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Agroecology Issues in Agricultural Policy and Allied Science Policies in Tanzania

Devotha Baltazary Mosh¹*, Suzana Samson Nyanda¹ & Dismas Lyegendili Mwaseba¹

¹ Sokoine University of Agriculture, P. O. Box 3000, Morogoro, Tanzania.

* Author for Correspondence ORCID: <https://orcid.org/0000-0001-9925-0226>; Email: devotha@sua.ac.tz

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The science and philosophy of agroecology are widely proposed as substantial aspects of the agricultural transition toward a sustainable food system and an eco-friendly environment. Yet, the extent to which agricultural and other allied policies are embedded with agroecology issues is little known, especially in African countries. This study assessed what and how agroecology narratives are integrated, interpreted, or embedded in policies, acts, and regulations of agriculture and allied sciences. A mixed methods approach was employed. The findings revealed that agroecology is not clearly narrated in these policy documents. The policies do not mention agroecology directly, but they point out some disputes or elements such as biodiversity, crop diversification, agroforestry, conservation agriculture and cropping and grazing land rotation, which are relevant for agroecology intensification. This means that in these policy documents, narratives supporting agroecology are insufficient. Thus, we recommend that taking on board policy narratives that directly support the adoption and implementation of agroecological practices is imperative.

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INTRODUCTION

Agroecology is increasingly recognized as an important solution to transform the agricultural sector and globally mainstream in development. The agricultural sector is central to the economy in most developing countries, especially in Sub-Saharan Africa. In Tanzania, agriculture contributes 25% to the country's gross domestic product (GDP) and 85% of export earnings (AECF, 2022). It employs over 70% of Tanzania's population who live in rural areas and derive their livelihoods directly or indirectly from agriculture, with up to 80% of all agricultural produce being produced by smallholder farmers (World Bank Group, 2019; Wineman, 2020). The development of the sector is also important to address food insecurity, zero poverty, and environmental challenges (United Nations, 2021), affecting most of the marginalized social groups (e.g., subsistence farmers, landless, poor farmers, women, youth and people living with disabilities), who depend on agricultural systems (Mosha et al., 2022). This is supported by evidence that: poverty alleviation is significantly related to overall economic development, agricultural growth has the strongest effects on poverty alleviation than any other sector in many LDCs, and the agricultural sector contributes to zero poverty through creating employment as an income source. These forward and backward linkages within the sector and with other sectors of the economy provide an added stimulus for food, nutrition and income security, and subsequent for economic growth (AECF, 2022), and the creation of inclusive and sustainable food systems for all.

Tanzania, in her efforts toward the development of the agricultural sector, faces several challenges, both internal and external (Cioffo et al., 2016; Isinika et al. 2016). The internal challenges include lower crop production due to soil infertility, pests and diseases occurrence, dependence on rainfed farming, inadequate and poor infrastructure, and inefficiency of policy and institutional arrangements or frameworks; while the external difficulties include climate change, unreliable markets of agricultural commodities and inputs. Recent trends reveal price fluctuations

are due to global crises such as the recent residual effects of the COVID-19 pandemic and the Ukraine-Russia war. These challenges highlight the necessity to redesign more sustainable agricultural systems and create an enabling policy environment that achieves most of the Sustainable Development Goals.

The now widely adopted 2030 UN Sustainable Development Agenda links economic development with ecological sustainability (United Nations, 2021), and highlights that agroecology is a prominent solution to realise sustainability of agricultural and food systems. The United Nations Food and Agriculture Organization (FAO) is taking the lead in scaling up agroecology concepts and principles to improve food security, nutrition and simultaneously maintain the health of the environment and ecosystems (Biovision, 2019; Wezel et al., 2020). The initiative brings on board all the UN works with countries to build joint action and cooperation from the grassroots level to the highest level of power, anchored in eight ecological core principles: resource recycling and minimizing losses in agri-food systems; minimizing the use of external inputs; best practices and systems on local context, traditions, knowledge, and values; building and maintaining socio-ecological resilience; multi-functionality; complexity and integration; equitably; and co-creation of knowledge that nourish the soil, the environment, plants, animals, humans, and landscapes as a whole (Wineman, 2020; El Bilali et al., 2021: UN Food Systems Summit, 2021).

In recent decades, East African nations have raised interest in recognising the necessity of integrating agroecology into their agricultural initiatives, reflecting a growing commitment to sustainable food systems. Among these nations, Tanzania established a specialised desk within the Ministry of Agriculture dedicated to addressing agroecological issues, and so far, the government intends to foster a holistic approach to agriculture, culminating in the launch of the National Ecological Organic Agricultural Strategy in 2023. This is a forward step to guide the promotion of agroecological transition in the country.

Agroecology, by its very nature, is a multifaceted approach that has been worldwide acknowledged to foster sustainability through a provision of resilient solutions to pressing challenges, such as food insecurity and climate change and vulnerability. This is due to anchored numerous benefits including stabilising yields, enhancing productivity, improving soil health, conservating biodiversity, and reducing environmental pollution. Furthermore, agroecology embraces social and cultural sensitivity, ensuring that local communities actively participate in and benefit from these initiatives (Mdee et al., 2017; Bellwood-Howard, & Ripoll, 2020; Costantine et al., 2021; D'Annolfo et al., 2021; El Bilali et al., 2021; Kanjanja et al 2022).

Despite its recognized benefits, there remains a significant gap in how national policies and guidelines incorporate agroecology issues. This deficiency is particularly pronounced in contexts like Tanzania, where limited research has been conducted to explore the intersection of agroecological issues and existing agricultural and allied science policies. Ajates et al. (2018) emphasize that effective agricultural policy and institutional frameworks play a critical role in addressing the concerns faced by farmers in developing nations. Such frameworks are indispensable for guiding the adaption and implementation of proven agricultural innovations (Treakle, 2018; Mouratiadou et al., 2024). The United Nations (2021) further underscores the necessity of a supportive policy environment for the realization of sustainable agricultural transformation. This transformation is crucial for combating food insecurity, poverty and malnutrition.

A conducive policy environment is likely not only to foster the widespread adoption of agroecology knowledge and practices, but also can accelerate the achievement of sustainability targets linked to the Sustainable Development Goals (SDGs), and enhance agricultural transformation to be more resilient, equitable and productive. Given the promises that agroecology holds, it is imperative to evaluate the extent to which the agricultural policies in Tanzania, explicitly recognize and

integrate agroecological concepts and principles, while providing valuable insights and recommendations necessary to promoting agroecological innovations. In addition, the research insights will inform policy-making that aligns with sustainability efforts.

CONCEPTIONAL ORIENTATION

Why Agroecology?

Since agroecology emerged as a concept in the early 20th century, there has been an evolution of definitions and interpretations (E.g., Sevilla Guzmán et al., 2023; Wezel et al., 2014; Mouratiadou et al., 2024; Zenda, & Rudolph, 2024). The concept of agroecology, as articulated by Wezel et al. (2014) is a multifaceted approach to sustainable food systems. Wezel et al. (2014) furthermore, framed this concept as a scientific discipline, a set of practices, and as a social movement. As a science discipline, agroecology is the study of agroecosystems that aims to apply ecological concepts and principles for the design and management of sustainable food systems (Gliessman, 2013). Agroecology is a web of complex processes and dynamics that cut across multiple sectors (FAO, & INRAE, 2020). Agroecology is a holistic systems approach to agricultural production, which integrates socio-economic and political dimensions (Gliessman, 2016; Altieri et al., 2017).

As a set of practices, agroecology embodies a range of agricultural strategies/practices including, but not limited to, multiple-cropping, agroforestry, integrated crops and livestock systems, biological pest management, and the use of local seed varieties adept at resisting environmental stresses (Gliessman, 2013). Notably, these methods not only enhance biodiversity but also promote sustainable food systems, that have minimal environmental impacts (National Standard of Competency for Architects (NSCA, 2021). In addition, they play a crucial role in climate change mitigation and adaptation (IPCC, 2023).

In addition to its scientific and practical dimensions, agroecology also manifests as

a potential social movement. It cultivates a collaborative atmosphere that promotes congregation and co-creation of knowledge through the integration of traditional and indigenous knowledge and practices. This inclusivity empowers local communities by using cultural relevance and economic viability in production processes, thus fostering a sense of food sovereignty, that people have a choice in what they produce and eat (Alteri, 2017; Johansson et al., 2023). Additionally, the Food and Agriculture Organization (FAO) has highlighted the relevance of agroecology in attaining food systems through its global mandate, which advocates, efficiency, social inclusion, equality, resilience, and governance (FAO, 2018), which aligned with the overall goal of agroecology intensification. These underscore the necessity of supportive policy to rely on these objectives.

The FAO's "Common Vision for Sustainable Food and Agriculture" across agricultural landscapes and seascapes are based on five principles, which link to a wider definition of agroecology. These principles are: improving efficiency in the use of resources, conserving, protecting, and enhancing natural ecosystems, protecting and improving rural livelihoods, equity, and social well-being, enhancing the resilience of people, communities, and ecosystems and promoting good governance of both natural and human systems (FAO, 2018), all which are strong proponents of agroecological intensification, and thus all need good policy environment.

RESEARCH METHODOLOGY

Profile of the Study Site

Tanzania, a country of approximately 945,087 km², is characterized by its diverse environmental and climatic conditions. Out of this vast expanse, agricultural land constitutes about 40% of the total area, emphasizing the agricultural sector's significance to the nation's economy and livelihoods (Devisscher, 2010). The country's climate is influenced by various factors, including its topography, inland lakes, vegetation types, and

its geographical proximity to the Indian Ocean (FAO, 2018). This topographical diversity results in a wide array of precipitation patterns across the region, with annual rainfall varying significantly. Most regions receive less than 1,000 mm of rain per year, while the highlands and some areas in the Southwest enjoy more abundant rainfall, ranging from 1,400 to 2,500 mm annually. In contrast, the central region experiences a more arid climate, with average annual precipitation between 400 and 600 mm.

As of the 2022 census, Tanzania's population stands at approximately 61.7 million, with a population density of 67 individuals per km² (NSCA, 2021). Markedly, over 64% of the population reside in rural areas, relying heavily on agriculture as their primary source of food and income. This dependence underlines the critical role of agriculture that environmental conditions and rainfall patterns play in sustaining the livelihoods of the Tanzanians, reinforcing the need for a conducive policy to support this sector.

Data Collection Methods

To collect evidence on the agroecological issues entrenched in the policies and guidelines, we applied a rapid review methodology (Kerr et al., 2021), recognized as a useful tool for evidence-based decision-making at the policy level. However, we narrow down our review in the initial phase of the literature identification by focusing more on Tanzania's agricultural policy and allied science policies. This means that most of the information is drawn from secondary sources - review of institutional frameworks (policies, and laws/acts) and peer-reviewed journal papers. The authors selected relevant policy and institutional frameworks on the field of agriculture (the National Agriculture Policy of 2013); environment (National Environment Policy (1997) and National Environment Act (2004); forest (the National Forestry Policy of 1998); and water (the National Water Policy of 2002 and Water Resource Act No. 11 of 2009).

The scope of our review was deliberately narrowed during the initial literature identification phase, concentrating specifically on Tanzania's

agricultural and allied science policies. The methodology predominantly relied on secondary sources, encompassing a thorough review of institutional frameworks—policies, laws, and acts—coupled with insights derived from peer-reviewed journal articles. Key agricultural and allied policies evaluated in this review include the National Agriculture Policy of 2013, the National Environment Policy of 1997, and the National Environment Act of 2004. Additionally, overarching frameworks such as the National Forestry Policy of 1998, the Livestock Policy of 1997, and the National Water Policy of 2002, which is complemented by the Water Resource Act No. 11 of 2009, were also scrutinized. This comprehensive selection reflects a holistic approach to understanding the multifaceted nature of agroecological interactions.

Our review adhered to the PRISMA-TT protocol (Stevens et al., 2018), which comprises four distinct phases: identification of relevant literature, retrieval of abstracts or documents, assessment of eligibility, and final evidence retrieval. Each phase was meticulously executed to ensure the integrity and relevance of the collected data. In a nutshell, this rapid review underscores the critical relationship between agricultural policies and agroecological practices in Tanzania. By integrating diverse policy frameworks, this analysis provides a foundation for informed policy recommendations that address the pressing agroecological issues faced by the country. Through rigorous evidence collection and evaluation, stakeholders can better navigate the complexities of sustainable agricultural development in Tanzania.

RESULTS AND DISCUSSION

Alignment to Agroecology Issues in National Agricultural and Allied Sciences Policies

The National Agricultural Policy 2013

The National Agriculture Policy 2013, also thereafter referred to as NAP 2013 was inaugurated in 2013, as the principal institutional framework for agricultural development in Tanzania. The policy revolves around goals to

develop an efficient, competitive and profitable agricultural industry that contributes to the improvement of the livelihoods of Tanzanians, and the attainment of broad-based economic growth and poverty alleviation (URT, 2013). The policy provides a comprehensive framework on how the agricultural sector can be transformed, proposing solutions to challenges that hinder the development of the agricultural sector. The policy rightly notes that for agriculture to drive economic growth and overcome poverty alleviation, it is important to address the major challenges that impede agricultural productivity, including soil infertility, limited use of agro-inputs, low adoption of agronomic practices, dependence on rain-fed agriculture, inadequate agriculture support services, poor infrastructure, inefficient agro-processing industries, environmental degradation, and crop pests and diseases.

The National Agriculture Policy recognises the right to a green revolution^[1] and emphasizes the need to transform agriculture from subsistence farming to commercialization. More specifically, it promotes crop diversification to increase crop yields, and land protection through cover crops/mulching, mixed farming, intercropping, crop rotation and agroforestry. It also emphasizes the efficient use of irrigation water and intensification of wild and domesticated plant genetic conservation programmes (URT, 2013). Crop intensification is also a key element of agroecology, thus indirectly suggesting that agroecology can improve soil health and food systems.

The most elaborate policy statement in the NAP recognises the importance of organic farming. Clearly explains that organic foods, as products derived from certifiable farm management systems use land husbandry techniques and biological methods instead of synthetic inputs and lower use of fossil fuels (URT, 2013 p.25). According to the policy statement, the commercial value of organic products depends upon an established marketing channel and reliable certification mechanism for organic production systems. Organic farming is another window of opportunity that can enhance

household incomes and national economic growth. However, the policy recognizes the fact that the production and productivity of organic farming are usually low (URT, 2013). This statement reminds us that for agroecological transformation to happen, the agroecological principles ought to be embedded in the coming National agriculture policy.

Furthermore, the NAP of 2013 outlines environmental aspects such as water and biodiversity management to avoid environmental degradation, this is allied with agroecology practices. However, we found that the NAP has not integrated the agroecology principles and the fact that the term agroecology has not appeared in the policy document. This can be explained by the fact that in 2013, agroecology was not or less familiar to scientists and policymakers in Africa. The FAO conference inaugurated agroecology in 2014, one year after the formulation of Tanzania's national policy of agriculture. The NAP of 2013 highlights the low productivity of productive resources (e.g., land, labour and inputs) as one of the critical weaknesses of Tanzanian agriculture, but there has not been clearly and explicitly emphasised the use of agroecology principles to address the challenges (URT, 2013). The policy statements also promote intensification through agrochemicals, which is against the principles of agroecology. The policy recognises that crop production is affected by pest infestations and disease infections, often at epidemic proportions. Various fungi, bacterial and viral diseases are common pests affecting crop production and food security (URT, 2013).

Our findings reveal that the NAP of 2013 has not highlighted directly the importance of agroecological practices and Indigenous knowledge among the potential solutions to contemporary and persistent challenges of agriculture. Thus, ecological changes in the agricultural sector cannot be promoted without comparable changes in the social, political, cultural, and economic arenas, which are key determinants of agriculture improvement (Johansson, 2023). Making agroecological practices work for countries in Africa, especially

in SSA calls for a dramatic shift that looks at sustainable food systems, with minimal or no environmental impacts. This can be possible through ecological upscaling through supportive policies and budgetary allocations (Anderson, & Maughan, 2012; Ouko et al., 2024). In addition, Kerr et al (2024) argue that efforts to transform the life of rural households into sustainable livelihoods in terms of social and economic gains need holistic agroecological efforts. A question of the appropriate policies that take on bold agroecology issues is crucial for a nation looking to embark on an ecological organic agricultural transition.

The policies must comprehend the prerequisites for a successful policy, with components that will promote the adoption and effective scaling up of agroecology principles. This means the current subsidies and policy incentives that support conventional approaches to agricultural development must be re-designed with current traditional knowledge of social groups and environmental protection in consideration, both in the short-term and long-term run. These findings support Altieri's (2017) and Johansson's (2023) arguments that institutional mechanisms including laws, rules, regulations, partnerships, and educational processes must change to enable the agroecological approach to grow.

The National Environment Policy (1997 & 2021) and Environment Management Act (2004)

The National Environment Policy (NEP) of 1997 provides policy objectives for multiple sectors, namely, agricultural, livestock, water and sanitation, health, transport, energy, mineral, land, industry, tourism and wildlife, forestry and fisheries (URT, 1997). The NEP of 2021 (which is the most recent) defines the broad meaning of environment to include air, land and water, as well as plant and animal life including human and socio-economic aspects. It further recognizes that the lives of all people are connected to the environment and that the survival of the current and future generations depends on a harmonious relationship with the natural environment. It is worth noting that the intensification of agriculture

as a result of the green revolution and industrial agriculture in 1980 put pressure on natural resources, contributing to environmental degradation and pollution.

On recognizing these, the NEP of 1997 (URT, 1997) includes statements linked to agroecology and agroecological intensification, like "...promotion of mixed farming to intensify biological processes on farmland through multiple cropping, intercropping, crop rotation and agroforestry". (pp 19) and "...Intensification and diversification of agricultural production" (pp 19). However, the policy is rather silent on principles that support harmonious relationships between people and the environment, which are principles that are foundational for agroecology.

The NEP of 1997 also discusses issues related to agriculture. It clearly states that the main objective is to ensure food security and the eradication of poverty eradication through the promotion of production systems, technologies and practices that are environmentally sound. Specific policy objectives are to: Improve land husbandry through soil erosion control and soil fertility improvement; intensify and diversify agricultural production; manage agrochemicals; improve water use efficiency in irrigation such as control of water logging and contamination.

The Environment Management Act of 2004 also states that a healthy economy and a healthy environment go hand in hand and that both are needed for the survival and prosperity of Tanzanian society (URT, 2020). Progress is crucial on three fronts: raising and sustaining productivity; diversifying production and trade; and keeping the environment safe for more sustainable development. Sustainable development means achieving a quality life that can be maintained for many generations that is socially desirable, economically viable, and environmentally sustainable. The Environment Management Act of 2004 further recognizes that development is sustainable if it takes place within nature's tolerance limits, both from short- and long-term perspectives.

The NEP of 1997 calls for Tanzanians to recognize the various demands made upon their environment and reconcile these in ways that seek to maintain and also improve the environment for the future. Agroecology might provide the solution, as smallholder farmers undertake production while considering the opportunities provided to the environment and resilience to climate change (Zenda, & Rudolph, 2024). According to Ray (2019), the majority of smallholder farms employ traditional farming practices, with key enterprises focusing mostly on crops and animals that serve as both food and income sources. The Environment Management Act (2004) highlights a need for the government to mainstream environmental sustainability strategies into the core of national development policy, and that all development initiatives should have a common goal to keep the environment at its carrying capacity (URT, 2020).

The NEPs further point out the negative outcomes on natural resources and the environment by promoting agriculture as an engine for economic growth. The expansion of agriculture could imply bringing more land into production from existing forests and woodlands; wildlife areas; and wetlands; expanding irrigated agriculture accompanied with salinization and water-logging; and increasing the use of agrochemicals with risks of overuse of both inorganic fertilisers and pesticides that could threaten the quality of surface and ground water. This type of agricultural promotion has been influenced by development strategies through conventional agro-industrial approaches (Swai et al., 2022). Even though economic and institutional interests have supported research and development for the conventional agro-industrial approach of development, research and development for agroecology and other sustainable agricultural approaches have been largely ignored and not favoured (Swai et al., 2022). Only in recent years, there has been a growing realization of the advantages of alternative agricultural technologies. The evidence shows that sustainable agricultural systems with holistic agroecological approaches are economically, environmentally

and socially viable and consequently contribute positively to livelihood enhancement (Gambart et al., 2020).

The Environment Management Act (2004) points out that Tanzania is one of 14 biodiversity hotspot countries in the world. This means, the country is enriched with biodiversity thus proposes the need to undertake programmes for conservation and biodiversity use to prevent and control drivers of biodiversity loss (URT, 2004). Ideal interventions are those based on the people's initiatives and for which solutions are geared towards experienced and perceived needs, thereby diminishing the gap between theory and practice. The act emphasizes the necessity of governmental institutions to exercise a bottom-up approach to biodiversity management. The ability of local communities to scale up innovations through farmer-to-farmer research and extension approaches has been emphasized by Holt-Gimenez et al. (2013) and Johansson *et al.* (2023). Agroecological strategies need to deliberately target the poor, and not only aim to increase production or benefit nature conservation (URT, 2020). Also, they should emphasize that farmers' own initiatives align well with agroecology for the development of sustainable agricultural technologies.

The livestock sector is another sub-component in the NEP of 1997, aimed to stimulate the development of the livestock industry in the country while also taking care of the environment (URT, 1997). Moreover, the Livestock sector has its policy, which was formulated in 2006, but has no mention of agroecology. The reason behind this is the same because the principles and concept of agroecology became active in 2014 introduced by FAO. The specific policy objectives are (i) improvement and conservation of grazing lands and preservation of feed resources; (ii) restoration and protection of grazing lands; (iii) promotion of rotational grazing; and (iv) promotion mechanisms for resolving conflict among different land users' interests, especially the more recent growing conflicts over land between farmers and pastoralists (e.g., Johansson *et al.*, 2023). For example, rotational grazing is the traditional way to conserve grazing land and

preserve feed resources and is a good method to promote agroecology transition.

The policy highlights very clearly that rotational grazing is an effective way to constantly supply cattle with food, allow rapid pasture regrowth, and evenly distribute manure to farm fields, which is also supported by Altieri, & Rosset (2007). Pastures can be inextricably linked to crops and crop residues in many farming systems, for example, maize production. The benefits of livestock integration with crops and other farm resources are important to optimize production efficiency, nutrient cycling, and crop protection. It is against this evidence; we argue that the NEP has statements that if well implemented address agroecological intensification and transformation.

The National Forestry Policy (1998)

The National Forest Policy (NPF) was formulated and adopted in 1998. The policy seeks to ensure sustainable and equitable use of resources for meeting the basic needs of the present and future generations without degrading the environment (URT, 1998). The policy encourages the sector to develop a sustainable regime for soil conservation and forest protection through afforestation, catchment conservation and freshwater availability. Specifically, policy objectives include the promotion and enforcement of rational exploitation of forest resources; and afforestation to meet requirements of domestic consumption and export earnings in a sustainable manner. Natural forests with a high biological and genetic diversity and value should be conserved and maintained, thereby not replaced by exotic species (URT, 1998). These aspects are relevant to agroecology, as agroecological systems aim to promote traditional species of crops and trees. These findings from the policy review will provide better opportunities for including or embedding agroecological principles in forest management and sustainable use for economic development.

The National Water Policy (2002) and Water Resource Act No. 11 of 2009

The National Water Policy was formulated in 2002, and one of its associated acts is the Water Resource Management Act Number 11 formulated in 2009. These two are among the principal institutional frameworks for Tanzania's water sector. They provide a comprehensive framework that emphasizes equitable access, appropriate utilization, development, control, and management of water (both surface and groundwater) for the benefit of the present and future generations. To realize the above goals the National Water Policy sets four long-term policy objectives which are to: (i) preserve, conserve and protect available water resources and allocate them in sustainable, rational, and economic ways; (ii) supply good quality water in sufficient quantities to meet the various water needs, including poverty alleviation while ensuring safe wastewater disposal and environmental protection; (iii) establish efficient and effective institutions to achieve systematic development and management of the water sector; and (iv) develop a sound and sustainable system for effective water resources management, water supply, and sanitation development (URT, 2002). As indicated in early sections, these two institutional frameworks in the water sector were formulated way back before the concept and principles of agroecology were adopted in Tanzania. However, the policy and the Acts have a bearing on agroecology; as it aims to conserve water resources for the benefit of human beings, wildlife and ecosystems.

Gaps in Practice

The review of policy documents on agriculture with specific reference to crops, soils and livestock indicates that both policies have statements that focus on organic crop farming and livestock rearing, respectively. However, relatively little has been achieved in crop and livestock sectors given the challenges associated with requirements and costs for organic certification. Agroecology, on the other hand, for which certification is not a requirement, has not prominently featured in either NAP or NEP documents which implies that there is a window of opportunity to add strategies or regulations that

support agroecological intensification. Instead, the government has, from time to time, implemented programmes and projects to promote industrial inputs. For example, the National Agricultural Input Voucher Scheme (NAIVS) was introduced in 2009 for the promotion of inorganic fertilizers and improved maize and rice seeds. However, there have not been similar interventions to support the distribution and facilitation of bio-inputs such as bio-fertilizers, and bio-pesticides. This implies that the policies in place largely support conventional agricultural systems while paying very little attention, if any, to agroecological systems.

CONCLUSIONS AND RECOMMENDATIONS

This paper reviewed the extent to which agroecology aspects have been embedded into the NAP of 2013, NEC, and other related policies. The reviews revealed that agricultural and environmental policies and their associated Acts do not allude to agroecology directly, but indirectly they point out some narratives relevant to agroecology. In Tanzania, it is likely that farmers already implement some agroecological practices as their normal routine, and get support in terms of knowledge and hands-on practices from NGOs and other development agencies. Specific agroecology issues and principles are not a direct future in the institutional frameworks.

As agricultural policy has an influence on the implementation of agroecological practices and principles, and agroecological intensification is important to increase food security and environment conservation; thus, it is important that the policy be strengthened to support the implementation of agroecology to contribute toward a sustainable food system and the environment. Policy change is critical for moving forward with agroecological intensification and transition in Tanzania. Also, agroecology research is important to provide evidence-based for decision-makers and researchers.

Policy Implications

- A supportive policy environment is paramount to support the movement toward agricultural transformation.
- The promotion of agroecological intensification practices should not be based on the level of productivity only. There are diverse benefits from agroecological intensification practices including affordability by farmers and a sustainable environment.
- Mainstreaming agroecology in the government plans and guidelines is important to guide investments in the domestic production of bio-inputs. This will help to improve the supply and availability of bio-inputs to meet the current and future demand.
- The Plant Health Act of 2020 needs changes to include guidelines on agricultural production, quality assurance, and distribution systems to ensure availability of the bio-inputs (seeds, fertilizers and pesticides), with minimum risk to human health and environmental pollution of water sources.
- There is a need to address the knowledge gap on agroecology among agricultural practitioners including extension workers. The Ministry of Agriculture has already taken steps to review a curriculum of agroecology for short courses, especially for extension staff at the Certificate and Diploma programme level. However, much remains to be done to train in-service extension staff to consciously include agroecological practices in their day-to-day routines.

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