NGOs (PELUM, ActionAid) (Paez 2017). While these grey literature sources were not formally scored, their findings were systematically cross-validated against peer-reviewed sources during the synthesis process to mitigate potential bias. A systematic search was conducted in databases including PubMed, Google Scholar, Web of Science, and Scopus, using combinations of keywords such as "agroecology," "sustainable agriculture," "smallholder farming," "climate change adaptation," and "Zimbabwe." Search results from all databases were first combined into a single reference list in EndNote, where automatic and manual checks were applied to remove duplicates (Bramer 2018). First, the 130 records were screened by title and abstract, during which 30 records were excluded as they did not meet the inclusion criteria. Second, the remaining 100 potentially relevant articles were retrieved for full-text review (Page et al. 2021). Of these, six articles were excluded for not meeting the eligibility criteria (e.g., tangential focus, lack of relevant data). The final dataset consisted of 94 documents in total: 62 peer-reviewed journal articles and 32 grey literature reports. The entire screening process is illustrated in the PRISMA Flow Diagram (Fig. 1), and the specific criteria for inclusion and exclusion are detailed in Table 1.

A quality assessment for the peer-reviewed articles was undertaken using a simplified checklist adapted from the Critical Appraisal Skills Programme and Joanna Briggs Institute tools (JBI 2017). It focused on clarity of objectives, appropriateness of methodology, transparency of data collection, and validity of findings. Studies were scored on a three-point scale (high, moderate, low quality). No studies were excluded solely based on quality, however, quality ratings informed the interpretation of findings (Lindsay et al. 2025).

Data extraction involved identifying key themes related to the definitions of agroecology, its biophysical and socio-economic impacts, policy frameworks, and institutional arrangements. The thematic categories that guided the analysis and structure of this review are presented in Table 2. Thematic synthesis was used to analyse the documents, with coding carried out in NVivo 14 software using an inductive–deductive approach (Fereday and Muir-Cochrane 2006; Proudfoot 2023). Two independent reviewers coded the data, achieving a high inter-reviewer agreement (Cohen's $\kappa = 0.81$) (McHugh 2012). Disagreements were resolved through discussion, and where

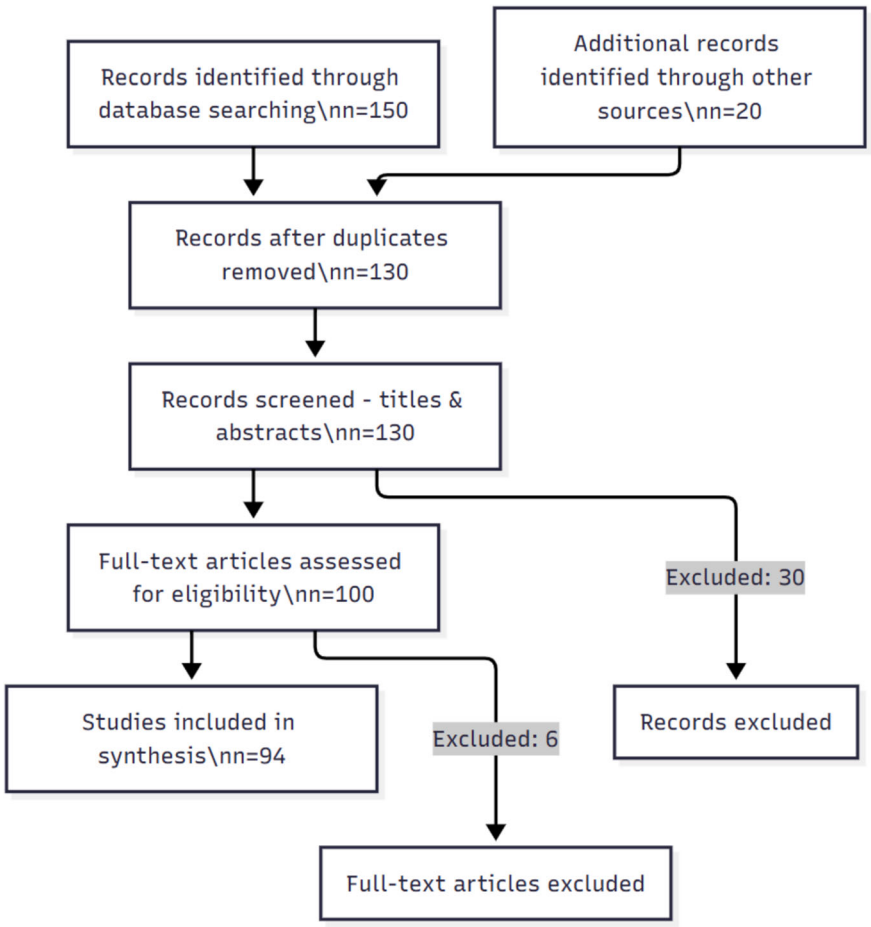



**Fig. 1** PRISMA flow diagram of literature selection process

**Table 1** Inclusion and exclusion criteria for reviewed literature

| Criteria | Inclusion | Exclusion |
|---|---|---|
| Topic | Directly addresses agroecology, sustainable agriculture, food sovereignty, or related concepts | Focuses solely on conventional agriculture or unrelated to food systems |
| Geography | Focuses on Zimbabwe, SADC countries, or broader sub-Saharan Africa (SSA) with relevance to SADC | Studies outside sub-Saharan Africa with no transferable lessons |
| Content Type | Peer-reviewed articles, books, theses, credible grey literature (NGO reports, policy briefs, government docs, working papers) | Opinion pieces, unverified content, promotional materials |
| Language | English | Non-English publications |
| Relevance | Empirical data, policy analysis, or conceptual frameworks relevant to agroecology | Purely theoretical or tangential to stated objectives |

consensus could not be reached, a third reviewer was consulted (Belur et al. 2021).

## DEFINING AGROECOLOGY IN ZIMBABWE AND THE SADC CONTEXT

Agroecology, as a scientific discipline, set of practices, and social movement, provides a holistic framework for transforming food systems towards ecological sustainability and social equity. Globally, agroecology's principles have been articulated by the Food and Agriculture Organization (FAO) and the High-Level Panel of Experts (HLPE), emphasizing elements, such as diversity, resilience, synergy, efficiency, recycling, and co-creation of knowledge (FAO 2018; HLPE 2019). These principles guide the design and evaluation of sustainable agricultural systems across diverse contexts.

**Table 2** Thematic categories for data synthesis

| Thematic category | Description |
|---|---|
| 1. Defining Agroecology | Conceptualizations, principles, and local understandings of agroecology in Zimbabwe and SADC |
| 2. Agroecological Practices | Specific farming practices implemented (e.g., conservation agriculture, intercropping, organic farming, integrated pest management) |
| 3. Policy & Institutional Landscape | Analysis of national agricultural policies, laws, strategic plans, and the roles of government agencies, NGOs, research institutions |
| 4. Biophysical Impacts | Evidence related to soil health, biodiversity, water use efficiency, climate resilience, and ecosystem services |
| 5. Socio-Economic Impacts | Evidence related to yield, food security, livelihoods, income, market access, gender equity, farmer autonomy, and knowledge sharing |
| 6. Challenges & Opportunities for Scaling | Barriers (e.g., policy gaps, market access, knowledge transfer) and enablers (e.g., farmer networks, successful models, research support) |

In Zimbabwe, agroecological practices are widespread, but farmers and institutions rarely refer to them as "agroecology." This reflects both the historical evolution of indigenous knowledge systems and the dominance of formal agricultural discourse, which prioritizes externally defined, input-intensive approaches. Traditional and locally adapted practices such as intercropping, organic composting, indigenous seed use, and water harvesting are deeply rooted in Zimbabwean farming. These align with agroecological principles, even though they are not always framed in such terms. This distinction highlights the need to recognize and elevate local knowledge that may not conform to technical or academic labels but nonetheless reflects agroecological logic.

Within Zimbabwe, agroecological practices can be broadly categorized into two types: (1) technical-practical practices, such as conservation agriculture, crop diversification, integrated pest management, and composting, which emphasize ecological processes and resource efficiency, and (2) knowledge-based political frameworks, which include farmer autonomy, local innovation, seed sovereignty, and food sovereignty movements. Together, these reflect both the practice and politics of agroecology, especially from a grassroots and rights-based perspective.

Indigenous knowledge systems (IKS) are critical to Zimbabwean agroecology. Generations of experiential learning have produced sophisticated approaches to soil fertility management, seed saving, pest control, and adaptation to climatic variability (Hodzi and Maheve 2024). These systems are embedded in cultural practices and community norms, making them essential to any effort to scale agroecology in a socially embedded and ecologically appropriate (Otieno 2024).

Across the SADC region, many of these dynamics are reflected. While agroecology may go by different names, such as organic farming, climate-smart agriculture, or permaculture, the core principles of ecological balance, farmer empowerment, and diversification are widely present. Countries such as Malawi, Tanzania, and South Africa demonstrate varying degrees of agroecology integration, particularly through CSO-led initiatives and community-based programs (Snapp et al. 2021; Madsen et al. 2025).

Understanding these localized definitions and expressions is essential for assessing whether policies, institutions, and interventions support or hinder agroecology. This conceptual grounding informs later sections, including the analysis of Zimbabwe's policy frameworks and the evaluation of agroecological impacts. By starting with how agroecology is practiced and understood on the ground, we establish a foundation for measuring both alignment and misalignment between national systems and farmer-led innovation.

## NATIONAL POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS INFLUENCING AGROECOLOGY, SITUATING THEM WITHIN REGIONAL SADC TRENDS

Despite the growing global and regional recognition of agroecology, Zimbabwe's national agricultural policy and institutional frameworks exhibit a notable disconnect, largely failing to explicitly integrate or coherently support agroecological principles. This review finds that such disconnect is deeply rooted in the country's political economy, shaped by the legacy of colonial-era commercial farming, post-independence land redistribution dynamics, and input-driven state subsidy programs (Snapp et al. 2021; Chiduwa et al. 2023). These historical influences have perpetuated an agricultural development model focused on commodity production and external inputs. This model is reinforced by the significant influence of vested agribusiness interests (e.g., seed and fertilizer corporations) and

donor dependencies tied to conventional input packages, often at the expense of diversified, low-input, and ecologically sustainable systems.

### Policy instruments and alignment

An analysis of key policy documents including the National Agricultural Policy Framework, the National Climate Policy, the Strategic Plan for Agricultural Research and Extension, and Zimbabwe's National Adaptation Plan reveals minimal direct reference to agroecology. Terms such as "sustainable agriculture" and "climate-smart agriculture" appear in policy, but they often support conventional models focused on yield, input intensification, and commercialization rather than systemic agroecological transformation (Tumbure et al. 2022; Ouko et al. 2024). This creates a semantic inclusion but operational exclusion of agroecological principles within national strategies.

As shown in Table 3, most national instruments are misaligned with core agroecological principles such as diversity, co-creation of knowledge, recycling, and resilience (FAO 2018; HLPE 2019). For instance, the Seed Act [Chapter 19:13] criminalizes informal seed systems, a cornerstone of agroecology, while conservation agriculture programs although well-intentioned are heavily input-driven and weakly integrated with farmer knowledge systems (Mapfumo et al. 2022; Chiduwa et al. 2023).

### Institutional arrangements and gaps

Government institutions, including the Ministry of Lands, Agriculture, Fisheries, Water and Rural Development, follow top-down, input-focused delivery models. Extension services mainly promote synthetic fertilizers, hybrid seeds, and mechanization, with little recognition or support for agroecological practices (Mapungwana 2022; Mchomvu 2022; Chimonyo et al. 2023). This institutional inertia is not accidental but reflects a political economy reinforced by training curricula, performance metrics that undervalue participatory approaches, and powerful private-sector lobbying that overlooks traditional knowledge systems (Mapfumo et al. 2022). Donor-driven climate-smart agriculture programs also tend to favour externally defined technologies over farmer-led diversification. Together, these forces create structural disincentives for agroecology, which relies on low-cost, biodiversity-enhancing practices often perceived as incompatible with commercial input markets. Moreover, agroecology often "falls through the cracks" institutionally, lacking a dedicated policy home or coordination mechanism among ministries and donor programs. The fragmented, siloed nature of state institutions limits multisectoral collaboration critical for scaling agroecology (Jones et al. 2022). The policy–practice disconnect, where "sustainable agriculture" supports conventional models, creates a major barrier to agroecological transition. Overcoming this gap requires a fundamental policy and institutional shift towards fully embedding agroecological principles in implementation processes rather than just in rhetoric.

### The role of Civil Society Organizations (CSOs)

In the absence of a strong public sector lead, civil society organizations (CSOs) have emerged as primary catalysts of agroecological experimentation and diffusion in Zimbabwe. Organizations such as the Zimbabwe Smallholder Organic Farmers Forum (ZIMSOFF), PELUM Zimbabwe, and Bio-Innovation Zimbabwe have played pivotal roles in advancing agroecological practices through farmer field schools, seed fairs, and participatory research platforms that embody agroecological principles (Biovision Africa Trust 2025). Despite their notable contributions, these initiatives face significant limitations, including short-term donor-driven funding cycles, insufficient public sector support, and weak integration into formal agricultural extension and research systems (Mouratiadou et al. 2024). Consequently, their impact remains localized and vulnerable to shifting funding priorities. To address these systemic constraints and improve agroecology's sustainability and scalability, this review highlights three main policy reform mechanisms. First, inclusive multi-stakeholder policy dialogues involving farmer organizations, CSOs, researchers, and policymakers could help co-develop a comprehensive National Agroecology Strategy (Jones et al. 2022). Second, evidence-based advocacy that leverages case studies and cost–benefit analyses from Zimbabwe and other SADC countries can help shift institutional mindsets and build political will within ministries (Chiduwa et al. 2023). Third, aligning national policy frameworks with regional commitments such as the SADC Regional Agricultural Policy, the Ecological Organic Agriculture Initiative, and broader African Union frameworks offers a pathway for policy learning and coherence in support of agroecology (AFSA 2017; Ouko et al. 2024).

### Regional comparison and SADC policy landscape

This review shows that Zimbabwe lags behind several SADC countries in integrating agroecology into formal agricultural strategies. As shown in Table 4, a clear divergence in policy pathways is evident. Tanzania and Malawi have made significant progress by adopting dedicated national strategies that embed agroecological principles into nutrition, climate, and seed policies (Tanzania's National Ecological Organic Agriculture Strategy,

**Table 3** Alignment of key Zimbabwean policy instruments with agroecology principles

| Policy/Institutional Framework | Year | Key Objectives Related to Agriculture/ Environment / Agroecological Alignment | Alignment with Agroecology Principles (Low/Medium/ High) | Rationale/Comments / Key Gaps and Constraints | Supporting Source(s) |
|---|---|---|---|---|---|
| National Agricultural Policy Framework (NAPF) | 2018 | Food security, productivity, commercialization; climate adaptation, smallholder support | Low | Emphasis on subsidies and commercial systems; lacks agroecology strategy or farmer innovation | Government of Zimbabwe (2019b), Ouko et al. (2024) |
| Climate Policy / Zimbabwe Climate Policy | 2017 | Adaptation, mitigation, ecosystem and land use sustainability | Medium | Focuses on CSA but favours inputs over systemic agroecological shifts | Government of Zimbabwe (2016), Ouko et al. (2024) |
| Land Reform Programme | Post-2000 | Land equity and smallholder empowerment | Low (Indirect) | Promotes smallholders but not necessarily sustainable or agroecological practices | |
| Environmental Management Act | 2002 | Resource sustainability, pollution control | Medium | Lacks agroecological provisions or targeted incentives | Government of Zimbabwe (2002) |
| Strategic Plan for Agricultural Research & Extension | Latest | Dissemination, training | Low | Dominated by conventional technologies; lacks agroecological training frameworks | |
| Seed Act [Chapter 19:13] | N/A | Regulates seed quality, marketing, and standards | Low | Criminalizes informal seed systems, restricts agro-biodiversity and sovereignty | Seed Act [Chapter 19:13] |
| Conservation Agriculture (CA) Programs | N/A | Reduced tillage, soil cover, input packages | Low | Aligned in principle but practices emphasize synthetic inputs, discourage biodiversity | Tumbure et al. (2022) |
| Agricultural Extension Services | N/A | Potential platform for AE | Low | Conventional, input-focused, under-resourced, limited participatory learning | Mchomvu (2022) |
| Public Agricultural Finance | N/A | Broad agricultural funding | Low | Skewed towards subsidies, no dedicated agroecology financing | Ewert et al. (2023), Anderson et al. (2019) |
| Agrochemical Subsidy Programs | N/A | Increase yields | Low | Reinforces monoculture and chemical dependency | Tumbure et al. (2022), Dushyant et al. (2024) |
| National Certification Schemes | N/A | Market access and quality assurance | Low | No AE-specific schemes; lacks consumer trust-building or labelling | Mouratiadou et al. (2024), Jones et al. 2022 |
| Civil Society Initiatives (e.g., ZIMSOFF, PELUM) | N/A | Training, policy advocacy | Medium | Donor-led, fragmented, lacking institutionalization or scale | AFSA (2017), Tumbure et al. (2022) |
| SADC Regional Policies (FNSS, RAP) | N/A | Food security, sustainability | Low | Weak enforcement, AE is peripheral or unacknowledged | Ouko et al. (2024), Manyanga et al. (2023) |
| National Adaptation Plan (NAP) | 2021 | Agricultural adaptation | Low | Promotes techno-fixes; minimal support for farmer-led or indigenous approaches | Government of Zimbabwe (2019a, 2019b) |

**Table 4** Comparative overview of agroecology policy landscape in selected SADC countries

| Country | Agroecology Policy Framework / Explicit National Agroecology Policy/Strategy | Integration into National Strategy / Mainstreaming in Key Agricultural/ Climate Policies | Dominant Policy Orientation | Role of State Extension in Agroecology | Notable Public Investment/ Support for Agroecology | Key Institutions / Initiatives | Citations |
|---|---|---|---|---|---|---|---|
| Zimbabwe | No standalone policy; CSO-led initiatives | Fragmented; AE not in major national strategies | Input-subsidy dominant; CA aligned in parts | Low/ Fragmented | Low | ZIMSOFF, PELUM Zimbabwe, Bio-Innovation Zimbabwe | Tumbure et al. (2022), Mapfumo et al. (2022) |
| South Africa | No formal AE policy; provincial pilots exist | Patchy AE via CSA in some provinces | Mixed (AE + tech-driven farming) | Variable; CSO partnerships key | Moderate (local funding and research) | Biowatch, South African Food Sovereignty Campaign (SAFSC), Dept. of Agriculture | Zenda et al. (2024), African Centre for Biodiversity (2023) |
| Malawi | Draft National Agroecology Strategy (2021–2026) | Growing integration in food/climate policies | Resilience & food sovereignty framing | Increasing; NGO-led | Moderate (donor-funded) | Agroecology Hub, AFSA Malawi | AFSA (2023), Kansanga et al. (2021) |
| Tanzania | National Ecological Organic Agriculture Strategy (2020–2030) | Integrated into seed, nutrition, and extension systems | AE as sustainability and resilience driver | Limited public extension, strong grassroots | Low | Tanzania Organic Agriculture Movement (TOAM), Sustainable Agriculture Trust (SAT), Ecological Organic Agriculture (EOA) Initiative | AFSA (2023) |
| Zambia | No AE policy; CA dominates CSA | AE marginal; donor-driven CA programs | CA-centric, minimal AE | Pilot projects exist | Moderate (donor-supported) | Conservation Farming Unit (CFU), FAO Zambia, Ministry of Agriculture | Jones et al. (2022), |
| Mozambique | AE via land and food sovereignty frameworks | Moderate integration | Overlaps with indigenous farming systems | N/A | N/A | União Nacional de Camponeses (UNAC), Associação Rural de Ajuda Mútua (ORAM), Ministry of Agriculture | Ouko et al. (2024) |
| Lesotho | No explicit AE; permaculture in education | Weak; NGO-led school gardens | Input-subsidy model with AE in education | N/A | N/A | Growing Nations Trust, Ministry of Agriculture | AFSA (2023) |

2020–2030; Malawi's Draft National Agroecology Strategy, 2021–2026) (Africa Alliance for Food Sovereignty 2023). In contrast, Zimbabwe's approach remains one of institutional fragmentation, lacking a coherent national policy and relying instead on localized, CSO-driven efforts. Other countries like Zambia and South Africa represent a middle ground, experimenting with pilot programs, but these often operate without national-level policy support or institutional sustainability(African Centre for Biodiversity 2023; Greenberg 2024). The comparative analysis reveals that regional learning platforms such as the AFSA, SACAU, and Biowatch could support cross-country policy harmonization and shared advocacy (Otieno 2024). For Zimbabwe, aligning national agricultural and climate strategies with regional efforts could leverage external support while building internal coherence and legitimacy.

## AGROECOLOGY IN PRACTICE: BIOPHYSICAL AND SOCIO-ECONOMIC EVIDENCE OF IMPACT

The credibility of agroecology as a transformative approach hinges not only on its conceptual alignment with sustainability goals but also on its demonstrable biophysical and socio-economic outcomes. This section critically synthesizes empirical and comparative evidence from Zimbabwe and other SADC countries, revealing the promise and limitations of agroecological interventions in real-world contexts.

### Biophysical performance: Productivity, soil health, and biodiversity

Contrary to the belief that agroecology is less productive, recent evidence from Zimbabwe shows that diversified low-input systems can match or exceed conventional yields, especially under climate stress (Manyanga et al. 2023). For example, the intercropping systems in Hwedza improved yield stability by 15–25% during erratic rainfall years (Mugiyo et al. 2021). Soil health benefits have been consistently reported in the literature. Farmer practices such as organic mulching, composting, and minimum tillage have been shown to improve soil organic carbon, moisture retention, and microbial activity (Campbell et al. 1997). In Matabeleland South, farmers using traditional pit planting and mulching techniques reported visibly improved water retention and early crop establishment (Biovision Africa Trust 2025). Agroecology enhances on-farm biodiversity by preserving indigenous seeds, using multiple crops, and integrating trees and animals. While data on ecological indicators remain sparse, studies have noted improved pollinator presence, reduced pest outbreaks, and greater agrobiodiversity in agroecological systems (Mouratiadou et al. 2024). However, this review also notes a lack of systematic biodiversity monitoring in Zimbabwe, and little quantified data at the landscape scale. Most biophysical assessments are site-specific and often rely on anecdotal or short-term observations.

### Socio-economic benefits: Livelihoods, food security, and farmer autonomy

Agroecology in Zimbabwe has notably contributed to farmer livelihoods by reducing reliance on costly external inputs, improving income stability, and enhancing household food security (Mafongoya et al. 2016; Chimonyo et al. 2023). These benefits are particularly pronounced among marginalized groups women, youth, and low-income smallholders who often face barriers to accessing conventional inputs and markets.

For instance, in the Mwenezi and Mutoko districts, farmers practicing agroecological approaches reported an average of 10.1 months of adequate food provisioning per year, compared to 8.2 months among their conventional farming peers, highlighting the potential of agroecology in addressing seasonal food insecurity (Katsi 2025). Income gains were also reported, driven by lower input costs, improved soil fertility, and diversified production portfolios that included vegetables, legumes, and drought-tolerant small grains.

To further explore the economic viability and resilience of agroecology, this review draws on comparative data from Zimbabwean and Southern African smallholder farming systems. Table 5 presents a side-by-side assessment of agroecological and conventional farming systems, highlighting their performance across multiple dimensions, including costs, yields, gross margins, input use, and food security.

Agroecological systems cut input costs by over 55% through farmer-saved seeds, compost, and botanical pest control (Thierfelder et al. 2015). Labour needs are about 35% higher, but this is often met through family labour and lower cash expenses (Thierfelder et al. 2015). Critically, gross margins were 31% higher in AE systems, and yield stability during drought years was nearly three times greater than in conventional systems. Farmers using agroecological methods also enjoyed almost two additional months of adequate food provisioning, directly contributing to household food security and reduced vulnerability.

Agroecology offers a cost-effective, risk-resilient farming alternative that is better suited to the socio-ecological realities of Zimbabwe's smallholders. However, this potential remains structurally unsupported by current national policy, extension models, or research agendas (see "National policy frameworks and institutional arrangements influencing agroecology, situating them within

**Table 5** Comparative cost–benefit profile: agroecology vs. conventional systems in Southern Africa

| Metric (per ha) | Agroecological System (Intercropped maize/legume with compost) | Conventional System (Monocropped maize with NPK & herbicide) | Cost–Benefit Differential | Source(s) |
|---|---|---|---|---|
| Variable cash input cost (USD) | US $110 ± 12 | US $265 ± 18 | 55–60% lower cash outlay for AE | Nyagumbo et al. (2019) |
| Family labour demand (person-days) | 38 ± 4 | 28 ± 3 | + 10 person-days for AE (~ 35%) | Nyagumbo et al. (2019) |
| Grain yield (t/ha) | 3.2 ± 0.4 (maize + cowpea equivalent) | 3.4 ± 0.3 | Statistically similar ($p > 0.1$) | Nyagumbo et al. (2019) |
| Gross margin (USD/ha) | US $485 | US $370 | + US $115 for AE (+ 31%) | Nyagumbo et al. (2019) |
| Drought-year yield loss (El Niño 2015–16) | –8% | –27% | 19 pp lower loss for AE (≈ 3 × more stable) | Nyagumbo et al. (2019) |
| MAHFP (months) | 10.1 ± 0.6 | 8.2 ± 0.5 | + 1.9 months of food security | Bezner Kerr et al. (2019) |
| Nitrogen fertilizer use (kg N/ha) | 0 (legumes + compost) | 69 ± 6 (synthetic urea) | 100% reduction in fossil N use | Nyagumbo et al. (2019) |
| Pest control expenditure (USD/ha) | US $9 (botanicals) | US $41 (pesticides) | 78% reduction in cost | Bezner Kerr et al. (2019) |

All figures represent average estimates across smallholder case studies in Zimbabwe and Malawi. AE = agroecology. MAHFP = Months of Adequate Household Food Provisioning

regional SADC trends" section). The positive outcomes presented are predominantly from localized, NGO-supported interventions, which may not be fully representative of the entire country. However, they provide compelling empirical evidence that agroecological practices can significantly improve food security and smallholder livelihoods. Therefore, a key policy challenge is to create an enabling environment for these successes to scale and become the norm rather than the exception.

## Demonstrating agroecology's technical and socio-political impacts: Case studies

To demonstrate the practical relevance of agroecology, this section synthesizes ten representative case studies from Zimbabwe and other SADC countries. These cases reflect diverse agroecological zones, institutional models, and practice combinations, offering insights into the technical feasibility and socio-political dynamics of agroecological transitions (Anderson et al. 2019). The examples span interventions such as intercropping, composting, water harvesting, seed saving, and farmer-to-farmer knowledge exchange, and are drawn from peer-reviewed studies, NGO project evaluations, and participatory research reports.

In Zimbabwe, farmer-managed seed systems supported by PELUM Zimbabwe in Masvingo and Mutoko districts have successfully revitalized indigenous millet and sorghum varieties, contributing to drought resilience, dietary diversity, and local seed sovereignty (Mudzingwa and Mambeva 2018). These initiatives have increased cash income through seed sales while also enhancing on-farm species richness, a proxy for agroecological resilience. In Goromonzi, the Zimbabwe Smallholder Organic Farmers Forum (ZIMSOFF) implemented Farmer Field Schools focused on composting, intercropping, and legume rotations. Women-led experimentation led to measurable improvements in soil fertility and grain yield, alongside enhanced farmer confidence and community learning networks (Mudzingwa and Mambeva 2018). This case exemplifies the principle of knowledge co-creation in agroecology, especially when supported by participatory methodologies and long-term facilitation (Anderson et al. 2019). Water harvesting integrated with agroecological cropping systems was another recurring theme, particularly in the semi-arid regions of Zimbabwe (Nyagumbo et al.

2019). Community-constructed swales and contour ridges in Zimbabwe have been shown to enable year-round water retention and stabilize crop performance, particularly for staple crops like maize and sorghum, during midseason droughts (Nyagumbo et al. 2019). Meanwhile, in Manicaland, community-based Participatory Guarantee Systems (PGS) helped agroecological producers obtain 20–30% price premiums by enhancing market trust and cooperative visibility (Bezner Kerr et al. 2019).

The section then moves to cross-country examples that add further depth to the comparison. In Malawi, the Farmer-Led Agroecology Movement (FLAM) achieved adoption rates exceeding 70% in pilot communities, with tangible reductions in input costs and pest pressure through the use of botanical sprays and diversified rotations (Bezner Kerr et al., 2019). Similarly, Tanzania's Participatory Ecological Land Use Management (PELUM Tanzania) promoted compost-based polycultures that improved household income and food security, particularly among female-headed households (Manyanga et al. 2023; Dushyant et al. 2024). In South Africa's Limpopo Province, farmer-led soil regeneration initiatives using compost, cover crops, and reduced tillage have reversed land degradation trends and improved yield performance on previously marginal fields (Africa Alliance for Food Sovereignty 2023).

Table 6 summarizes the key agroecological practices, geographic scope, institutional actors, and reported outcomes for each of these ten case studies. This reinforces the narrative findings by offering a comparative lens that spans both biophysical and socio-economic impacts. These case studies collectively illustrate the adaptability of agroecology across climatic zones and its ability to address intersecting challenges, such as soil degradation, food insecurity, and social exclusion (Mafongoya et al. 2016; Nyagumbo et al. 2019). However, the review also reveals common constraints: most initiatives are donor-funded, geographically localized, and poorly integrated into national research and extension frameworks (Tumbure et al. 2022; Mouratiadou et al. 2024). The absence of sustained public sector involvement or policy alignment limits the replicability and institutionalization of these models. In summary, while these examples validate agroecology's technical and social promise, they also underscore the urgent need for structural reforms to mainstream such approaches at scale. Without integration into formal education, financing, and policy systems, these innovations risk remaining exceptional rather than transformative (Anderson et al. 2019; Jones et al. 2022).

**Table 6** Selected agroecology case studies in Zimbabwe and SADC: practices, outcomes and evidence. *AE* Agroecology, ↑ increase, ↓ decrease

| # | Location | Core Practice / Model | Key Quantified Outcomes | Reference(s) |
|---|---|---|---|---|
| 1 | Hwedza, Zimbabwe | Maize–legume *inter-cropping* + on-farm compost | ↑ grain-yield stability 15–25%; higher soil-moisture retention; ↓ synthetic-N demand | Nyagumbo et al. (2019), Mugiyo et al. (2021) |
| 2 | Mutoko, Zimbabwe | Farmer-managed *seed systems* + scattered *agroforestry* | Dietary-diversity + 3 food-groups; local seed sales boost cash-income; ↑ on-farm species richness | (Mudzingwa and Mambeva (2018) |
| 3 | Mwenezi, Zimbabwe | *Small-grain diversification* (sorghum, millet) | Food-security maintained during 2019–20 drought; ↓ reliance on maize imports | Katsi (2025) |
| 4 | Central Malawi | *Legume integration* (pigeon-pea, groundnut) + botanical pest control (neem, ash) | ↑ soil N; 30–40% ↓ variable costs; lower pest incidence | Bezner et al. 2019) |
| 5 | Eastern Zambia | Gender-focused *agroecology training cooperatives* | ↑ women's decision-making; enlarged peer-learning networks; better child nutrition scores | Anderson et al. (2019) |
| 6 | Chikuku, Zimbabwe | Community *water–harvesting* (swales, contour ridges) integrated with AE cropping | Year-round water availability; entry into dry-season horticulture; resilience to mid-season drought | Chiturike et al. (2024) |
| 7 | Matabeland South, Zimbabwe | *Integrated livestock* (goats, poultry) + drought-tolerant crops | Stable mixed-enterprise income; on-farm manure replaces chemical fertilizer; risk-spreading | AFSA (2023) |
| 8 | Limpopo, South Africa | Farmer-led *soil-restoration* (compost, cover crops, reduced tillage) | ↑ soil organic matter on degraded land; yield recovery on marginal fields; ↓ erosion | AFSA (2023), Zenda and Rudolph (2024) |
| 9 | Morogoro, Tanzania | *Push–pull* habitat-management (Desmodium/Napier) | 50–100% ↑ maize yield; effective Striga & stemborer control; dual fodder supply | AFSA (2023) |
| 10 | Manicaland, Zimbabwe | Community *Participatory Guarantee Systems* (PGS) for AE produce | 20–30% price premium; stronger farmer co-ops; ↑ consumer trust/market reach | Mashapa et al. (2020) |

### Evidence gaps and research needs

Despite the compelling evidence emerging from agroecology case studies in Zimbabwe and the wider SADC region, important theoretical and research priorities remain. Rather than viewing these only as "gaps," they represent opportunities to advance ecological science by testing resilience theory and socio-ecological systems thinking in African contexts. Strengthening these dimensions is essential not only for policy uptake and investment prioritization, but also for refining global ecological theory through the Zimbabwean case.

First, there is a marked absence of longitudinal, large-scale, and quantitative studies assessing agroecological outcomes over time and across diverse agroecological zones. Most of the available evidence while insightful is derived from short-term, small-scale, donor-funded interventions, many of which lack replication, control comparisons, or statistically rigorous sampling (Jones et al. 2022; Tumbure et al. 2022). This limits the ability to test resilience concepts such as regime shifts, ecological thresholds, and adaptive cycles in real farming landscapes, which Zimbabwe's smallholder systems are uniquely positioned to illustrate. Moreover, current evaluations seldom capture the long-term ecological benefits of agroecology, such as improvements in soil organic carbon, biodiversity, and water cycling.

Second, research on agroecology in Zimbabwe is dominated by non-state actors, particularly NGOs and civil society organizations, with limited involvement from public research institutions, agricultural universities, or government extension systems. This institutional imbalance reflects broader structural biases in funding, curricula, and research incentives, which continue to favour conventional, input-intensive agricultural models (Mapfumo et al. 2022; Mouratiadou et al. 2024). Consequently, agroecology remains under-theorized in mainstream ecological science, despite offering living laboratories for exploring socio-ecological feedbacks, cross-scale interactions, and adaptive governance.

Third, trade-offs and transition risks are insufficiently documented in the literature. While agroecology shows strong performance in terms of food security and input cost reduction, little is known about short-term yield variability, opportunity costs for labour, or learning curves associated with agroecological transitions. Such uncertainties are particularly relevant for risk-averse smallholders, whose production decisions are shaped by immediate food needs and volatile climatic conditions (Bezner Kerr et al. 2019; Nyagumbo et al. 2019). Without deeper theorization of trade-offs, particularly around labour–capital substitutions and short-term yield variability, ecological science risks overlooking how agroecology redefines resilience pathways in smallholder systems.

Fourth, market-related research is notably limited. Few studies have explored the value chains, certification mechanisms, or consumer behaviour necessary to support differentiated agroecological products (Snapp et al. 2021; Biovision Africa Trust 2025). The potential for agroecological produce to secure premium prices, access institutional markets, or align with public procurement (e.g., school feeding programs) remains largely untapped and under-researched. Similarly, the absence of consumer awareness studies and agroecology-specific labelling schemes undermines efforts to build demand and trust.

Addressing these gaps will require a paradigm shift in research design and practice. Transdisciplinary, farmer-led research models, in which scientists, farmers, extension officers, and policy actors collaborate to co-generate context-specific knowledge, offer a promising alternative to top-down experimentation (Anderson et al. 2019; Africa Alliance for Food Sovereignty 2023). Participatory monitoring tools, such as farmer diaries, citizen science platforms, and community-defined indicators, can supplement conventional data systems while respecting local knowledge systems.

At the regional level, SADC institutions can play a catalytic role in standardizing agroecological metrics, supporting collaborative research platforms, and facilitating South–South knowledge exchanges. Initiatives such as the Ecological Organic Agriculture Initiative (EOA-I) and the Alliance for Food Sovereignty in Africa (AFSA) already provide scaffolding for such cross-border learning, but they require stronger state buy-in, funding, and alignment with formal research agendas (Anderson et al. 2019).

Without robust, context-sensitive, and policy-relevant data, agroecology risks being marginalized as an experimental or ideological approach despite mounting evidence of its systemic benefits. Bridging the evidence gap is thus not only a technical necessity but also a strategic imperative for advancing sustainable, resilient, and inclusive food systems in Zimbabwe and across Southern Africa.

## SCALING AGROECOLOGY IN ZIMBABWE: CHALLENGES AND OPPORTUNITIES

Despite growing evidence of agroecology's technical feasibility and socio-ecological benefits, its expansion in Zimbabwe remains highly constrained by entrenched structural, institutional, and political barriers. This section synthesizes the core limitations and identifies critical enablers for agroecology to transition from fragmented local practice to a national strategy for food system transformation.

## Persistent challenges: Policy, power, and fragmentation

The most significant constraint is the absence of a coherent and dedicated National Agroecology Strategy. As outlined in "National policy frameworks and institutional arrangements influencing agroecology, situating them within regional SADC trends" section, agroecology remains conspicuously absent from key national policy frameworks, which continue to prioritize mechanization, hybrid seed adoption, fertilizer subsidies, and export-oriented production (Tumbure et al. 2022; Ouko et al. 2024). While references to "sustainable agriculture" or "climate-smart agriculture" appear in official documents, they rarely translate into support for low-input, farmer-led models. This disconnect between policy language and practice generates confusion among implementers and undermines the institutional recognition and legitimacy of agroecology in Zimbabwe.

Institutional fragmentation further undermines the potential of agroecology. Although civil society organizations (CSOs) have emerged as crucial actors in agroecological experimentation and training, their efforts remain disconnected from public extension services, research institutions, and tertiary curricula (Anderson et al. 2019). Agroecology is often viewed as "NGO territory" rather than a state-sanctioned development pathway. Government extension agents, where present, are primarily trained to promote conventional input packages rather than facilitate participatory learning and knowledge co-production (Manyanga et al. 2023).

Power asymmetries also play a critical role in suppressing the visibility of agroecology. Agribusiness actors including fertilizer companies, seed multinationals, and commercial grain traders continue to shape policy narratives and influence state investment decisions. These actors perceive agroecology not as complementary but as disruptive to established profit models (Mouratiadou et al. 2024). Their influence marginalizes farmer voices and reinforces technocratic, productivist paradigms that ignore the ecological and social dimensions of agricultural sustainability.

Funding structures and research priorities reflect this bias. Most public agricultural finance in Zimbabwe is funneled into input subsidies, mechanization schemes, and commercial extension, with no dedicated public investment stream for agroecology (Ewert et al. 2023). Simultaneously, universities and research stations lack agroecology-focused units, leading to limited institutional anchoring for agroecological innovation, training, and impact monitoring.

## Opportunities and scaling pathways

Despite these systemic constraints, multiple entry points exist for scaling agroecology in Zimbabwe, drawing lessons from regional successes and grassroots experimentation. The following pathways offer strategic opportunities for mainstreaming agroecology through inclusive and evidence-based reforms:

1. Policy Coherence and Reform:

Zimbabwe urgently requires a National Agroecology Policy or Strategy that explicitly aligns agroecology with climate adaptation, seed sovereignty, nutrition, and land restoration goals. This process should be inclusive and multi-stakeholder in nature engaging CSOs, farmer networks, researchers, and policymakers alike (Jones et al. 2022). Successful policy dialogue models from Malawi and Tanzania offer valuable precedents (Wambua 2022).

2. Institutional Anchoring in Public Systems:

Agroecology must be integrated into public extension services, national research stations, and agricultural education. This includes updating extension curricula, institutionalizing farmer field schools, and embedding agroecology modules in agricultural colleges (Mapfumo et al. 2022). Locally embedded platforms such as participatory guarantee systems (PGS) or farmer research networks can serve as vehicles for scaling while preserving local relevance.

3. Market Development and Agroecological Financing:

Access to appropriate markets and financial tools is essential. Innovations such as public procurement from agroecological producers (e.g., school feeding schemes), organic certification, and participatory market assurance systems can enhance economic viability (Africa Alliance for Food Sovereignty 2023). Financial support mechanisms such as climate-adaptive microcredit or payments for ecosystem services should be designed with flexible, agroecology-aligned indicators, moving beyond simplistic yield metrics.

4. Regional Integration and Learning Platforms:

SADC regional instruments such as the Regional Agricultural Policy (RAP) and the Ecological Organic Agriculture Initiative (EOA-I) provide platforms for convergence. Zimbabwe can benefit from structured knowledge exchanges, harmonized indicators, and coordinated advocacy across member states (Anderson et al. 2019; Ouko et al. 2024). Regional hubs and South–South learning alliances can amplify agroecological knowledge and influence cross-border investment priorities.

5. Reframing Agroecology as a Resilience and SDG Strategy:

To gain policy traction, agroecology must be framed not only as a farming system, but as a cross-cutting resilience strategy that delivers on Sustainable Development Goals (SDGs). Agroecology supports SDG 2 (Zero Hunger), SDG 13 (Climate Action), SDG 15 (Life on Land), and SDG 5 (Gender Equality), particularly when targeted at women, youth, and marginalized farmers (Mouratiadou et al. 2024). Policymakers and donors should adopt this framing to reposition agroecology within broader development agendas.

### Strategic synthesis: From fragmentation to systems change

This review finds that agroecology in Zimbabwe is both promising and precarious technically sound, socially grounded, but politically and institutionally marginalized. The case studies and empirical data presented in "Defining agroecology in Zimbabwe and the SADC context" to "Agroecology in practice: Biophysical and socio-economic evidence of impact" sections underscore the multiple benefits of agroecology, including yield stability, income diversification, ecological restoration, and social empowerment. Yet these outcomes remain localized and vulnerable without systemic reform. Scaling agroecology in Zimbabwe will require more than the expansion of existing pilot projects it demands structural transformation. This includes rethinking what constitutes agricultural "success," shifting investment priorities, reforming training systems, and embracing farmer agency as a foundation for innovation. Zimbabwe's agroecological movement has demonstrated capacity, creativity, and commitment. What remains is for institutions and policies to match that ambition with enabling frameworks and sustained support.

### Limitations of the study

Despite its rigour, the review faced several limitations. First, reliance on published literature may have excluded undocumented grassroots agroecological practices, especially in remote or marginalized communities. Second, the review is susceptible to publication bias, as studies with positive or policy-aligned findings are more likely to be disseminated, potentially underrepresenting unsuccessful or experimental initiatives (Nair 2019). Third, the geographical distribution of studies was uneven, with certain provinces such as Mashonaland East and Manicaland appearing more frequently, while others particularly Matabeleland North and Midlands were under-represented (Zikhali 2018). This imbalance may skew the perceived spread and impact of agroecology in the country. Fourth, the evidence base was dominated by NGO-led studies, which, while valuable, may reflect specific programmatic priorities or donor reporting requirements rather than the full diversity of agroecological practice (Anderson et al. 2019). While thematic synthesis allows for the rich integration of diverse data, it inherently involves interpretive judgement, which can introduce bias. In addition, methodological inconsistency across included studies particularly in measuring biophysical outcomes or livelihood impacts limited comparability and the ability to draw robust, quantitative conclusions (Pretty et al. 2018). Finally, restricting the review to English-language sources likely excluded potentially valuable reports or oral knowledge available in local languages. Future research should seek to address these gaps through: (i) longitudinal designs that capture seasonal and multi-year agroecological dynamics (Tittonell et al. 2010; Lark et al. 2020); (ii) larger and more geographically representative samples; (iii) the use of standardized metrics for biophysical and socio-economic indicators (FAO 2018); and (iv) greater inclusion of local-language materials and community-level oral histories (Nyantakyi-Frimpong 2019). Such approaches would improve comparability, reduce bias, and generate a more holistic and inclusive evidence base for agroecology in Zimbabwe and the wider SADC region. Nonetheless, by combining robust screening, clearly defined grey literature credibility criteria, high inter-reviewer agreement, and structured thematic coding, this methodology offers a replicable and context-sensitive synthesis of agroecology in Zimbabwe and the wider SADC region.

## CONCLUSION AND RECOMMENDATIONS

This review provides the first comprehensive synthesis of agroecology in Zimbabwe, situating it within the broader Southern African Development Community (SADC) context. The evidence shows that agroecological systems can reduce input costs by more than 55%, improve drought-yield stability nearly threefold, and extend household food security by almost two months compared to conventional systems. These benefits are supported by ecological gains such as improved soil health, biodiversity, and water retention and socio-economic improvements, including income diversification and stronger farmer autonomy. However, despite this potential, agroecology in Zimbabwe remains a largely grassroots phenomenon, constrained by policy–practice gaps, fragmented institutions, and minimal public investment. This disconnect reflects entrenched agricultural models favouring input-intensive production, a lack of dedicated national strategies, and under-recognition of Indigenous and farmer-led knowledge systems. The

main contribution of this review is not only its holistic integration of empirical evidence, policy analysis, and regional comparisons, but also its explicit theoretical framing. By linking the Zimbabwean experience to resilience theory and socio-ecological systems thinking, the study demonstrates how specific agroecological practices operationalize resilience. For example, intercropping and agroforestry build 'functional diversity' and 'redundancy', enhancing the system's capacity to absorb climate shocks (e.g., drought). Farmer-managed seed systems are a direct mechanism for 'adaptive capacity', allowing for rapid, farmer-led selection for climate-resilient traits. The study shows how these practices strengthen ecological functionality under stress and reveal feedbacks between grassroots innovation and institutional structures. By framing agroecology as more than a farming approach rather, as a cross-cutting resilience strategy aligned with ecological theory, climate adaptation, biodiversity conservation, and the Sustainable Development Goals (SDGs) the study contributes to both applied policy debates and broader ecological science. It positions smallholder systems in Zimbabwe as living laboratories for testing concepts such as adaptive cycles, and institutional fit within socio-ecological systems. To unlock agroecology's full potential, Zimbabwe must: (1) develop a National Agroecology Strategy with clear implementation pathways; (2) integrate agroecology into public extension, research, and education systems; (3) build supportive markets and financing mechanisms; and (4) strengthen regional collaboration for policy convergence and shared learning. Future research priorities should extend beyond documenting outcomes to advancing ecological theory through long-term, landscape-scale monitoring of resilience processes, critical assessment of trade-offs during transitions, and theorization of how markets and governance structures mediate socio-ecological transformations. If adopted, this roadmap could transform Zimbabwe's food systems into resilient, equitable, and sustainable engines of development, while also advancing global ecological science. In doing so, Zimbabwe's agroecology movement offers not only policy lessons for Southern Africa but also theoretical insights of worldwide relevance into how coupled human–natural systems adapt, reorganize, and persist in the face of climate and economic shocks. Based on the evidence synthesized, Zimbabwe would benefit from developing a coordinated National Agroecology Strategy that aligns climate adaptation, nutrition, biodiversity, and seed-system reforms. Scaling agroecology requires stronger institutional anchoring in public extension, greater investment in farmer-led research platforms, and market innovations such as participatory guarantee systems and public procurement. Strengthening SADC-level collaboration can enhance policy convergence and shared learning across the region. These directions offer feasible pathways for transitioning towards resilient and equitable food systems.

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**Declarations**

**Conflict of interest** The author declares no competing interests.

**Ethics approval** This study is based solely on secondary data from published and publicly available documents. No primary data involving human participants or animals were collected, and therefore ethical approval was not required.

## REFERENCES

Africa Alliance for Food Sovereignty. 2023. *Seed sovereignty, A viable option for food and nutritional security in Africa*.

African Centre for Biodiversity. 2023. Policy brief: An assessment of support for agroecology in South Africa's Policy Landscape.

AFSA. 2017. A study of policies, frameworks and mechanisms related to agroecology and sustainable food systemas in Africa. *AFSA reports*: 1–64.

Anderson, C. R., J. Bruil, M. J. Chappell, C. Kiss, and M. P. Pimbert. 2019. From transition to domains of transformation: Getting to sustainable and just food systems through agroecology. *Sustainability* 11: 5272. https://doi.org/10.3390/SU11195272.

Belur, J., L. Tompson, A. Thornton, and M. Simon. 2021. Interrater reliability in systematic review methodology: Exploring variation in coder decision-making. *Sociological Methods and Research* 50: 837–865. https://doi.org/10.1177/0049124118799372.

Bezner Kerr, R., J. Kangmennaang, L. Dakishoni, H. Nyantakyi-Frimpong, E. Lupafya, L. Shumba, R. Msachi, G. O. Boateng, et al. 2019. Participatory agroecological research on climate change adaptation improves smallholder farmer household food security and dietary diversity in Malawi. *Agriculture, Ecosystems & Environment* 279: 109–121. https://doi.org/10.1016/J.AGEE.2019.04.004.

Biovision Africa Trust. 2025. *Review of the African Union Ecological Organic Agriculture Initiative (EOAI) Strategic Plan (2015–2025) Coordinated By: Biovision Africa Trust*.

Bramer, W. M. 2018. Reference checking for systematic reviews using endnote. *Journal of the Medical Library Association* 106: 542. https://doi.org/10.5195/jmla.2018.489.

Campbell, B., P. Frost, H. Kirchmann, and M. Swift. 1997. A survey of soil fertility management in small-scale farming systems in North Eastern Zimbabwe. *Journal of Sustainable Agriculture* 11: 19–39. https://doi.org/10.1300/J064v11n02_04.

Chiduwa, M., P. Marenya, H. Ngoma, and V. Chimonyo. 2023. Opportunities for agroecological transition in Zimbabwe: A review current policies.

Chimonyo, V. G. P., T. Sibanda, D. J. Choruma, G. N. Falconnier, and F. Baudron. 2023. *Agroecological Living Landscapes: A Context Assessment in Murewa, Zimbabwe*. CGIAR.

Chiturike, P., J. Gotosa, I. W. Nyakudya, S. M. Madamombe, R. Mandumbu, N. Chirinda, A. T. Kugedera, and G. Nyamadzawo.

2024. The effects of contour-based rainwater harvesting and integrated nutrient management on maize yields in semi-arid regions of Zimbabwe. *CABI Agriculture and Bioscience* 5: 1–14. https://doi.org/10.1186/s43170-024-00233-2.

Ewert, F., R. Baatz, and R. Finger. 2023. Agroecology for a sustainable agriculture and food system: From local solutions to large-scale adoption. *Annual Review of Resource Economics* 15: 351–381. https://doi.org/10.1146/annurev-resource-102422-090105.

FAO. 2018. *The 10 elements of Agroecology: Guiding the transition to sustainable food and agricutlural systems*. *FAO*.

FAO. 2023. *The State of Food Security and Nutrition in the World 2023*. *The State of Food Security and Nutrition in the World 2023*. FAO; IFAD; UNICEF; WFP; WHO; https://doi.org/10.4060/cc3017en.

Fereday, J., and E. Muir-Cochrane. 2006. Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International Journal of Qualitative Methods* 5: 80–92. https://doi.org/10.1177/160940690600500107.

Government of Zimbabwe. 2002. Environmental Managment Act of 2002 2004: Chapt 20:27.

Government of Zimbabwe. 2016. *Zimbabwe Climate Policy April 2016*.

Government of Zimbabwe. 2019a. National Adaptation Plan (NAP) Roadmap for Zimbabwe Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement Climate Change Management Department.

Government of Zimbabwe. 2019b. *National Agriculture Policy Framework 2019–2030*. *Government of Zimbabwe*. Vol. 12. Harare.

Greenberg, S. 2024. *Agroecology in Southern Africa: Financing the transition*.

HLPE. 2019. *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*.

Hodzi, B., and N. B. Maheve. 2024. Cultural ecology and agriculture in rural areas in Zimbabwe. In *Sustainable practices for agriculture and marketing convergence*, 105–123. IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-2011-2.ch005.

IPCC. 2022. *Point of Departure and Key Concepts. In: Climate Change 2022 – Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Climate Change 2022 – Impacts, Adaptation and Vulnerability*.

JBI. 2017. Checklist for systematic reviews and research syntheses. *The Joanna Briggs Institute*: 2017.

Jones, S. K., N. Bergamini, F. Beggi, D. Lesueur, B. Vinceti, A. Bailey, F. A. DeClerck, N. Estrada-Carmona, et al. 2022. Research strategies to catalyze agroecological transitions in low- and middle-income countries. *Sustainability Science* 17: 2557–2577. https://doi.org/10.1007/s11625-022-01163-6.

Kansanga, M. M., J. Kangmennaang, R. Bezner Kerr, E. Lupafya, L. Dakishoni, and I. Luginaah. 2021. Agroecology and household production diversity and dietary diversity: Evidence from a five-year agroecological intervention in rural Malawi. *Social Science & Medicine* 288: 113550. https://doi.org/10.1016/j.socscimed.2020.113550.

Katsi, M. 2025. *Field Days Spotlight Agroecology's Impact in Mutoko and Murehwa, Zimbabwe*.

Lark, R. M., I. S. Ligowe, C. Thierfelder, N. Magwero, W. Namaona, K. Njira, I. Sandram, J. G. Chimungu, et al. 2020. Longitudinal analysis of a long-term conservation agriculture experiment in Malawi and lessons for future experimental design. *Experimental Agriculture* 56: 506–527. https://doi.org/10.1017/S0014479720000125.

Lindsay, C., I. Blancquaert, and F. Rousseau. 2025. Tools used to appraise the quality of studies included in systematic reviews and meta-analyses in human genetics: A systematic review. *European Journal of Human Genetics*. https://doi.org/10.1038/s41431-025-01861-6.

Madsen, S., E. Laske, J. Fisher, A. N. Sall, S. Enloe, and R. Bezner Kerr. 2025. What good is agroecology? Predominant narratives about agroecology in Africa. *Journal of Rural Studies* 118: 103706. https://doi.org/10.1016/j.jrurstud.2025.103706.

Mafongoya, P., L. Rusinamhodzi, S. Siziba, C. Thierfelder, B. M. Mvumi, B. Nhau, L. Hove, and P. Chivenge. 2016. Maize productivity and profitability in conservation agriculture systems across agro-ecological regions in Zimbabwe: A review of knowledge and practice. *Agriculture, Ecosystems & Environment* 220: 211–225. https://doi.org/10.1016/j.agee.2016.01.017.

Manyanga, M., T. Pedzisa, and B. Hanyani-Mlambo. 2023. Adoption of agroecological intensification practices in Southern Africa: A scientific review. *Cogent Food & Agriculture* 9: 2261838. https://doi.org/10.1080/23311932.2023.2261838.

Mapfumo, P., T. Mapangisana, F. Mtambanengwe, S. MacCan, S. Siziba, Y. Muto, E. Makoni, H. Nezomba, et al. 2022. Farms in transition: Agroecological farming giving families an edge in the face of declining agricultural productivity and climate stress in Bikita, Zimbabwe. *Agroecology and Sustainable Food Systems* 46: 1386–1413. https://doi.org/10.1080/21683565.2022.2107596.

Mapungwana, D. 2022. *Determinants of Farmer Participation in Hybrid Maize Seed Contract Farming: A Case Study of Seed-Co Zimbabwe Growers*.

Mashapa, C., P. Zisadza-Gandiwa, E. Libombo, P. Mhuriro-Mashapa, N. Muboko, and E. Gandiwa. 2020. An assessment of women participation in community-based natural resource conservation in southeast Zimbabwe. *Open Journal of Ecology* 10: 189–199. https://doi.org/10.4236/oje.2020.104013.

Mchomvu, I. I. 2022. Effects of agricultural extension services and hybrid seeds on maize smallholder farmers in the Mtwara Region: The Case of Maize Farmers In Mtwara Region.

McHugh, M. L. 2012. Interrater reliability: The Kappa statistic. *Biochemia Medica* 2: 276–282. https://doi.org/10.11613/BM.2012.031.

Mouratiadou, I., A. Wezel, K. Kamilia, A. Marchetti, M. L. Paracchini, and P. Bàrberi. 2024. The socio-economic performance of agroecology. A review. *Agronomy for Sustainable Development* 44: 19. https://doi.org/10.1007/s13593-024-00945-9.

Mudzingwa, N., and M. R. Mambeva. 2018. *Farmer seed systems (FSS) in Sub-Saharan Africa A Study on Farmer Managed Seed Systems (FMSS) in Zimbabwe: Case Studies of Mutoko, Zvishavane and Masvingo Districts Implementing Organization: ZIMSOFF*.

Mugiyo, H., T. Mhizha, V. G. P. Chimonyo, and T. Mabhaudhi. 2021. Investigation of the optimum planting dates for maize varieties using a hybrid approach: A case of Hwedza, Zimbabwe. *Heliyon* 7: e06109. https://doi.org/10.1016/j.heliyon.2021.e06109.

Nair, A. 2019. Publication bias: Importance of studies with negative results! *Indian Journal of Anaesthesia* 63: 505. https://doi.org/10.4103/ija.IJA_142_19.

Nyagumbo, I., G. Nyamadzawo, and C. Madembo. 2019. Effects of three in-field water harvesting technologies on soil water content and maize yields in a semi-arid region of Zimbabwe. *Agricultural Water Management* 216: 206–213. https://doi.org/10.1016/j.agwat.2019.02.023.

Nyantakyi-Frimpong, H. 2019. Combining feminist political ecology and participatory diagramming to study climate information

service delivery and knowledge flows among smallholder farmers in northern Ghana. *Applied Geography* 112: 102079. https://doi.org/10.1016/j.apgeog.2019.102079.

Otieno, M. 2024. Sustainable agroecological practices in Sub-Saharan Africa in the face of climate change. *Advances in Geographical and Environmental Sciences*. https://doi.org/10.1007/978-3-031-70472-7.

Ouko, K. O., C. L. Yugi, M. O. Oketch, J. B. Mboya, R. J. Ogola, M. Muthoka, and D. C. Midamba. 2024. A review of the landscape of agroecology policies towards transforming food systems in Sub-Saharan Africa. *Cogent Social Sciences* 10: 2363491. https://doi.org/10.1080/23311886.2024.2363491.

Paez, A. 2017. Gray literature: An important resource in systematic reviews. *Journal of Evidence-Based Medicine* 10: 233–240. https://doi.org/10.1111/jebm.12266.

Page, M. J., D. Moher, P. M. Bossuyt, I. Boutron, T. C. Hoffmann, C. D. Mulrow, L. Shamseer, J. M. Tetzlaff, et al. 2021. PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ* 372: n160. https://doi.org/10.1136/bmj.n160.

Pretty, J., T. G. Benton, Z. P. Bharucha, L. V. Dicks, C. B. Flora, H. C. J. Godfray, D. Goulson, S. Hartley, et al. 2018. Global assessment of agricultural system redesign for sustainable intensification. *Nature Sustainability* 1: 441–446. https://doi.org/10.1038/s41893-018-0114-0.

Proudfoot, K. 2023. Inductive/deductive hybrid thematic analysis in mixed methods research. *Journal of Mixed Methods Research* 17: 308–326. https://doi.org/10.1177/15586898221126816.

Sharma, K., S. Roy, K. Rooma, N. Mahan, P. Kumar, M. Kumar, S. K. Singh, B. Kumar, et al. 2024. Principles and applications of agroecology: A review. *Journal of Scientific Research and Reports* 30: 843–853. https://doi.org/10.9734/jsrr/2024/v30i52002.

Snapp, S., Y. Kebede, E. Wollenberg, K. M. Dittmer, S. Brickman, S. Egler, C. Egler, and S. Shelton. 2021. Agroecology & climate change rapid evidence review: Performance of agroecological approaches in low-and middle-income countries: 1–58.

Thierfelder, C., W. Bunderson, and W. Mupangwa. 2015. Evidence and lessons learned from long-term on-farm research on conservation agriculture systems in communities in Malawi and Zimbabwe. *Environments* 2: 317–337. https://doi.org/10.3390/environments2030317.

Thomas, J., and A. Harden. 2008. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology* 8: 45. https://doi.org/10.1186/1471-2288-8-45.

Tittonell, P., A. Muriuki, K. D. Shepherd, D. Mugendi, K. C. Kaizzi, J. Okeyo, L. Verchot, R. Coe, et al. 2010. The diversity of rural livelihoods and their influence on soil fertility in agricultural systems of East Africa: A typology of smallholder farms. *Agricultural Systems* 103: 83–97. https://doi.org/10.1016/j.agsy.2009.10.001.

Tumbure, A., J. Dera, T. C. Kunjeku, and J. Nyamangara. 2022. Contextualising smallholder organic agriculture in Zimbabwe and other sub-Saharan African countries: A review of challenges and opportunities. *Acta Agriculturae Scandinavica Section B Soil & Plant Science* 72: 1020–1035. https://doi.org/10.1080/09064710.2022.2142657.

Wambua, V. *EOA-I 2022 Annual Technical Report Reporting on the EOA Initiative SDC Contribution by The Lead Coordinating Agency and Secretariat to the EOA Continental Steering Committee*.

Wezel, A., B. G. Herren, R. B. Kerr, E. Barrios, A. L. R. Gonçalves, and F. Sinclair. 2020. *Agroecological principles and elements and their implications for transitioning to sustainable food systems*. A review: Agronomy for Sustainable Development. Springer-Verlag Italia s.r.l. https://doi.org/10.1007/s13593-020-00646-z.

World Bank. 2022. *Africa's energy future: Challenges and opportunities. World Bank Publications*. Vol. 28.

Zenda, M., and M. Rudolph. 2024. A systematic review of agroecology strategies for adapting to climate change impacts on smallholder crop farmers' livelihoods in South Africa. *Climate* 12: 33. https://doi.org/10.3390/cli12030033.

Zikhali, W. 2018. Indigenous knowledge systems for development: A critical analysis from Nkayi District, Zimbabwe. *Advances in Social Sciences Research Journal* 5: 626–638. https://doi.org/10.14738/assrj.56.4752.

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