RUFORUM Working Document Series (ISSN 1607-9345), 2024 No. 23 :165-195
Available from http://repository.ruforum.org

Research Application Summary

How can agroecology contribute to improving food security in Africa?

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Abstract

This discussion paper aims at exploring the potential of agroecology to improve food security, nutrition and the overall wellbeing in Africa in the face of the challenges posed by the growing population, climate change, rising cost of living, sociocultural and environmental pressure on the continent. Based on the FAO High Level Panel of Experts (HLPE) definition and the principles of agroecology, by using desk reviews and webinar series as the main methodology, the paper summarizes evidence-based benefits and challenges for the adoption of agroecological practices and explores open research questions on agroecology. The paper contributes to the support of FARA and RUFORUM to the Regional Multi-actor Research Networks (RMRN) in agroecology that will promote food and nutrition security and sustainable agriculture across Africa.

Keywords: Agroecology, FARA, Food and nutrition security, JRC, RUFORUM

Résumé

Cet article de discussion vise à explorer le potentiel de l'agroécologie dans l’amélioration de la sécurité alimentaire, la nutrition et le bien-être général en Afrique face aux défis posés par la croissance démographique, le changement climatique, l'augmentation du coût de la vie, ainsi que les pressions socioculturelles et environnementales sur le continent. En se basant sur la définition et les principes de l'agroécologie proposés par le Groupe d'experts de haut niveau (HLPE) de la FAO, et en utilisant des revues de littérature et des séries de webinaires comme principales méthodologies, le document résume les avantages et défis basés sur des preuves pour l'adoption des pratiques agro-écologiques et explore les questions de recherche ouvertes sur l'agroécologie. Ce document contribue au soutien de la FARA et du RUFORUM aux Réseaux Régionaux de Recherche Multi-acteurs (RMRN) en agroécologie, qui favoriseront la sécurité alimentaire et nutritionnelle ainsi qu'une agriculture durable à travers l'Afrique.

Mots-clés : Agroécologie, FARA, Sécurité alimentaire et nutritionnelle, JRC, RUFORUM

Introduction

The second Sustainable Development Goal (SDG 2) is to eliminate hunger and all forms of malnutrition in the world by 2030. But, despite recent advances in these areas, many countries on the African continent still face significant food insecurity challenges (, Xie *et al.,* 2021, FAO, 2024, FSIN *et al*., 2024). This has been recently aggravated by the Covid-19 pandemic bottlenecks, the Russian war against Ukraine and by climate related extreme events. Subsequently, over 20 percent of the continent's population (roughly 298.4 million people) face hunger (FAO, 2024).

Eight of the top 10 African countries experiencing acute food insecurity are facing national and regional conflicts; these represent about 82 % of the record of Africans facing acute food insecurity (Africa Center for Strategic Studies, 2023). Studies show that, 47.8 million people are in urgent need of assistance as a result of climate related shocks induced acute food insecurity in 12 African countries, (FSIN *et al*., 2024)

Moreover, projections by the United Nations Economic Commission for Africa report indicate that Africa's annual food imports are significantly increasing, by a factor of seven from $15 billion in 2018 to $110 billion by 2025, making it the only continent that imports more food than it produces (Armstrong, 2022). This dependency exposes African countries to the volatility of global markets, trade policies, and geopolitical tensions, which tend to disrupt food supply chains leading to shortages or price spikes (World Bank, 2020). This vulnerability and dependency is likely to induce a cascading effect on the continent's economic growth and self-sufficiency; especially when its population is likely to face a 50% increase by 2050 (Van Ittersum *et al.,* 2016, Berners-Lee *et al.,* 2018; Le Mouël *et al*., 2018). The surge in food demand as a result of rapid population growth and urbanization, together with change in diets is likely to cause substantial need to increase production, which presents a formidable challenge given current agricultural capacity.

Feeding the African continent is a complex and multifaceted challenge that involves many areas addressing issues related to agricultural productivity, distribution and access, economics, sociocultural structures, governance, and environmental sustainability. To tackle the current agronomic, environmental, social challenges and to improve food security; a transformation of the current agricultural sector and the food system is needed. This transformation must aim at boosting productivity sustainably while reducing chemical inputs and greenhouse gas emission, and enhancing resilience to climate change through regenerative agricultural practices such as agroecology, conservation agriculture, and organic farming. These approaches help create a more balanced and productive ecosystem, ensuring that agricultural land remains fertile and productive in the future; despite adverse weather conditions, pests and diseases conditions (IPCC, 2019). Efficient resource use also helps reduce the dependency on costly external inputs, making agriculture more economically viable and sustainable (FAO, 2021).

In particular, agroecology offers a holistic pathway to enhance food security and nutrition across Africa by addressing agricultural production, food system transformation and resilience building to climate change shocks. One of its characteristics is its capacity to ensure food security for smallholder farmers and poverty alleviation (Madsen *et al*., in press). Yet the transition towards agroecological food systems and the development of both productive and resilient farming systems and value chains are complex processes that require new knowledge, competencies and policies and the capacity to co-create solution based on agroecological principles and the integration of scientific and local knowledge.

This paper a) draws attention to the principles and benefits of agroecology, b) provides evidence from scientific literature that agroecology has the potential to minimize negative impacts while guaranteeing a sustainable production, c) points to research gaps for future research initiatives, d) documents agroecology initiatives to promote food security on the continent; and e) provides policy directions, implementation, investments, and support systems to initiatives such as the regional multi-actor research network (RMRN) project. The RMRN project is one of the AU-EU initiatives to increase science, technology and innovation capacities of regional centers of excellence in agroecology to contribute to a green transition in Sub Saharan Africa through actions that will enhance coherence and convergence of agro ecological innovations for a green transition in Africa. The initial draft of the paper was discussed at the side event of the second RUFORUM Triennial Conference held in Windhoek, Namibia in 2024. It builds on a review of scientific literature and two webinars on agroecology.[1] It was revised into its current version based on insights from participants during the side event.

Definition and principles of agroecology

Definition. The definition of agroecology has evolved significantly over time, reflecting changes in agricultural practices, scientific understanding and societal values (Gliessman, 2018). Originally, agroecology was primarily viewed through a bio-ecological lens, focusing on applying ecological principles to agricultural systems (e.g Bensin, 1930; Altieri, 1995; 2002; Gliessman, 2007). In earlier agroecological studies, agroecology was mostly concerned with studying the interactions between crops and their environment (Altieri, 2002). Emphasis was placed on the interactions between plants, animals, microorganisms and the farming systems with the aim of optimizing naturally agricultural productivity. In particular, enhancing functional biodiversity in agroecosystems was identified as a key ecological strategy to bring sustainability to production (Altieri, 1999).

In the middle of the 20th century, the scope of agroecology expanded to incorporate a broader ecological context including biodiversity conservation, soil health and ecosystem services (Altieri, 1995; Pimbert and Moeller, 2018). This contributed to the emergence of new concepts such as polyculture and integrated pest management as sustainable alternatives to monocultures (Altieri and Letourneau, 1982) and use of chemicals for pest control (Ahuja *et al*., 2015). Towards the end of the 20th century, the definition of agroecology started including socio-economic and cultural dimensions. Several scholars and practitioners recognized that sustainable agriculture cannot be achieved solely through ecological practices but must also address issues of social justice, economic viability, and cultural traditions, farmers' knowledge, and community resilience (Dubey, 2024).

At the beginning of the 21st century, Francis *et al*. (2003) and Gliessman (2015) broadened the scope of agroecology to the entire food system. This conferred to agroecology the entire socio-ecological spectrum that includes food production systems, societies, economic and political systems. In this perspective it is viewed as a more holistic approach that integrates ecological science with social and economic considerations, promoting food sovereignty and local food systems (THN and SOCLA, 2015, Altieri *et al*., 2017; Sanderson Bellamy and Ioris, 2017). It is widely accepted that agroecology is a science, practice, and social movement (Wezel *et al.*, 2011; FAO, 2018; Boillat *et al.,* 2022; Behl *et al.,* 2024).

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[1] Webinar "Exploring Agroecology: Current Insights and Emerging Research Frontiers", 5 May 2024, recording: https://www.youtube.com/live/rEqftSCPXjw

Webinar "From Degradation to Regeneration: Agroecology and Soil Health Research for Sustainable Agriculture in Africa", 17 July 2024, recording: https://www.youtube.com/watch?v=02VyzxP2bco

Agroecology has been defined by the High Level Panel of Experts (HLPE) on Food Security and Nutrition (HLPE, 2019) as

"*Agroecological approaches favour the use of natural processes, limit the use of purchased inputs, promote closed cycles with minimal negative externalities and stress the importance of local knowledge and participatory processes that develop knowledge and practice through experience, as well as more conventional scientific methods [...]. Agroecological approaches recognize that agrifood systems are coupled social–ecological systems from food production to consumption and involve science, practice and a social movement, as well as their holistic integration, to address food and nutrition security*".

Principles of agroecology

Agroecology seeks to create agricultural systems that are not only productive but also environmentally sound, socially equitable, and economically viable. The implementation of agroecology on the ground varies by socio-economic, cultural and agro-climatic context, reflecting agricultural practices, market opportunities, technologies, and societal norms. Agroecology therefore needs to be adapted to the specific local context. This is why defining principles is much more encompassing and universally applicable than identifying specific farming practices or sets of practices.

Agroecology is rooted in the following principles (HLPE, 2019; Source for text: https://www.agroecology-europe.org/our-approach/principles/:

1. **Recycling.** Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass.
2. **Input reduction.** Reduce or eliminate dependency on purchased inputs.
3. **Soil health.** Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and by enhancing soil biological activity.
4. **Animal health.** Ensure animal health and welfare.
5. **Biodiversity.** Maintain and enhance diversity of species, functional diversity and genetic resources and maintain biodiversity in the agroecosystem over time and space at field, farm and landscape scales. This improves resilience to pests, diseases, and climate variability and change. Intercropping, crop rotation, and integrating livestock and plants are among the practices for biodiversity enhancement.
6. **Synergy.** Enhance positive ecological interaction, synergy, integration, and complementarity amongst the elements of agroecosystems (plants, animals, trees, soil, water).
7. **Economic diversification**. Diversify on-farm incomes by ensuring small-scale farmers have greater financial independence and value addition opportunities while enabling them to respond to demand from consumers.
8. **Co-creation of knowledge.** Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.

9. **Social values and diets.** Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets.

10. **Fairness.** Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights.

11. **Connectivity.** Ensure proximity and confidence between producers and consumers through promotion of fair and short distribution networks and by re-embedding food systems into local economies.

12. **Land and natural resource governance.** Recognize and support the needs and interests of family farmers, smallholders and peasant food producers as sustainable managers and guardians of natural and genetic resources.
13. **Participation.** Encourage social organization and greater participation in decision-making by food producers and consumers to support decentralized governance and local adaptive management of agricultural and food systems.

Evidence from scientific literature on the impact of agroecology on food and nutrition security

Research on impacts of agroecological practices and agroecology as management system on food and nutrition security has been increasing in the last two decades as shown by the increasing number of research papers that include the term "agroecology" in title or abstract (Figure 1)

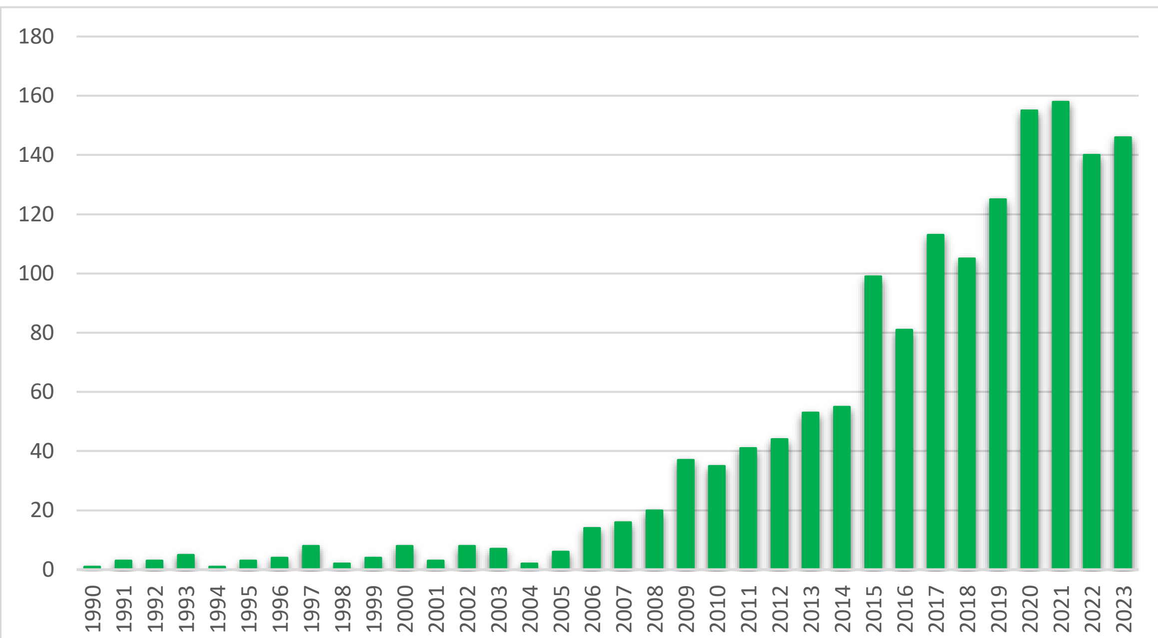

Fig. 1: Articles mentioning agroecology (or agro-ecology, or agroecological transition) in the title (source: Web of Science)

Nevertheless, research-generated knowledge needs to be structured in order to answer specific questions, such as "to what extent is agroecology - or the potential of agroecology - contributing to food and nutrition security". This section provides an overview about the implementation of agroecology, its impacts of food and nutrition security and knowledge gaps.

Major agroecological practices used and their adoption rate on the continent. Agroecological practices and systems need to be distinguished. The first can be individual practices for which there is evidence of increased beneficial impacts (and reduced negative ones) compared to conventional practices (a typical example is no tillage vs tillage), the latter is the adoption of a set of agroecological practices at the farm level, so that the whole farm is transitioning towards the adoption of the agroecological principles listed in section 2.2. The identification of a suitable set of agroecological practices depends on farm type, environmental setting and constraints (e.g. availability of water or not, soil type etc.), socio-economic characteristics of the farm and of the region.

Table 1 below summarizes the dominant agoecological practices across the farming systems of Africa and their rate of adoption (Akanmu *et al*., 2023). Efforts still need to be made to increase the adoption of agroecological practices.

Table 1. Dominant agroecological practices under different farming systems of Africa (Akanmu *et al*. 2023)

N.	Farming Systems	Dominant agroecology practices	Adoption Rate (%)	References
1	Irrigated	Rainfed cropping or animal husbandry, integrated irrigation- aquaculture (e.g. stocking fish in canals), inter-cropping, regenerative agriculture	2-5.0	LaCanne *et al.* 2018 FAO (2016, 2018) FAO *et al.* (2018) Giller *at al*. (2021) Gebregziabher (2013) Namara *et al*.(2011) Namara & Sally (2014)
2	Humid Lowland tree crop	Home Gardens, plantation crop combinations, multilayer tree garden, alley cropping and other intercropping systems	30-50	Garrity *et al.* (2012) Franzel *et al*. (2001) Warner (1993).
3	Forest based	Silvopasture, Agri-silviculture, alley cropping, windbreaks and shelterbelts, Home gardens, forest farming, riparian agroforestry, multistrata agroforestry,Taungya farming, community agroforestry	44-59	Shidiki *et al.* (2020) Hauser (2020)
4	Highland perennial	Horticulture, smallholder dairy, high quality coffee and smallholder tea.	55 -80	Sinclair *et al.* (2019) Lynam (2019)
5	Highland mixed	Draught animal plough, hand weeding and harvesting.	0-100	Akanmu *et al*. (2023) Kamau *et al*. (2024)
6	Root and tuber crop	Mechanization, minimal external inputs, livestock important, Medium use of tractors, high use of external inputs	20-60	Adjei-Nsiah *et al* (2012) Allemann *et al.* (2004)
7	Cereal-root crop mixed	Conservation agriculture (CA), agroforestry, integrated pest management (IPM) and integrated crop/livestock intensification	33-60	Kassam *et al*. (2019) Mponela *et al*. (2023)
9	Maize Mixed	Integration of crops, livestock, and trees, Minimum tillage, Use of cover crops, Crop rotation, Use of organic fertilizers and pest control methods	0-59.0	Pretty. *et al*. (2018) Morris *et al.* (2003a) Mshenga *et al*. (2016)
10	Agro Pastoral	Crop rotation, Intercropping, Mulching, Manure application and Integrated pest management	23-25	Vall *et al.* (2023) FAO (2024)

11	Pastoral	Integration of crop and livestock production, Rotational grazing, Use of fire and Indigenous knowledge	20-45	Boureima & Flury (2016) Krishna *et al*. (2021)
12	Arid Pastoral Cases	Rangeland management, Water management, Intercropping and multi-storey cropping, Agroforestry, Indigenous knowledge and Focus on local adaptation	60-70	Kurniawati (2017)
13	Fish based	Aquaponics, Integrated Fish Farming, Increased resource efficiency	40-50	Delgado (2003)
14	Perennial Mixed	Species diversification, multi-strata cropping, nitrogen fixation, organic matter management, integrated pest management, water conservation	40-80	Isgren *et al*. (2020) Grabowski *et al.* (2019)

Several factors have been identified to contribute to a low adoption of agroecological practices include farmers' motivation, ability, demand, legitimacy (Schoonhoven and Runhaar, 2018), which can be further classified into economic (Pannell, 1999; Hart *et al.*, 2016; Runhaar *et al*., 2017), social (Runhaar *et al.*, 2017), informational (Schrugren-Meyer, 2010; Sánchez *et al*., 2016, and political (Dumont *et al*., 2021) dimensions. The major obstacles that prevent large adoption of agroecology include:

- **Farmers' perception of agroecological practices:** farmers develop individual perceptions and preferences for innovation. These perceived perceptions significantly impact their technology adoption decisions (e.g Benitez-Altun *et al.*, 2021; Akpatcho *et al.*, 2022).
- **Limited access to extension and advisory capacity in SSA region:** Agricultural extension is recognized as a critical component for technology transfer (Bonye *et al*., 2012). In many African countries, the public extension and advisory services have been overwhelmed because of the competence of the extension workers, farmers to extension worker ratio, limited finance and bureaucracy, inadequate research and extension linkages; and policy focus (Raidimi and Kabiti, 2017; Nwafor *et al*, 2021). This has contributed to a significantly evolvement of the sector that currently includes' public, non-profit and private sector players. Several agricultural development initiatives are currently being experimented with the various forms of private extension and advisory services, unfortunately not necessarily affordable to the majority of farmers they are supposed to serve (Chapota, 2020). This makes the extension and advisory services one of the major threats to the sustainability of smallholder farmers (Mapiye *et al.*, 2021).
- **Policy and institutional barriers**: Several countries on the continent lack policies that support agroecology. Conventional agriculture, with its emphasis on high input monoculture systems, often receives more attention. Subsequently agricultural institutions and extension services are geared towards promoting conventional farming methods.

- **Economic and market constraints**: Because of the limited access to credit and financial resources, it is challenging for smallholder farmers to invest in the initial transition to agroecological practices. The situation can be significantly aggravated by lack or limited access to fair markets for agroecologically produced goods. Without robust local and regional markets, farmers may struggle to sell their diverse products at fair prices. Strengthening the farmer-consumer relationship and adequate link to markets can facilitate community-supported agroecological interventions. This can be done through Farmer Field Schools or innovation platform approaches that provide possibility to learn and participate in multi-stakeholder dialogues including with the private sector, companies who realize the benefit of agroecological products and engage in the processing, trading and selling it. The added value of these products need to be communicated to the consumer; i.a. by developing a low cost, reliable certification scheme.

- **Technical and knowledge barriers**: Agroecological principles and benefits are not known by many farmers, extension workers, researchers and policymakers. The facts that these practices are context specific also contribute in hindering the adoption of these practices and innovations. Very few agroecology academic training programmes exist on the continent ad most of them are less than five years. Subsequently, there are very few professionals trained in the continent to provide agroecological solutions to existing production and environmental problems.

- **Socio-cultural challenges:** Farmers can be skeptical to experiment new practices and changes those which have stood the test of time, and transmitted through generations. In other circumstances traditional practices and cultural norms may hinder the adoption of new farming methods, including those under agroecology. Successful agroecological practices will require collective action and cooperation, which can be challenging in communities with diverse interests and varying levels of social cohesion.

- **Environmental constraints:** While agroecology can enhance resilience to climate change, the most effective practices that effectively reduce the impact of extreme weather events and changing climate patterns need to be identified. However, this may be a very long term process. In addition, restoration of degraded lands, to a state where they can support diverse agroecological systems can also be challenging, energy and time consuming. Equally challenging is the state of roads and storage facilities which will limit the access to market, quality seeds, inputs and reduce post-harvest losses.

- **Political and governance issues:** In regions with political instability and conflict, it is challenging to implement and sustain agroecological initiatives. Weak governance structures and corruption can divert resources and support away from agroecological programs and towards less sustainable agricultural practices.

Impacts of selected agroecological practices on food and nutrition security. The first question that an assessment of agroecology impacts needs to answer is how a wider uptake of agroecological practices impacts yields, and subsequently food and nutrition security. Pretty (2006) analyzed 286 agroecology projects from 57 countries across the world and observed from 350 reliable yield comparisons of 198 projects, the mean relative yield increment was 79.2% across the very wide variety of systems and crop types. In about 25% of these projects relative yield increment was above 200%; while 50% had yield increment between 18% and 100%.

The above findings are supported by several meta-reviews (Paracchini *et al.*, 2020, 2022; Bezner Kerr *et al.*, 2021; Faure, 2024). Bezner Kerr *et al.* (2021) found evidence of positive outcome of agroecology practices in 78% of 56 scientific publications she reviewed of households in low and middle-income countries. Some studies found mixed outcomes, and a few studies reported negative outcomes. Agroecological practices included crop diversification, agroforestry, integrating crop and livestock, and organic soil amendments. Of these, more complex systems such as mixed crop-livestock systems were more likely to have positive food security and nutrition outcomes. Studies with more robust evidence of impact had interventions that more often included participatory approaches and efforts to address gender inequality (Bezner Kerr, 2021; Faure, 2024).

A review by Paracchini *et al.* (2020, 2022) of agroecology in 26 developing countries (among them 19 countries in Africa) showed that more than 50% of the studies reported a positive contribution on crop yield and food security. Dittmer *et al*. (2023) reported from an analysis of 50 peer-reviewed papers, from which 70% were in Africa, that agroecology had a positive outcome on crop yield for 63% of them. This is also illustrated by results from 30 long-term experiments across Europe and Africa (Mc Laren, 2022; Faure, 2024).

More recently, a systematic review by Madsen *et al.* (in press) found overwhelmingly positive outcomes associated with use of agroecological practices from all investigated agro-climatic zones (humid, semi-arid, sub-humid), with SDGs 1 (no poverty), 2 (zero hunger), 8 (decent work and economic growth), and 13 (climate action) most frequently assessed. In particular, crop diversification and agroecosystem diversity were found to simultaneously lower production costs (SDG1) and boost yields (SDG2) through better soil health or agroecosystem resilience to climate events (SDG13/15), while reducing agrochemical pollution (SDG6) and improving biodiversity (SDG15). Moreover, 79% of analysed papers found that agroecological practices positively influenced two or more SDGs simultaneously.

Table 2. Effect of selected agroecological practices on food security

Country	**Staple crop**	**Cash crop**	**Agroecological practices**	**Food security**	**References**
Senegal	Rice, millet, sorghum and maize	Cotton, groundnuts, fruits and vegetables	Residue mulch , crop mixtures or intercropping and rotations	Positive	Paracchini *et al*., 2020; Bright *et al.* 2017; Badiane *et al*. 2001, Stoate *et al*. 2008, Trail *et al*. 2016
Mali	Millet, sorghum, and maize, yams and cassava, Rice, groundnut, sugarcane, tobacco, and tea	Vegetables and fruits, including cabbages, turnips, carrots, beans, tomatoes, bananas, mangoes, and oranges	Crop residue management, cereal-legume cropping rotations and intercropping, biological pest control through predator rearing, agroforestry, and the use of trees as fences	Positive	Payne *et al* 2011, Roge *et al* 2017, Sidibe *et al* 2017
Burkina Faso	Millet, sorghum, and maize	Cotton	Rope-livestock integration, the use of organic manure, conservation agriculture, the use of neem-based bio pesticides, agroforestry, and Zaï holes	Positive	Ouedraogo *et al*. 2001; Vall *et al*. 2017; Bambara *et al*. 2008; Billaz 2012
Niger	Millet, sorghum, cowpea, groundnut, cassava and rice.		Market gardening systems, agroforestry, home gardening, and mixed cropping systems, micro-dosing of fertilizer, biological pest control, intercropping, market-based diversification, demi-lunes and Tassa (planting	Positive	Payne *et al*, 2001, AFSA, 2015

			pits), organic fertilization and natural seed treatments		
Ghana	Maize, plantain, cocoyam and cassava, maize, legumes, cocoyam or yam	Coffee, cocoa, rubber and oil palm, tobacco and cotton	Shifting cultivation, bush fallow system, use of inorganic fertilizers, (intercropping, minimal tillage, residue management, manure application, contour ploughing, crop rotation, manure management and rainwater harvesting, crop rotation with legumes, using organic fertilizers,	Positive	Bandana *et al*. 2016, Alare *et al*., 2018
Togo	Millet, sorghum, and maize	Cocoa, coffee and cotton, tomatoes and onions	Extensive rain-fed crops and off-season small scale irrigated home-garden cropping, crop diversification and rotation, agroforestry and fertilization (mainly manure and organic compost)	Positive	Viscarra Rossel, 2019; Levard *et al*., 2018
Benin	Maize, cassava, sorghum, yam, cowpea and groundnut.	Pineapple, oil palm, cashew	Crop rotations with legumes, the return of crop residues, insect netting, crop associations in market gardening, and the use of organic insecticide	Positive	Maliki *et al*., 2012, Amouzou *et al*., 2019
Ethiopia	Wheat, coffee, barley, sorghum, beans, teff, noug, and rapeseed		Intercropping, soil bunds, grass strips, agroforestry systems, diverse polycultures, (inter and intra species diversity), water conservation practices (water harvesters), integrated crop livestock systems, integrated pest management, and direct seeding	Positive	Ayalew 2011, Hadgu *et al*., 2009, Feyisa *et al.* 2018
Kenya	Maize, cassava, rice, wheat, arrowroot, millet, potatoes and sorghum	Cotton, sugar, coffee, tea and chat	Terracing, soil bunds, crop residue management, manure use, zero tillage, and use of improved maize seeds	Positive	MEFE, in UNEP 2008, Quandt *et al*., 2019

Tanzania	Maize, beans, rice, sunflower, and cassava		Livestock integration, local varieties, no-till, maize-legume intercropping, crop rotation, cover cropping, mulching, terracing and contour ridges, and incorporation of organic fertilizers	Positive	Limbu *et al*., 2017
Malawi	Maize, groundnuts, soybean, sorghum, millet, cow pea, pigeonpea and mucuna		Intercropping, compost-manure application, mulching, and crop rotation, planting fertilizer trees and fruit trees	Positive	Jones *et al*., 2016, Kerr *et al*., 2016 Frimpong *et al*. 2016 and Kangmennaang *et al.*,2017
Zimbabwe	Maize, sorghum, millet, and groundnuts	Cotton, coffee, tea, and sugar	Integrated pest management, and livestock integration, conservation agriculture, organic production, urban farming, intercropping, crop rotation, reduced tillage, mulching and use of leguminous species and combinations of organic and inorganic fertilizers for soil fertility.	Null to positive, positive and negative	Manzeke *et. al*.,2012, Makate *et al*., 2016, Kutiwa *et. al*., 2010 and Mango *et al.*, 2017
Madagascar	Rice, cassava, beans, groundnuts and bananas		Composting; integration of trees; system of rice intensification (SRI); crop rotation; cover cropping (seasonal + semi-permanent); organic, fertilization; crop diversification; integration of livestock; use of grass strips; and integration of fish within rice paddy systems	Positive	Razafimbelo *et al*., 2018, Violas *et al*., 2018 ; Randrianarison *et al*,. 2017

Agronomic impacts. The impact of different agroecological practices has been reviewed by Beillouin *et al*. (2021), who compiled the results of 95 meta-analysis integrating 5156 crop diversification experiments (cover crops, crop rotation, intercropping, and mixtures cropping) conducted for over 84 years in different locations around the globe. The review showed that crop diversification had beneficial effects on agricultural production (a median increase of 14%). It also had effects on biodiversity (+24%, i.e., the biodiversity of non-cultivated plants and animals), several supporting and regulating ecosystem services including water quality (+51%), pest and disease control (+63%) and soil quality (+11%).

Integration_of legumes. A review of Peng *et al*. (2024) of 104 scientific papers showed a moderate increase in main crop yield, amounting to 2.6%. Leguminous cover crops showed the greatest potential for increasing yield (9.8%) particularly when paired with corn. The integration of legumes was of significant importance due to nitrogen fixation capabilities of legumes. This was achieved through a variety of methods, including intercropping, crop rotation, green manures, and agroforestry systems. A global systematic review has demonstrated that legume-based rotations yield more than non-legume-based cropping systems (Zhao *et al*., 2022). The study found based on 844 field observations in Africa that the incorporation of legumes into agricultural systems resulted in an average yield increase of 43%. This relatively higher increment in yield on the African continent was attributable to initial lower yield values before legumes were introduced. This is shown in many field studies: the use of improved legume fallows on maize in Zimbabwe and inter cropping with legumes and maize in Malawi resulted in improved maize growth and rehabilitated soil structure (HLPE, 2019). In various agroecological zones of Ghana revealed that rotating pigeon pea with maize can boost maize yields by 75–200% compared to predominantly maize-based farming systems (Adjei-nsiah, 2012). However, increasing legume production among smallholder farmers at scale depends on a strong knowledge base for ecologically tailored management practices across diverse environments and farming systems (McAlvay and Morgan, 2023).

Mixed cropping and crop rotation. mixed cropping is a method of increasing yields by enhancing resistance to adversity of abiotic stresses, which was previously used mainly to control the occurrence of pests, diseases and weeds (Newton and Karley, 2023; Borg *et al*., 2018). According to a review on studies conducted by Huang *et al*. (2024) mixing of cultivars increased crop yield by 3.82%, with a relatively high gain in rice (+16.1%), followed by maize (+8.5%), and were lowest in barley (+0.9%) and sorghum (no increase).

Mineral fertilizers, organic and bio-fertilizers. inorganic fertilizers have been widely applied to increase plant productivity in various grassland and cropland ecosystems (Li *et al.*, 2023). These are synthetized chemical compounds whose application increases aboveground biomass and lower plant diversity, with larger plant diversity losses as the amount and number of added nutrients increase (Harpole *et al*., 2016; Seabloom *et al.*, 2021). Organic fertilizers supply organic matter and nutrients to soil, thus increasing soil organic carbon (SOC), cation exchange, water-holding capacity, and microflora (De Melo *et al*.,2019). Inorganic fertilizers can complement agroecological practices, and their benefits appear to be most pronounced at lower levels of nitrogen fertilizer use, with diminishing returns as fertilizer application rates increase. Results in Cai *et al.* (2019) and Curadelli *et al*. (2023) showed that digestate fertilization produced yields 80% higher than the control. Yields were statistically similar to those obtained with conventional treatments with chemical fertilization (only 2% lower in average). Organic and biofertilizers demonstrate strong potential in addressing soil fertility, enhancing crop yields and contributing to the nutrient cycle in Africa (Freyer *et al.*, 2024). In order to utilize organic waste, early-stage waste separation is crucial to make household waste-based organic fertilizer production economically feasible and enhance the quality of organic fertilizers. Waste-based organic fertilizer production and use can yield various positive environmental impacts. These encompass mitigating soil and water contamination, reducing greenhouse gas emissions from landfills, increasing soil humus and nutrient content, improving nutrient availability and water holding capacity for soils, elevating the water table and positively influencing climate change mitigation. Resource recovery and reuse projects demonstrate heightened economic viability when external environmental and human health costs are internalized and positive effects are accounted for (Freyer *et al* 2024). Most efficient and environmental friendly biofertiliser need to be developed on the continent.

Integrated Crop-livestock systems (ICLS). a meta-analysis of 66 studies comparing crop yields in ICLS with unintegrated controls across three continents, 12 crops, and four livestock species showed that annual cash crops in ICLS averaged similar yields (-7% to +2%) to crops in comparable unintegrated systems (Peterson *et al.*, 2020). The dual-purpose crops (crops managed simultaneously for grazing and grain production), yielded 20% less on average than single-purpose crops. With the exclusion of dual-purpose crop, the crops under ICLS tended to yield more than in unintegrated systems in loamy soils. Such a nutrient recycling system created a positive balance, particularly for agro-pastoral farmers in West Africa or in proximal fields and home gardens (Diarisso *et al*., 2015). In Burkina Faso, ICLS through recycling of organic matter back into the soil enhanced soil fertility (Schlecht *et al*.,2006; Vall *et al*., 2023).

Agroforestry is a crucial component of agroecological transitions in many agroecosystems. Through mimicking natural forests, these systems offer multiple benefits such as soil fertility enhancement with carbon sequestration and recycling of other nutrients from deep soil layers, potential reduction in pest and disease pressure depending on the context, erosion control thanks to shade and roots, and adaptation to climate change thanks to shade and better water retention (Faure, 2024; IMAP online). In Kenya and Tanzania, agroforestry systems have shown an increase in maize yields by providing shade and reducing soil erosion, thereby improving the microclimate and soil conditions for crop growth (Kimaro *et al*., 2024; Lenga *et al.*, 2024). These systems exemplify how integrating trees with crops can lead to mutually beneficial outcomes for both the environment and food production. Niether *et al*, (2020) conducted a meta-analysis of 52 scientific publications, 80% of them from Africa (Ghana, Cameroon, Ivory Coast), and found that cocoa agroforestry systems outcompeted monocultures in most indicators. Cocoa yields in agroforestry systems were 25% lower than in monocultures, but total system yields were about ten times higher, contributing to food security and diversified incomes. This finding was supported by a similar profitability of both production systems. Cocoa agroforestry also contributed to climate change mitigation by storing 2.5 times more carbon and to adaptation by lowering mean temperatures and buffering.

Impacts on farmer livelihoods. Agroecology significantly impacts farmers' livelihoods, especially in rural and agrarian communities where farming is often the primary source of income (Onyenekwe *et al*., 2024). This is through increasing crop and livestock production. For small-scale farmers who depend on their production for food, this is especially crucial (Akanmu *et al*., 2023).

A review study, covering 80 peer reviewed scientific publications, commissioned by the EC-Knowledge Center on Food and Nutrition Security examined the socio-economic performance of agroecology (Mouratiadou, 2024). The study found that agroecological practices are associated more often with positive socio-economic outcomes across the broad range of evaluated metrics (51% positive, 30% negative, 10% neutral, and 9% inconclusive outcomes). While the overall trends are positive, there can be strong variation depending on parameters analyzed: the authors found a higher share of positive outcomes for income, revenue, and efficiency/productivity and negative outcomes for production costs and labour requirements. In a study conducted in Malawi, Bezner Kerr *et al*. (2019) noted that agroecological practices contribute to gender justice and social relations. The study underscored the critical role of reproductive labor, often carried out by women, in improving social relations and stressed the need to address gender dynamics in agrarian change and equity. Achieving food sovereignty involves challenging power dynamics at the household level, including income distribution and decision-making. However, gender considerations are frequently neglected in both theoretical discussions and practical applications of agroecology (Bezner Kerr *et al*., 2019).

Vanlauwe (2023) identified that the time required for soil health-restoring practices to show visible benefits is a major hurdle for smallholder farmers. Without short-term incentives, and given the complexity of information related to complementary practices, farmers may be hesitant to adopt some of the agroecology practices or transitioning towards agroecology. Zenda *et al*. (2024) noted that smallholder farmers in South Africa face challenges in adopting agroecological practices because of financial barriers from initial investments, social and cultural resistance, and institutional constraints such as limited technical support and market access. The initial adjustment period, with potentially lower yields, poses financial risks for those dependent on their agricultural output. It is worthwhile to note that the link between agroecology and food and nutrition security is often discussed from an agronomic perspective, its impact on household economics and social reproduction is less studied in Africa compared to other continents (Ume *et al*., 2022).

Impacts on Food Systems

Securing sustainable food production is one key concern on the African continent grappling with several challenges including population growth, ecosystem degradation, poor management of natural resources, climate change and variability. Agricultural management can in some cases (e.g. through monocultures, overgrazing, poor irrigation practices, excessive use of agrochemicals) contribute to environmental degradation (e.g. biodiversity loss, water pollution, soil erosion, soil salinisation). By integrating ecological principles, agroecology addresses environmental, social, and economic challenges food systems are facing. Its focus on biodiversity, soil health, resource efficiency, empowerment of smallholders, gender equity, food sovereignty, economic resilience, and supportive policies makes agroecology a powerful framework for creating sustainable and resilient food systems. The number of scientific papers strictly focusing on specific interface agroecology/food system is still limited (Madsen *et al*., 2023). In particular, the equity dimension of sustainable food systems, either territorial equity or equity between actors (e.g. gender equity, marginalized groups) is poorly explored, and similarly analyses of mid-stream segments of the food systems are lacking.

Impacts on healthy diets. Agroecology promotes agricultural practices that lead to more diverse, sustainable, and nutrient-rich diets (Altieri, 1999; FAO, 2018). Diversification of household production has a risk-spreading advantage (Meldrum *et al*., 2018) in case of crop failure or seasonal bridge (Devereux *et al*., 2012), and also enables farmers to produce a more diverse array of nutrients (Bezner Kerr *et al*., 2023). When transitioning to agroecology, farmers incorporate legumes, fruits, and vegetables alongside staple crops through techniques such as intercropping and crop rotation on their farms. Including in rotations crops of different periods of maturity is recommended. Legumes contribute proteins to a diversified diet which is of critical importance in addressing the pervasive issue of malnutrition and micronutrient deficiencies. Several authors (e.g Herforth, 2010; Webb-Girard *et al.*, 2012; Jones *et al.*, 2014; Powell *et al.*, 2015; Sibhatu *et al.*, 2015; Jones *et al.*, 2016; Lachat *et al.*, 2018; Luna-González and Sørensen, 2018) found a positive association between the number of crops grown and farm households' dietary variety. However, there is a need to increase aggregate yield and market access to allow food produced to reach the consumer (Martin-Guay *et al*., 2018; Vispute *et al*., 2023).

Impacts on climate change mitigation and adaptation. There is a large amount of scientific literature on the impact of agroecology on climate change impact. For example, Snapp *et al.* (2021) assessed evidence regarding (i) the impact of agroecological approaches on climate change mitigation and adaptation in low- and middle-income countries and (ii) the programming approaches and conditions supporting large-scale transitions to agroecology. They conducted a systematic review of more than 20,000 scientific articles, including 18 synthesis articles, and showed that the agroecological approach with the strongest body of evidence for impacts on climate change adaptation was farm diversification, while tropical agroforestry was strongly associated with carbon sequestration in biomass and soil. Mitigation of nitrous oxide (N_2O) was often associated with organic farming and ecological management of nutrients. As an ecosystem-based farming approach, agroforestry can strengthen climate resilience with multiple co-benefits, but trade-offs and benefits vary with the socio-ecological context. Agroecological practices can increase food systems resilience and provide mitigation measures. Further the authors show that agroecological approaches adopting more than one agroecological practice have more often positive climate change impact outcomes than negative, neutral or inconclusive outcomes across the broad range of mitigation type metrics evaluated.

Several agroecological practices can cope with climate variability and mitigate climate change. Practices such as agroforestry, integrating crop-livestock systems, mangrove silvo-aquaculture systems contribute to mitigate climate change and provide adaptive solutions (Kremen and Merelender, 2018, Sinclair *et al*., 2019; Weisberger, 2021).

Agroecological projects on the continent and capacity building. There are a multitude of continental and regional initiatives that promote agroecology, each tailored to the specific regional needs and challenges (Table 3). At continental level two initiatives stand out: The FAO projects aim at integrating agroecological principles into national policies and practices to enhance sustainable food systems. The Alliance for Food Sovereignty in Africa (AFSA) promotes agroecology among the smallholder farmers and advocates for policy change on the continent.

All initiatives and projects at regional level have a capacity building component as a core activity, ensuring that farmers have the knowledge, skills, and support necessary to implement and sustain agroecological practices. This is achieved through training, technical assistance, and community engagement. Farmers are engaged in research activities to co-develop and test agro ecological practices in some of the projects. For half of the project platforms for knowledge exchange between farmers, researchers, and policymakers were created. A few of the regional projects involved Higher Education and Research Institutions, to develop, test and disseminate agroecological innovations.

Table 3. Capacity building activities in continental wide projects on agroecology

Initiatives	Objectives	Capacity building activities
Food and Agriculture Organization (FAO) Agroecology Projects	To integrate agroecological principles into national policies and practices to enhance sustainable food systems. *Various countries across Africa, including North, West, East, Central, and Southern Africa.*	• Hands-on training and education to farmers on agro ecological practices such as integrated pest management, crop rotation, and organic farming • Strengthening local agricultural extension services to offer continuous support and advice to farmers • Partnering with universities and research organizations to advance the scientific understanding of agro ecology and develop new practices and technologies • Establishing online and offline platforms for knowledge exchange among farmers, researchers, and policymakers.

		• Training government officials on the principles and benefits of agroecology to influence policy development.
Alliance for Food Sovereignty in Africa (AFSA)	To promote agroecology and food sovereignty by supporting smallholder farmers and advocating for policy changes at the continental level. *Target: Over 20 countries across Africa, including East, West, Central, and Southern Africa regions.*	• Training sessions on agro ecological practices for farmers, community leaders, and agricultural extension workers • Strengthening local extension services to ensure ongoing support and advice for farmers practicing agro ecology • Engaging with policymakers to promote policies that support food sovereignty and agroecology

Table 4. Regional agroecology projects, aim and capacity building activities [2]

Region	Project	Hands-on training	knowledge exchange among farmers	Strengthening the capacity of CBOs	Involving local universities and research institutions	Establishing demonstration farms	Working with local governments to develop policies	Development of participatory research initiatives	Sub-grants	Creating platforms for knowledge exchange
Northern	*Scaling Up Agro-ecology in North Africa*	+	+	+		+	+			
Southern	*Climate-Smart Villages (CSV) in Southern Africa*	+	+			+		+		+

[2] This list is not exhaustive, more initiatives can be found here: https://onemillionvoices.agroecologymap.org/en/map

Eastern	*Sustainable Agriculture Practices in East Africa (SAPEA)*	+	+	+	+	+	+	+		+
	Agro ecology and Safe Food System Transitions (ASSET)									
	The Climate Resilient Agribusiness for Tomorrow (CRAFT) Project									
	The Biovision Foundation's Agroecology Program									
Central	*The Sustainable Agricultural Intensification Research and Learning in Africa (SAIRLA)*	+	+	+	+	+		+	+	
	Agro ecology Fund Projects The Congo Basin Forest Partnership (CBFP)									
Western	*Soil and Land Management in the Sahel (SLMS)*	+	+			+				

Open research areas to answer the question "How can agroecology contribute to improving the food security situation in Africa? The review of scientific literature provides evidence that agroecology can have a significant impact on food security and nutrition. However, there is no clear evidence as to what magnitude and degree the upscaling of agroecology can contribute to the food security and nutrition from the local to the territorial, national and continental level. As further confirmed by the discussions during the two webinars organized by FARA, RUFORUM and JRC, Research on agroecology in Africa must address several levels:

Understanding agroecological farming practices. Agroecological practices need to be adapted to the local conditions on farm and landscape level. A better understanding of biophysical processes (microbial interaction, linking genomics to soil functionality, role of phytomicrobiome on soil, plant health) and knowledge that supports the change of practices will help to increase production while safeguarding the ecosystem. This includes basic research on genetics and breeding, pest and disease management, reducing fossil fuel inputs, provision of ecosystem services, restoration of biodiversity and nature.

Agroecological practices are often analyzed in isolation. But, complex agroecological systems that combine multiple practices and landscape elements may yield better food security outcomes.

Therefore, research should study agroecological systems that combine more agroecological practices and include higher level of management practices and landscape elements. More evidence is needed on the potential of agroecology in terms of efficiency in general terms and in particular for improving yields and nutritional quality of products. Areas like vegetable production, cash crops, livestock, crop-livestock integration, underutilized crops, and post-harvest practices require further study (Paracchini, 2020, 2022).

Trade-offs also need exploration, i.e., considering labor requirements, investment costs, yield impacts and gender equality, and economic returns. Multidisciplinary analysis, on-station experiments, and participatory research can enlarge the understanding of these effects and interlinkages. Qualitative findings from social science could help evaluate the magnitude of positive or negative outcomes and the conditions under which these emerge and how they might change according to temporal and spatial scales (Mouratiadou *et al*., 2024).

Understanding the diversity of conditions under which agroecology enhances socio-economic and agronomic performance is essential. This includes analyzing farm characteristics, transition timing, farmer participation, and spatial-temporal variability (Mouratiadou, 2024). Long term, multi-disciplinary, multi-stakeholders' studies can help to generate context specific knowledge and innovations for adapted agroecological practices and technologies that offer sustainable pathways to address the challenges of hunger, malnutrition, and environmental degradation in different farming systems. This should also include innovations in the field of mechanization, use of geospatial data and digitalization.

Understanding agroecology and food systems. Many studies on agroecology address farm-scale and rural smallholders. There is a gap in considering all stakeholders connected to food systems, especially youth, mid-stream segments, urban consumers, food movements, and governments. A complete food system analysis requires a better understanding of the interaction between all food system actors.

Research should encompass the entire value chain, including storage, trade, marketing, processing, and private sector involvement. Knowledge on social and human capital along the value chains, such as market access, value chain functioning, employment opportunities, working conditions, and gender equity is largely missing. Metrics for socio-economic indicators would facilitate comparative studies (Mouratiadou, 2024)

The development of technical and social innovations along the value chain and new adapted business models will support the agroecological transition. Value chains linking urban and peri-urban/rural areas need to develop at territorial/landscape scale. Socio-economic research should further deepen the understanding of the market potential of agroecological products, i.a. with a focus on labeling, branding and certifications to ensure fair distribution of the added value among all actors involved in the value chain. (Faure *et al*., 2024) Little is known about consumer behaviour and how to link them to agroecological farmers.

Enablers of agroecological transformation. Identification of key factors that contribute to the successful implementation and up-scaling of agroecological practices and innovations is necessary. This includes information on conducive environments at various governance levels, policies impacting and support structures such as agricultural extension services.

Models simulating biophysical, economic, and social processes can inform decision-makers on the benefits of agroecology. However, primary qualitative and quantitative data on all on food system components, including production, supply chains, consumption patterns, and waste management, are often lacking. For these models a clear framework with defined system boundaries, knowledge on feedbacks and trade-offs within the system and clear parameters are needed. The European Commission and African partners engage in the development of models for agricultural transition on different scales. Cross-scale, cross-climatic zones, cross-dimension, and cross-value chain studies that explore trade-offs and co-benefits of agroecology transitions are scarce. Such multi-faceted research would be crucial for informing policymakers and private actors. The integration of innovative technologies, such as earth observation, artificial intelligence, machine learning, and blockchain, into agroecological research can bring numerous potential benefits, including enhanced data-driven decision-making, optimized resource allocation, and increased transparency throughout the food supply chain, ultimately contributing to a more sustainable and resilient agricultural system.

In summary, advancing agroecological research in Africa requires a multi-level approach, from farm-specific practices to broader food system analysis, fostering innovations and policies that support sustainable transitions. Addressing knowledge gaps and developing robust models are essential for understanding and promoting agroecology's role in securing a sustainable, equitable food future.

Recommendations for future R&I and the RMRN

This paper has documented that agroecology offers numerous benefits for sustainable agriculture and food security. However, actors willing to uptake agroecology face significant challenges, particularly in the African context. These challenges span from policy and institutional barriers, economic and market constraints, technical and knowledge barriers, socio-cultural challenges, and limited access to inputs.

The paper strongly advocates for the establishment and operationalization of initiatives such as the Regional Multi Actor Research Networks (RMRN) which target a broad range of stakeholders such as farmer representatives, food system actors, consumers, decision makers, extension and advisory service and scientists.

The paper proposes concrete actions that need to be undertaken by the implementers and funders of RMRN initiative to address some of the gaps identified by the paper to support the green transition of Africa through agroecology practices.

- **Multistakeholder Engagement for agroecological research and practice:** The RMRN will foster regional-based participatory research and engagements to ensure that agroecology practices and innovations are developed according to the needs of stakeholders. The analysed research gaps in section 5 provide a valuable starting point for discussion and priority setting, highlighting the need for more detailed knowledge on the impact of various agroecological approaches at multiple scales. Specifically, a deeper understanding is required at the local level to tailor these approaches to specific agroecological conditions, and at the regional and continental levels to inform advocacy efforts and policy decisions.

- **Networking**: FARA, RUFORUM and the sub-regional organizations (SROS)- ASARECA, CCARDESA, and CORAF- will support these engagements and facilitate the exchange and cooperation between the multi-actor networks. They will liaise with international and continental networks and organizations, such as Transformative Partnership Platform on Agroecology (TPP), Agroecology Coalition, CGIAR Initiative on Agroecology, FAO Knowledge Hub, Biovision, AFSA and others.

- **Capacity Building:** RMRN will provide training for researchers, scientists, extension workers, and policymakers in agroecological principles and practices. This action will strengthen scientific and technological capacities in agroecology to produce, collect, access, process, share data / information and carry out impactful research activities. This action will further ensure transformative quality research and scientific knowledge generation and dissemination on the continent. FARA and RUFORUM will support the RMRN in building up capacities and mutual learning. With scientific support of the JRC trainings on the use of Earth Observations, on agroecology in food systems and economic policy modeling are envisaged.

- **Policy Advocacy:** RMRN, together with the regional and continental structures will engage with decision makers to inform them of the benefits of agroecology in order to build up a broad recognition, build up supportive environments, and the integration, and consolidation of solutions and responses generated by research in agroecology. The RMRN will establish a platform for exchange and information sharing among policy makers', extension workers, farmers, and researchers.

- **Investment in Research:** RMRN, together with the regional and continental structures will call for increasing funding for agroecological research and innovation tailored to the diverse farming and food systems on the African continent. The research gaps provided can be an inspiration of where to support agroecological research on the continent. The project will further provide support to scientists in the RMRN to undertake case studies using existing earth observation data and tools and produce knowledge products on specific agroecological practices and approaches.

- **Infrastructure Development:** The SRO and the RMRN will strengthen their existing infrastructure with support tools to build up centres of excellence on agroecology for sustainable research and training capacities and structures on agroecology.

- **Generation of Reliable Data**: Inadequate data on agroecology (e.g. adapted agroecological systems, barriers for adoption, transformation of food systems, as well as impact research) on the continent has been observed. Where data exists, there is an identified lack of balance between quantitative and qualitative data. Quantitative data on the continent are often missing and absence of such information has represented a strong limitation to carry out a complete analysis of the link with food security. Overall, there is currently scattered knowledge on the functioning of agroecological systems, and a systemic approach to research should be adopted. The RMRN will support the generation of reliable quantitative and qualitative data on agroecology to support the generation of knowledge.

Acknowledgement

This paper is contribution to the second RUFORUM Triennal Conference held 12-16 August, 2024 in Windhoek, Namibia.

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