

STATUS OF AGROECOLOGY IN SOUTH AFRICA: A DIAGNOSTIC ASSESSMENT OF TRANSITION PATHWAYS IN SMALL-SCALE AND COMMERCIAL FARMING SYSTEMS

ÉTAT DE L'AGROÉCOLOGIE EN AFRIQUE DU SUD : ÉVALUATION DIAGNOSTIQUE DES TRAJECTOIRES DE TRANSITION DANS LES SYSTÈMES AGRICOLES À PETITE ÉCHELLE ET COMMERCIAUX

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ABSTRACT

South Africa is experiencing a gradual transition from conventional agricultural production systems towards more sustainable and regenerative farming approaches. Agroecology has emerged as a promising pathway for addressing challenges associated with climate variability, environmental degradation, biodiversity loss, and socio-economic inequalities. This paper presents the findings of a preliminary diagnostic assessment conducted across ten local municipalities in five provinces of South Africa to evaluate the status of agroecological adoption among small-scale, community-based, and commercial farming enterprises, representing diverse agroecological zones, production systems, and socio-economic conditions. Agroecological performance was assessed using an evaluation framework based on the thirteen principles proposed by the High-Level Panel of Experts (HLPE). Information was gathered through farmer interviews, focus-group discussions, stakeholder consultations, and field observations involving small-scale, community-based, and commercial farming enterprises. Results indicate that although a transition to agroecology is underway, adoption remains uneven across regions and farming sectors. Ecological principles associated with biodiversity, recycling, soil health, livestock integration, and reduced external inputs were commonly observed. In contrast, social dimensions such as fairness, governance, knowledge co-creation, and community empowerment were less developed and inconsistently implemented. Commercial irrigation enterprises demonstrated successful transitions towards conservation agriculture, diversified crop rotations, cover crops, silvopastoral crop-livestock integration, and agroforestry systems. Small-scale agroecological initiatives on the other hand relied heavily on support from community networks, non-governmental organisations (NGOs) and indigenous knowledge systems. These findings suggest that agroecological transition is underway in South Africa with producers already implementing practices aligned with agroecological principles, often without formally identifying them as such. However, broader adoption and long-term sustainability will require stronger institutional support, improved policy alignment, enhanced capacity development, strengthened value-chain integration, and greater investment in knowledge-sharing platforms that connect farmers, researchers, civil society organisations, with policymakers. These findings provide an important baseline for guiding future agroecological policy development and implementation in South Africa.

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Keywords: Agroecology; climate variability; socio-economic inequalities; biodiversity; recycling; soil health; cover crops.

RESUME

L'Afrique du Sud fait face actuellement à une transition progressive des systèmes de production agricole conventionnels vers des approches agricoles plus durables et régénératrices. L'agroécologie est devenue une trajectoire prometteuse pour relever les défis liés à la variabilité climatique, à la dégradation de l'environnement, à la perte de biodiversité et aux inégalités socio-économiques. Cet article présente les résultats d'une évaluation diagnostique préliminaire menée dans dix municipalités locales de cinq provinces en Afrique du Sud afin d'évaluer l'état d'avancement de l'adoption de l'agroécologie au sein des exploitations agricoles à petite échelle, communautaires et commerciales, représentant diverses zones agroécologiques, divers systèmes de production et diverses conditions socio-économiques. Les performances agroécologiques ont été évaluées à l'aide d'un cadre d'évaluation fondé sur les treize principes proposés par le Groupe d'experts de haut niveau (HLPE). Les informations ont été recueillies grâce à des entretiens avec des agriculteurs, des discussions en groupes de réflexion, des consultations avec les parties prenantes et des observations sur le terrain auprès d'exploitations agricoles à petite échelle, communautaires et commerciales. Les résultats indiquent que, bien qu'une transition vers l'agroécologie soit en cours, son adoption reste inégale à travers les régions et les secteurs agricoles. Les principes écologiques liés à la biodiversité, au recyclage, à la santé des sols, à l'intégration de l'élevage et à la réduction des intrants externes ont été fréquemment observés. Au contraire, les dimensions sociales telles que l'équité, la gouvernance, la co-création de connaissances et l'autonomisation des communautés étaient moins développées et mises en œuvre de manière inégale. Les exploitations commerciales irriguées ont démontré des transitions réussies vers l'agriculture de conservation, la diversification des rotations culturales, les cultures de couverture, l'intégration sylvopastorale entre cultures et élevage, ainsi que les systèmes agroforestiers. Les initiatives agroécologiques à petite échelle, quant à elles, s'appuyaient fortement sur le soutien des réseaux communautaires, des organisations non gouvernementales (ONG) et des systèmes de savoirs autochtones. Ces résultats proposent qu'une transition agroécologique soit en cours en Afrique du Sud, les producteurs mettant déjà en œuvre des pratiques conformes aux principes agroécologiques, sans nécessairement les désigner de cette façon. Cependant, une adoption plus grande et une durabilité à long terme nécessiteront un soutien institutionnel plus solide, une meilleure harmonisation des politiques, un renforcement des capacités, une intégration accrue de la chaîne de valeur et des investissements plus importants dans des plateformes de partage des connaissances reliant les agriculteurs, les chercheurs, les organisations de la société civile et les décideurs politiques. Ces résultats font partie d'une base de référence importante pour orienter l'élaboration et la mise en œuvre futures des politiques agroécologiques en Afrique du Sud.

Mots-clés: Agroécologie; Variabilité climatique; Inégalités socio-économiques; Biodiversité; Recyclage; Santé des sols; Cultures de couverture.

INTRODUCTION

Agricultural systems globally are facing increasing pressure to produce food sustainably while responding to climate change, biodiversity loss, soil degradation, water scarcity, and growing socio-economic inequalities. Successfully navigating these complex challenges is the cornerstone of the United Nations Sustainable Development Goals, specifically SDG 2 (Zero Hunger), which seeks to double agricultural productivity and ensure resilient food systems that leave no one behind (United Nations, 2015). Agroecology agri-food systems address the multifaceted crisis and is fundamental to achieving the United Nations Sustainable Development Goals, as sustainable agriculture serves as the critical bridge spanning SDG 13 (Climate Action) and SDG 15 (Life on Land) (United Nations, 2015). Conventional agricultural systems have contributed significantly to increased productivity over recent decades, but concerns regarding their environmental and social impacts have intensified. Climate change further exacerbates these challenges through rising temperatures, altered rainfall patterns, prolonged droughts, and more frequent extreme weather events.

As a result, there is growing recognition of the need for agricultural approaches that can simultaneously support food security, environmental sustainability, and social well-being.

Agroecology has emerged internationally as an alternative paradigm that seeks to transform agri-food systems by applying ecological principles to agricultural production while addressing social, cultural, and economic dimensions of sustainability. The Food and Agriculture Organization (FAO) (2018) defines agroecology as an integrated approach that applies ecological and social concepts and principles to the design and management of sustainable food and agricultural systems. Rather than focusing solely on production, agroecology considers the whole agri-food chain and promotes biodiversity, ecosystem services, local knowledge systems, social equity, and community resilience (FAO, 2018, HLPE, 2019). The HLPE identified thirteen interrelated agroecological principles that collectively support sustainable food-system transformation. These principles include recycling, input reduction, soil health, animal health, biodiversity, synergies, economic diversification, fairness, connectivity, participation, co-creation and sharing of knowledge, social values and diets, and responsible governance of land and natural resources. Together, these principles provide a comprehensive framework for assessing and guiding agroecological transition across diverse agricultural systems.

South Africa faces many of the challenges that have stimulated global interest in agroecology. The country's agricultural sector is characterised by considerable diversity, ranging from highly mechanised commercial enterprises to smallholder and subsistence farming systems. The country also spans a wide range of agro-climatic zones, from semi-arid regions in the west to humid subtropical environments along the eastern coastline. These diverse conditions create both opportunities and challenges for agroecological transition as each of the agroecological zones needs different interventions and can reach different optimal systems due to limitations of natural resources. Although agroecology has gained increasing attention within policy and academic circles, limited information exists regarding its current status and extent of adoption across South African farming systems. This paper presents findings from a preliminary diagnostic assessment undertaken to assess the current status of agroecology adoption in selected farming systems in various provinces of South Africa and identify opportunities and barriers for future up-scaling agroecology development.

MATERIALS AND METHODS

Study Areas

Exploratory assessments were conducted in ten local municipalities across five provinces of South Africa, representing a range of agroecological zones, production systems, and socio-economic conditions (Fig. 1). The sites were selected by the Project Reference Group of experts to cover the main agricultural production systems around South Africa. Therefore, they include LP_1: Greater Giyani and Greater Letaba as a summer rainfall semi-arid sub-tropical zone that supports sub-tropical fruits (mangoes, bananas, citrus), summer grains, extensive vegetable farming (such as tomatoes and potatoes) and livestock production (such as beef cattle ranching).

WC_2: Hessequa and Swellendam is included to represent the winter rainfall mediterranean climatic region often called the "breadbasket of the Cape," this agro-climatic zone is dominated by dryland (rain-fed) winter cereals and grains together with horticulture (berries, citrus, wine grapes, stone fruits) and extensive livestock (dairy, sheep (wool & mutton), goats).

KZN_3: uPhongolo, Jozini, and uMhlabuyalingana represent sub-tropical to tropical zone as it is a warm semi-arid to sub-humid sub-tropical/tropical transition zone with hot humid summer rainfall and very mild, dry winters, with the cultivation of commercial cash crops (sugarcane, cotton, timber), sub-tropical horticulture (citrus, mangoes, pineapples, bananas, spice/chilli) and livestock (extensive cattle, goats). FS_4: Nketoana and Setsoto represent the Highveld summer grain / dryland mixed farming agro-ecological zone with a temperate continental semi-arid climate with cold winters and summer rainfall with frequent afternoon thunderstorms and severe cold dry winters with frost. There are highly productive mixed farming systems with summer grains (maize, sunflower, sorghum, dry beans); winter grains (wheat); horticulture tree crops (cherries) and Livestock (beef cattle, sheep ranching) on natural sweet-

veld grasslands.

NC_5: Siyathemba represents the arid Nama Karoo zone with hyper-arid to semi-arid desert climate with extreme temperature fluctuations, very hot summer days and freezing winter nights accompanied by severe frost. The two contrasting agricultural production systems are veld-based extensive livestock (Dorper mutton sheep, Merino wool sheep, boer goats, beef cattle) and game ranching in contrast with river-based intensive irrigation crop farming (lucerne (alfalfa), wheat, maize, oats, cotton, pecan nuts, vegetables, wine/table grapes) (Fig. 1).

The assessment included both irrigated and rainfed farming systems and incorporated community gardens, small-scale producers, emerging farmers, and commercial farming enterprises from these five selected areas.



Figure 1. Local municipalities where assessments were conducted. Limpopo LP_1: Greater Giyani and Greater Letaba; Western Cape WC_2: Hessequa and Swellendam; KwaZulu Natal KZN_3: uPhongolo, Jozini and uMhlabuyalingana; Free State FS_4: Nketoana and Setsoto; Northern Cape NC_5: Siyathemba

Data Collection

Data were collected through a combination of community meetings, focus-group discussions, farmer interviews, stakeholder consultations, farm visits, and direct field observations. Participants included smallholder and commercial farmers, extension officers, non-governmental organisations (NGOs), farmer organisations, community representatives, researchers, and local government officials.

The participatory approach was designed to capture both technical and socio-economic dimensions of agroecological practices and to provide insights into local knowledge systems, institutional support mechanisms, production constraints, and opportunities for agroecological transition.

Agroecological Assessment Framework

The assessments were based on the thirteen agroecological principles developed by the High-Level Panel of Experts (HLPE, 2019) as an analytical framework. These principles encompass ecological, social, economic, and governance dimensions of sustainable agri-food systems and provide a comprehensive basis for evaluating agroecological transition.

Each farming system was evaluated using a structured assessment work sheet designed to determine the extent to which individual principles were reflected in farm management practices. Particular attention was given to: Biodiversity enhancement, Input reduction, Recycling and circular resource use,

Soil health management, Livestock integration, Economic diversification, Social equity and fairness, Connectivity between consumer and producer, Knowledge sharing and co-creation, Governance and participation.

A multidisciplinary team of researchers independently assessed each site using information gathered during stakeholder engagements together with field observations. Individual assessment sheets were subsequently consolidated and compared to develop an overall evaluation of the agroecological status of each farming system (Mashakeni, 2026). This process enabled the identification of strengths, weaknesses, opportunities, and constraints associated with agroecological adoption across the different study areas.

RESULTS

General Adoption Trends

Overall, the strongest levels of adoption were associated with ecological and production-oriented principles, while social, governance, and institutional dimensions generally lagged behind. This pattern was observed across both commercial and small-scale farming systems. The assessment revealed that agroecological transition is occurring throughout South Africa, but the pace and extent of adoption vary across regions, farming systems and production sectors. Adoption rates appear strongly influenced by access to technical support, farmer or smallholder networks and study groups, training opportunities, and institutional assistance (NGOs or government). Most farming systems incorporated at least some agroecological principles, although complete implementation of all thirteen HLPE principles was rarely found.

Frequently Applied Agroecological Principles

Several principles were consistently observed across both commercial and small-scale farming systems as the sites had been selected where either organic or conservation agriculture was reportedly being used. Input reduction was widely practised through reduced reliance on synthetic fertilisers and pesticides and increased use of organic amendments.

Biodiversity enhancement emerged as one of the most widely adopted agroecological principles across all study sites. It was evident through crop rotations, mixed cropping systems, and good integration of livestock enterprises into a mixed farming situation. Small-scale farmers frequently cultivated indigenous vegetables and maintained locally adapted livestock breeds, while commercial farmers increasingly diversified production systems to reduce risks associated with climate variability and market fluctuations. Many farmers demonstrated strong commitment to improving soil health through conservation agriculture practices, cover cropping, mulching, and/or compost application.

Recycling and circular resource use were widely practiced across both commercial and small-scale farming systems. Examples included livestock manure application, compost production, crop residue retention, use of household organic waste, water harvesting systems, and the reuse of biomass from invasive plant species. These practices contributed to improved nutrient cycling and reduced dependence on purchased agricultural inputs.

Water management emerged as a critical component of agroecological transition across all provinces. Commercial irrigation enterprises reported improvements in water-use efficiency through drip irrigation systems, enhanced soil infiltration, reduced runoff, cover crops, and increased soil organic matter. Small-scale farmers utilised roof-water harvesting systems, JoJo tanks, short-furrow irrigation systems, mulching, and other water-conservation techniques to improve water availability and resilience during dry periods (Chimonyo et al., 2026).

Economic diversification was increasingly important, particularly among farmers seeking to reduce vulnerability to climatic and market shocks. Economic diversification is vital for farmers to build resilience. By expanding income streams through different crops and livestock systems, agricultural

communities protect themselves from erratic weather events like droughts or floods, and unpredictable commodity prices. This adaptive strategy ensures stable livelihoods and food security, even in highly volatile environments (Grilli et al., 2024, Faye et al., 2025) due to shocks from climate variability and/or market volatility. There are a range of possible diversification strategies including mixed farming or additional enterprise options (crops, livestock, aquaculture, bees) and non-agricultural activities (agritourism, value-adding processing, off-farm employment) (Ahmed Yusuf, 2023).

Less Frequently Applied Agroecological Principles

Several agroecological principles were less frequently addressed by the farmers or gardeners or livestock owners across the assessed farming systems. These were primarily associated with the social, governance, and institutional dimensions of agroecology, which are often not regarded as integral components of traditional or conventional agricultural production systems. While many farmers were aware of or applied sound ecological practices, fewer had established mechanisms for participatory decision-making, equitable benefit-sharing, or collaborative innovation that are included as part of the principles of agroecology.

The principles that were most often neglected included fairness, social inclusion, natural resource governance, and knowledge co-creation causing initiatives to fall short of true food sovereignty. They were often absent or only weakly developed by one or two farmers in an area. The fairness and social inclusion were often overlooked as women and youth are marginalised although they carry the major burden of field labourers work but are excluded from land ownership, and leadership roles. Much of the governance of the natural resources (land, water, vegetation) is controlled at a plot level by the government and is not often as collective community assets (Swiderska et al, 2006). Knowledge co-creation is more prevalent in the smallholder community groups supported by NGOs as they belong to farmer-to-farmer learning groups where they readily exchange information. The exception is the strong study group movement amongst the Conservation Agricultural farmers in the Free State where they meet regularly and share their knowledge as well as conduct on-farm trials together with researchers (Maluleke et al., 2024, Asset Research, 2024). Many of the farmers relied on traditional knowledge handed down through the generations, while relatively few had any formal agricultural education or training. Some farmers had attended short courses or training about organic and/or conservation agriculture but found it difficult to implement such interventions on their own farms. These findings suggest that agroecological transition in South Africa remains focused primarily on production practices rather than broader agri-food-system transformation.

Agroecology in Commercial Irrigation Systems

Several commercial irrigation enterprises in the Northern and Western Cape demonstrated advanced transitions towards regenerative and agroecological farming systems. These farmers had been making changes over decades and usually had good study support groups that met on a regular basis to discuss opportunities and challenges. They were mostly educated in agriculture and were also well connected with farmers from other regions who were also making the transition to regenerative, organic, or conservation agriculture, as well as professional networks and had access to technical expertise.

Common practices observed on such farms included use of the following: No-till and minimum-tillage production systems; Permanent soil cover with multiple species swards; Diverse crop rotations including legumes; Cover crops and green manures; Integrated crop-livestock systems; Agroforestry and silvopastoral systems (fruit, nut trees, forage for livestock).

Farmers reported improvements in soil structure, infiltration, water-use efficiency, and resilience to climatic variability. This is in line with the growing body of empirical research confirms that agroecological interventions systematically restructure the soil matrix to mitigate climatic shocks (Vuth et al., 2026). By transitioning away from conventional inversion tillage and incorporating organic soil amendments, farmers can achieve a 12.9% to 19.4% increase in soil organic carbon alongside a 25% improvement in stable soil aggregation (Jayaraman et al., 2022). This structural improvement prevents surface crusting and maintains open biopores, which increases rainwater infiltration and reduces erosive runoff

(Mhlanga & Thierfelder, 2021). Furthermore, integrated management practices like mulching and cover cropping cut down on surface evaporation, boosting overall farm-level water-use efficiency by up to 40% (Keshyagol et al., 2026) (Table 1).

Table 1. Comparative Matrix: Soil Hydrology and Water Metrics

Hydrological Metric	Conventional Farming Setup	Agroecological Transition Setup	Key Biophysical Mechanism	Core Citations
Soil Organic Carbon (SOC)	Low to Declining (Degraded by continuous plowing and oxidation)	High Growth (12.9% to 19.4% increase over time)	Organic inputs and minimal soil disturbance accumulate stable carbon fractions.	Jayaraman et al. (2022) Audain (2025)
Soil Aggregate Stability	Poor / Fragile (Aggregates easily smash apart under heavy rainfall)	Highly Stable (20.7% to 25.9% improvement)	Mycorrhizal fungi and microbial glues (glomalin) bind soil particles together.	Jayaraman et al. (2022) Vuth et al. (2026)
Rainwater Infiltration	Low / Restricted (Surface crusting seals the soil profile)	Accelerated Rates (Remains open and absorptive)	Preserving natural root channels and earthworm biopores ensures deep water movement.	Mhlanga & Thierfelder (2021). Vuth et al. (2026)
Surface Runoff & Erosion	Severe Risk (Unprotected topsoil washes away easily)	Drastically Reduced (Water moves downward, not outward)	Surface mulch blankets absorb raindrop impacts and prevent soil detachment.	Keshyagol et.al. (2026)
Surface Evaporation	High Loss (Bare soil between rows is exposed to sun and wind)	Slashed Loss (Thermal barrier retains moisture)	Permanent crop residue or living canopy shields the soil from direct solar radiation.	Keshyagol et.al. (2026)
Water-Use Efficiency (WUE)	Inefficient Baseline (High percentage of applied water is wasted)	15% to 40% Increase (More water directly supports crop growth)	Maximised soil storage capacity coupled with minimized evaporative losses.	Keshyagol et.al. (2026)
Climatic Shock Resilience	Vulnerable / Rigid (High risk of crop failure during droughts or floods)	High / Adaptive (Buffers both extreme deluges and dry spells)	A porous, sponge-like soil profile stores deep water reserves and drains excess volumes.	Audain (2025) Vuth et al. (2026)

Increased biodiversity in the areas with higher species richness was reflected through greater abundance of beneficial insects, birds, and soil organisms as has been reported by Perez-Alvarez et al. (2026) Empirical meta-analyses confirm that transitioning from intensive monoculture to ecologically diversified systems significantly drives biological recovery. Specifically, studies demonstrate a 50% average increase in organism abundance, characterized by a heightened presence of avian populations, predatory insects, and underground decomposers (Bengtsson et al., 2005; Pfiffner & Stöckli, 2023). In multi-layered systems like silvopasture, this structural complexity promotes enhanced microclimates and habitat connectivity, fostering stable communities of beneficial insects, birds, and soil microbes (Kletty et al., 2023; Perez-Alvarez et al., 2026). Ultra-high-density grazing systems were increasingly used to improve pasture utilisation, stimulate biological activity, and enhance soil carbon accumulation (Truter et al., 2016).

Many commercial farmers indicated that rising fertiliser costs, increasing fuel prices, declining soil quality, and recurring droughts had initially motivated the adoption of regenerative farming approaches.

Agroecology Among Small-Scale Farmers

Small-scale agroecological initiatives were often strongly linked to local civil society or community organisations, farmer associations, and NGOs. These organisations provided training, mentorship, seed distribution, and market support while promoting traditional ecological knowledge and low-input farming approaches. Key practices amongst the small-scale farmers included: Cultivation of African

indigenous vegetables; Compost production using livestock manure and household organic waste; Water harvesting techniques; Short-furrow irrigation systems; Community seedbanks; and Mixed crop-livestock production systems. Community seedbanks played an important role in preserving locally adapted crop varieties and strengthening resilience against climate variability, pests, and diseases. Livestock production remained closely integrated with cropping activities through communal grazing systems involving cattle, goats, sheep, and poultry. Indigenous knowledge and local innovation played important roles in supporting agroecological management practices. Despite strong alignment with several agroecological principles, small-scale farmers faced substantial constraints, including limited access to finance, poor market access, inadequate infrastructure, restricted extension support, water scarcity, and limited bargaining power within agricultural value chains.

GENERAL DISCUSSION

The findings suggest that South Africa is experiencing a gradual but significant transition towards agroecological farming systems. However, transition pathways differ substantially between commercial and small-scale sectors and in different agroecological zones. Across study areas, farmers were observed to adopt agroecological principles incrementally in response to local environmental conditions, socio-economic circumstances, available resources, and institutional support. While the complete implementation of all thirteen HLPE principles was uncommon, most farming systems demonstrated elements of agroecological management, suggesting that agroecological transition is already underway across diverse agricultural sectors.

Commercial farmers often enter agroecological transitions through conservation agriculture and regenerative farming approaches motivated by economic sustainability and resource conservation. Small-scale farmers frequently engage through community-based initiatives focused on food security, local knowledge, local cultural values, household livelihood strategies and social empowerment. The findings also highlight the importance of support networks, training programmes, farmer organisations, and institutional partnerships in facilitating agroecological adoption. Sites where farmers were actively connected to non-governmental organisations, farmer associations, study groups, extension services, or research institutions generally demonstrated stronger implementation of agroecological principles. These observations reinforce the importance of farmer-to-farmer learning, participatory innovation, and knowledge-sharing platforms as key mechanisms for scaling agroecological practices. The role of social learning appears particularly important in enabling producers to adapt agroecological principles to local conditions and overcome technical and economic barriers to adoption. It also underscores the need to strengthen governance, social inclusion, and knowledge co-creation if agroecology is to achieve its broader transformational objectives.

A notable finding of the study is the contrast between the relatively strong adoption of ecological principles and the weaker implementation of social, governance, and institutional dimensions of agroecology. Biodiversity enhancement, soil health management, recycling, water conservation, and livestock integration were widely observed across the study sites. However, principles such as fairness, participation, connectivity, governance of natural resources, and co-creation of knowledge were generally less developed. This suggests that agroecological transition in South Africa remains largely focused on farm-level production practices rather than broader agri-food-system transformation. Without greater attention to these social and institutional dimensions, agroecology may not fully realise its potential to contribute to more equitable, inclusive, and resilient food systems.

Climate change adds further urgency to the agroecological transition. Increasing temperatures, greater rainfall variability, prolonged droughts, and growing water scarcity are expected to intensify across many regions of South Africa. The widespread adoption of practices that improve soil health, enhance biodiversity, increase water-use efficiency, strengthen nutrient cycling, and diversify farm enterprises suggests that agroecology can make an important contribution to climate adaptation and resilience. Improved soil organic matter, reduced dependence on external inputs, enhanced water infiltration, and diversified production systems all increase the capacity of farming systems to withstand environmental and economic shocks. Therefore, agroecology offers a practical way to simultaneously addressing food security, environmental sustainability, and climate resilience.

CONCLUSIONS

This preliminary diagnostic assessment demonstrates that agroecological transition is underway across diverse farming systems in South Africa. Adoption is evident among both commercial enterprises and small-scale farming communities operating under a range of climatic conditions in various agro-climate zones. The strongest evidence of agroecological adoption was associated with biodiversity enhancement, soil health management, recycling, integrated crop-livestock systems, water conservation, and reduced dependence on external inputs. In contrast, social and governance dimensions, including fairness, participation, connectivity, co-creation of knowledge, and natural-resource governance, were generally less developed. This suggests that while significant progress has been made in adopting agroecological production practices, broader agri-food-system transformation remains incomplete and requires greater institutional and policy support.

The findings further emphasise the importance of water management as a foundational component of agroecological transition. Across all study sites, improvements in soil organic matter, biodiversity, ground cover, and nutrient cycling contributed directly to enhanced water infiltration, reduced runoff, improved soil moisture retention, and greater resilience to drought. These outcomes are particularly significant in South Africa, where climate projections indicate increasing temperatures, greater rainfall variability, and growing pressure on limited water resources. Agroecological systems, therefore, offer important opportunities for both climate adaptation and mitigation while strengthening food security, environmental sustainability, and rural livelihoods.

Future efforts should focus on strengthening institutional support, farmer-to-farmer learning networks, value-chain development, and policy frameworks that encourage integrated agroecological development. Such interventions will be critical for scaling agroecology as a viable pathway towards climate-resilient and sustainable agri-food systems in South Africa.

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