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LEVERAGING GREEN TRAINING PRACTICES TO FOSTER SUSTAINABLE FARMING PRACTICES IN AGRICULTURAL CO-OPERATIVES IN TANZANIA.

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ABSTRACT: Globally, sustainable farming practices are essential for reducing the consequences of climate change and preserve the long-term sustainability of food production systems. Although studies have indicated that Tanzanian agricultural cooperatives may and should support climate change adaptation and mitigation strategies, the information on the impact of green training practices on sustainable farming practices is still scant. It is against this backdrop that the present study was carried out to assess the effectiveness of green training practices in fostering sustainable farming practices in agricultural co-operatives in Tanzania. By utilizing the Ability Motivation Opportunity theory, the study employed systematic review of literature by multiple reviewers whereby the International Bibliography of the Social Sciences, EBSOhost, SCOUPS, Google Scholar, DOAJ and Web of Science were searched focusing on titles and abstracts published from January 2015 to December 2025, supported with gray literature review and the field expert inputs. Further, only articles without language or publication date restriction were consulted and search terms included green training, co-operatives, agricultural cooperatives, sustainable farming practices and climate friendly agriculture. None the less, the Preferred Reporting Items for Systematic Reviews and Meta-analyzes (PRISMA) flow diagram was used to summarize and record the articles found relevant for the study. The search identified 110 studies on green training practices in sustainable agricultural co-operatives, with 43 meeting inclusion criteria. All studies provided relevant information addressing the research objective. Thus, the systematic review found that different green strategies, green skills and knowledge can promote sustainable farming practices in agricultural co-operatives, hence improving soil health, reducing

chemical dependency, and promoting eco-friendly methods. The study concluded that green training in Tanzanian agricultural cooperatives can foster commitment to sustainable agricultural practices, recommending strengthening green training programs and integrating green practices into cooperative by-laws as the best ways to promote sustainable agricultural practices in Tanzania.

Keywords: Green training, Co-operatives, Sustainable farming practices, PRISMA

INTRODUCTION

In today's world, sustainable farming has been recognized as a potential solution to mitigate the negative impacts of current agricultural practices on climate change and environmental degradation (UN, 2015a). Additionally, (Ji, et al., 2019) notes that as the global population continues to rise, the demand for food increases, putting additional pressure on agricultural systems. It is well-recognised that the global agricultural expansion and intensification has lead to habitat and biodiversity loss, soil degradation, environmental pollution, and greenhouse gas emissions due to intensive fertiliser use, soil tillage, and crop residue removal (Miroro, et al. 2022; Chebu, 2020). Nonetheless, the study by Donkor and Heykrilik, (2021) revealed that non-green agricultural practices, such as toxic pesticides, excessive fertilizer use, and waste disposal, negatively impact the environment and human health by fueling crop diseases, pests, and soil pollution. As a strategy for raising farmers awareness on sustainable farming practices, the UK firms educate 42% of employees on environmentally conscious behavior, while US commits $300 million for green jobs (Parilla, 2021). Generally speaking, sustainable farming entails the adoption of practices which enhances the production of food and fiber while preserving the environment, public health, human communities, and animal welfare (UN, 2015b; Ashrit & Thakur, 2021). Thus, by integrating techniques for restoring damaged regions, avoiding deforestation, reducing chemical use, and providing wildlife habitats will protect environment and natural resources, benefiting future generations (FAO, 2012, OECD, 2019). At the same time, these practices directly contribute to UN SDGs like climate action, poverty reduction, responsible consumption and production, inequalities reduction, climate action, and life below water, as highlighted by FAO, (2020). In Tanzania, agriculture is considered the backbone of the economy which contributes 26 percent to the national gross domestic product (GDP), 20 percent to exports (~$1.3 billion) and employs about 65 percent of the workforce (National Economic Survey, 2022). As emphasized by Mmbunghu, et al, 2024), the shift towards sustainable farming is very important in Tanzania where agriculture faces substantive challenges due to rapid industrialization and population growth. As alleged by Mauki, et al., (2023), sustainable farming practices that are environmentally friendly, enables higher produces by using fewer inputs, are likely to contribute to social, technological, and economic development, while minimizing damage to human and natural systems. The literature consulted has indicated that as a global business model where farmers pool resources, co-operatives share risks and benefit collectively (Kalele, et al. 2021) promote sustainable agricultural practices (Mmbughu et al. 2024), and advocate for favorable policies (Utting, 2020), enhancing social and environmental sustainability. Therefore, since cooperatives are characterized by values like education, training, and community concern, (Guerrero et al. 2022), they are crucial in advancing sustainable farming practices Erath (2020). Recent studies show that green skills (Nnko, 2024), knowledge (Agboola and Emanuel, 2019) and attitude (Oyero, et al. 2015) boosts farmers' green awareness, adoption of green technologies, and green human capital

development, promoting professional human capital in green farming and improving their value perception of green technologies. Especially, the report by UNEP (2021) affirms that green training, is a strategy that aims to enhance members' knowledge, skills, and attitudes towards environmental sustainability. Despite the increasing importance of green training in enhancing the farming sustainability and competitiveness of cooperatives, there is limited understanding of the specific strategies that farming cooperative employ to foster such practices within their organizations. Additionally, farming cooperatives often encounter various challenges in the adoption and implementation of these practices such as limited access to training (Myen, et al. 2019), risk perception (Miroro et al. 2022) collective actions (Ashrit & Thakur, 2021) and financial resources (Deller, et al.2021) which may hinder their effectiveness and potential benefits. On the other hand, Norton & Alwang (2020) has noted that African farming cooperatives are gradually incorporating green training practices, but there is a significant gap in green skills, knowledge and attitude in among Tanzanian farmers compared to western countries (Gautam et al. 2022, Utting, 2020; Dhaliwal et al. 2021 Ma & Abdulai, 2019) despite the documented benefits indicating a need for further knowledge on how green training contributes to sustainable farming practices especially in farming cooperatives. Therefore, it is against this backdrop that this study was undertaken to inform policy makers and other stakeholders about relevant green training strategies suitable for sustainable farming in cooperatives in Tanzania. To address the study problem, the following specific objectives guided the study: To identify different types of green training strategies adopted by members to enhance sustainable farming in farming cooperatives; To establish the influence of green skills practices in enhancing sustainable farming in farming cooperatives; and, to determine the extent in which green knowledge practices influence sustainable farming practices farming cooperatives.

LITERATURE REVIEW

In Tanzania a number of initiatives aimed at promoting sustainable farming methods have been greatly emphasized among farmer cooperatives. As a matter of fact, cooperative members can apply environmentally friendly farming practices including crop rotation, organic farming, and water conservation by pooling their resources and expertise (Mauki, et al, 2022; Sugden et al. 2021. As noted by leveraging cooperatives training has proven effective in supporting members to improve soil health and reduce environmental impact, (Donkr & Hejkilik 2021) emphasizing the importance of cooperatives in long-term agricultural productivity and resource conservation.The study by Myeni et al., (2019)indicated that in agricultural cooperatives, sustainable farming methods are essential because they guarantee long-term sustainability (Parilla, 2021), resource conservation (Dhaliwal et al. 2021), and higher farmer incomes (Ji, et al.2019). That is to say, by using sustainable practices, cooperatives can increase farm output (Kreilling &Paul, 2023) while reducing their negative effects on the environment and guaranteeing that resources will be available for future (OECD, 2021.) Mauki et al. (2022) study demonstrates cooperatives as effective tools for farmers to promote environmental sustainability through education, training, and community cooperation. Cooperatives facilitate adoption of farmer innovations (Nkomoki 2018.), knowledge exchange (Nnko, 2024), and community-level problem-solving (ICA 2022) through extension services and training (Chebu, 2020). Cooperatives facilitate social networking and learning among smallholder farmers, promoting sustainable practices and influencing others to adopt sustainable environmental approaches (Cedemir et al.2021). Basically, green training is viewed as a vital component for farmers to adopt sustainable

farming practices practices (Laizer, et al. 2019), minimizing environmental impact (Parilla, 2021), improving resource management (Li & Chen, 2023), and enhancing farm productivity (Fadey et al. 2022.). In fact, as said by Sawe et al. (2018) green farming in farming cooperatives involves sustainable practices, diversification, technology use, and social inclusion, involving sustainable soil management, renewable resources, crop diversification, and member training. According to Mmbughu, et al. (2024); TCDC, (2024), farming cooperatives are the best model for facilitating the adoption of farmer innovations and sustainable practices though extension service, group training and meeting participation, enhanced member information sharing and a best venue for community-level problem-solving. Therefore, this necessitates a determined effort in raising awareness and understanding of green training potential in the context of farming cooperatives in Tanzania. This study adopted Ability Motivation Opportunity Theory (AMO) by Bailey (1993). The AMO theory suggests that individuals are motivated to perform better when they have the necessary skills and opportunities to actively participate in work processes, indicating that organizations with motivated employees can enhance performance. Moreover, the theory suggests that employee abilities can be achieved through comprehensive training, motivation, incentives, and compensation strategies, while creating an enabling environment that promotes collaborative work and creativity (Nnko, 2024).In the context of this study, the ability represents green training practices provided by the farming cooperatives, motivation includes green rewards offered by the same cooperatives as a result of effective utilization of the adopted green practices whereas opportunity entails how cooperatives create an enabling environment for its members and staff to use green initiatives as well as demonstrating green practices. The factors influencing cooperative members' levels of green farming knowledge and proficiency have been thoroughly examined in the literature (Li &Chen, 2023, Deller at al. 2021; Cademir, et al.2021). Empirical studies emphasize that cooperative members' levels of education (Ashrit and Thekur,2021), farming experience (Sawe et al.2018), and cooperative training programs (Nnko, 2024) all have an impact on their knowledge and proficiency in green farming. Therefore, cooperative training is crucial for promoting sustainable agricultural practices, but low youth participation (Mmbughu et al. 2024) and limited knowledge about green farming (Wenzel & David, 2020) may hinder its advancement. Hence farming cooperatives, governmental organizations, and academic institutions plays a big role in enhancing technical assistance (Laizer et al. 2019), knowledge exchange, (Chebu, 2020), and the advancement of sustainable agricultural methods (Guererro, et al. 2022, TCDC, 2024). Theoretically, factors influencing green farming knowledge include education, training, (Nnko, 2024, information availability (Utting, 2020), cooperative organization (Sugden et al. (2021) farm size (Deller et al. 2021), land ownership (Luo et al, 2022) and income dependence Gautam et al. 2022). Thus enhancing social capital and networking facilitate knowledge dissemination and adoption. On the other hand, studies by Kreilling and Paul (2023) defines green attitudes as forms of predisposition to respond in a consistently favorable or unfavorable manner regarding environmental issues. Therefore, farmers' green attitude is likely influenced by beliefs, benefits, risks, and socio economic circumstances (IPCC, 2022). Therefore, Apollo and Emanuel (2019) asserts that with the provision of green skills, knowledge and enhanced green attitude farmers' ability and willingness to specialize in green farming will increase. Moreover, the study by Schwettmann, (2021,) found that cooperative leadership promotes green training and adoption by fostering sustainability culture, providing knowledge, resources, and a supportive environment, through green

training programs, policies, and social networks.On the other hand, empirical studied by Utting, (2020); Norton and Alwang (2020) affirms that cooperative leaders face challenges in implementing green training due to insufficient commitment, inability to accurately evaluate training results, lack of market or community support, incentive problems, poor governance, and inadequate financial management. Therefore, sustainable strategies that empowers members in cooperative organizations with the knowledge and skills to adopt sustainable practices, reduce their environmental impact, and improve their livelihood is paramount. In this study agricultural cooperatives and farming cooperatives will be used interchangeably.

METHODOLOGY

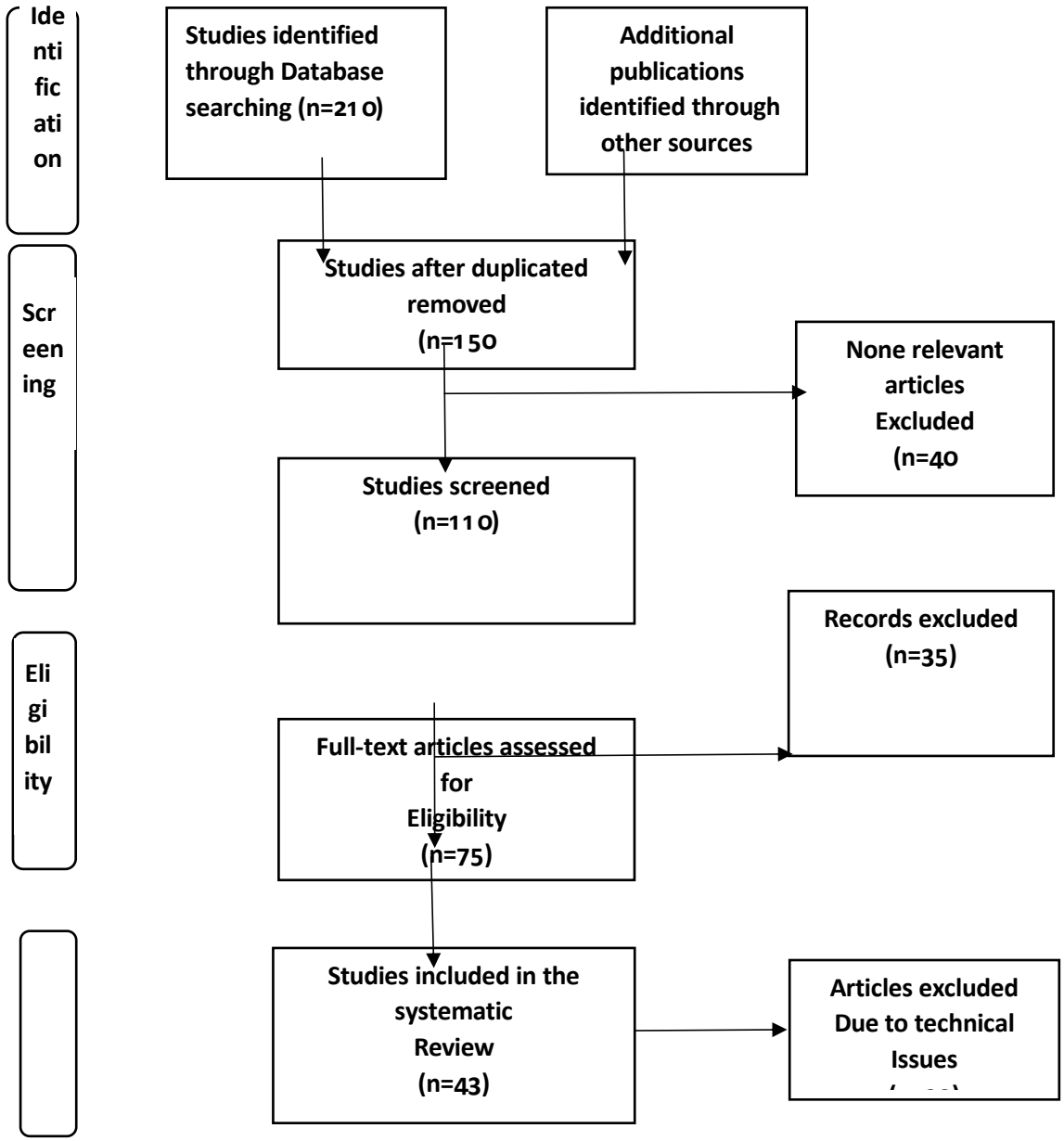
The study used a systematic literature review technique to examine, summarize, and draw conclusions from the current green HRM and sustainable farming literature. The review methods were adapted from (Danese et al., 2018) with a desire to understand the contribution of green training practices on green farming practices in farming cooperatives in Tanzania.

Study Design: The study undertook a detailed systematic literature review of green training practices on green farming practices withing farming cooperatives employing a systematic process (Shamseer et al., 2015) In order to reduce the possibility of bias, this systematic literature review adhered to a strict protocol, which included a predetermined search strategy, clear inclusion and exclusion criteria, and a masked review process for data extraction.

Data Collection Methods: In this study, a thorough literature search was conducted in databases such as the International Bibliography of the Social Sciences, EBSOhost, SCOUPS, Google Scholar, DOAJ and Web of Science. Also, a number of criteria, including timeliness, correctness, consistency, and completeness, were then used to choose the database. On the other hand, the literature search focused on the titles and abstracts published from January 2015 to December 2025, supported with gray literature review and the field expert inputs. Nonetheless, only articles without language or publication date restriction were consulted and search terms included ‘green training’, ‘co-operatives’, ‘farming cooperatives’, ‘sustainable farming practices’ and ‘climate friendly agriculture’. At this point, at least two authors independently reviewed each abstract whereby a consensus was obtained after minor disagreements were explored and settled in meetings.

Data Analysis: In this study every piece of information or piece of data that was examined using scopus.com (in the “Analyze search results” feature) whereby the analysis was assisted by the VOSviewer feature version 1.6.17 and Excel sheet as recommended by Abdillahi, (2023) (Danese et al. 2018). Based on the aforementioned standards, 210 articles were identified—175 from databases and 35 from other sources. After removing duplicated articles, a total of 150 remained whereby 40 articles were deemed irrelevant and excluded. After thorough screening of the remaining articles, 35 were excluded because the study couldn’t retrieve them in full. Afterward, due to issues with quality , technical issues or lack of significance, 32 articles were excluded . Thus, the final number of studies that met the inclusion criteria for further review were 43 as summarized in a PRISMA diagram below.

Figure 1: PRISMA Framework



FINDINGS AND DISCUSSION

After conducting an academic literature search, the study obtained 43 articles. The study found that articles discussing the utilized green training strategies in cooperative industry were 15 articles out of 43 articles, relationship between green skills and sustainable farming was 16 articles out of 43 articles, and articles discussing about green skill adoption in farming cooperatives were 12 out of 43 articles. This shows that research related to the influence of green training practices on sustainable farming practices in farming cooperatives is still relevant in recent years, so the empirical evidence is sufficient to discuss this relationship.

This research development could be influenced by several elements, such as the availability of research data, funding support for green

Table 1: Green Training influence on Sustainable Farming practices in Agricultural Cooperatives (List and Synthesis of Articles)

Theme	Sub- theme	Sources
Adopted green training strategies and sustainable farming	Sustainable soil management	Erath,(2020),Gautam et al. (2022), Chabu, (2020),Ma & Abdul (2020), Li & Che, 2023),Guerrero et al. (2022), OECD. (2019).
	Integrated pest management	Oyero et al. (2015), Sern, et al. (2018), UNEP (2021), Laizer et al. (2019),Faday, (2022), Sern et al., (2018)
	Crop diversification	Wenzel & David, (2020), Bro, et al. (2019), Nkomoki (2018), ICA, (2022)
Green skills influence on sustainable farming	**Green technical skills**	Norton & Alwang, (2020), Nnko, (2024), Shamseer et al. (2015), Ashrat &Thakur, 2021), Mauki, et al. (2023).
	Green soft skills a	OECD (2021), Kalele et al. (2021), Utting, (2020), Sawe et al. (2018), UNEP, (2020).
Green knowledge practices on sustainable farming	Factual Knowledge of green terminology and details,	Luo et al. (2022), Idosar et al. (2018), Apollo Aliance (2018), Sugden et al.(2021), TCDC, (2024)
	Procedural Knowledge of green processes and methods	Kreilling & Paul, (2023), Ji, et al. (2019), Schwettmann, (2021), ICA, 2022), Sawe at al. (2018), Quiloy & Cruiz (2017), Bro et al. (2019), Wenzel & David (2020), Parilla (2021), (FAO, (2020)
	Meta cognitive Knowledge of green learning strategies and processes	Vogel et al. (2021), Zhang & Chabay, (2020), Gautam, et al.(2022), Ma & Abdulai, (2019) Li & Chen, (2023),Norton & Alwan, (2020).
	Conceptual Knowledge of relationships among pieces of concepts	Schwettmann, J. (2021), Deller at al. (2021), (UN, 2015) Sern et al. (2021)Myeni et al. (2019),Mbughu, et al.(2024)

Adopted green farming practices among members in farming cooperatives: The primary purpose of conducting this research was to uncover the association of green training practices on sustainable farming practices in farming cooperatives in Tanzania.As noted by Cademir, (2021), modern agriculture presents significant environmental challenges, necessitating the crucial role of agricultural cooperatives in promoting environmental sustainability. The reviewed literature indicated that the the prominent adopted green training strategies in most of cooperative farming includes educating members on sustainable soil management (UNEP, 2022) empowering members with integrated paste management capabilities (Sawe et al. 2018), as well as training farmers with crop diversification techniques (Chabu, 2020) among others. In the same way, Fao (2022) report indicates that both practices aim to cultivate a culture of environmental responsibility and encourage eco-friendly behaviors for sustainable development

Sustainable soil management and sustainable farming in farming cooperatives: Soil management plays a crucial role in crop productivity, environmental sustainability, and human health, both directly and indirectly (Elbers et al, 2021).This study found that soil

erosion by wind and water are the main processes causing topsoil loss in cooperative farmlands whereby topsoil loss, caused by mineral imbalance or erosion, is the primary threat to agricultural productivity in numerous global regions. On the other hand, the report written by UNEP, (2024) indicates that deforestation and shifting cultivation practices in farming cooperatives in Northeast India cause soil degradation, nutrient loss, and hinder sustainable agricultural production, exacerbated by shifting practices in. Supporting the findings, Mvungi et al, (2021) Obag & Mwawa, (2018) argue that in Sub-Saharan Africa, soil health is quickly deteriorating as a result of climate change worsening drought and food insecurity. In Tanzania for example, the report by CIAT, (2017) indicated that putting into practice methods that enhance soil health, reduce environmental impact, and boost long-term productivity in order to improve sustainable farming and soil management is vital within farming cooperatives (Cademir, 2024; Kreilling and Paul, 2023; Schwertamnn, 2021). For example, Erath, (2020) affirms that promoting methods like crop rotation, cover crops, conservation tillage, and integrated pest management is part of the sustinable soil management. Also, Diao and Somwaru (2021) suggests cooperative can help with this by giving their members access to resources, training, and information.

Integrated pest management and Sustainable farming: Integrated Pest Management (IPM) is a long-term prevention approach that employs biological, cultural, physical, and chemical control strategies to manage pest populations effectively. The study found that farmer cooperatives promotes integrated pest management practices by combining ecological knowledge, collaborative action, and resource access for healthy crops, environment, and community. Further, Irwin (2023) highlights that farming cooperatives employs different kind of pest control strategies such as physical and mechanical control strategies with high emphasis on the least toxic and most effective pesticides. As indicated by Macknomen et al, (2020) manay farmers in Ethipia applies cultural practices such as or modified farming practices, such as adjusting planting dates, tillage methods, and irrigation, to create unfavorable conditions for pests. On the other hand, Yu et al, (2021) affirm that farmer cooperatives conduct training sessions on integrated pest management principles, educating members on pest identification, monitoring methods, and strategies, while sharing experiences and best practices within the cooperative. In Kenya, the study by Wanyama et al, (2021) indicates that farmers establish relationships with agricultural experts and researchers to access technical advice and support to gain more insights on integrated pest management awareness while implement monitoring programs to monitor pest populations, identify potential outbreaks, and make informed decisions about pest control measures. In this way, small-scale farmers adopting IPM practices can efficiently manage pests, improve crop yields, and reduce production costs due to limited access to expensive chemical pesticides. As noted by Sawe et al, (2019) small scale farmers in Tanzania require information on pest identification, monitoring techniques, and control methods, and workshops and training sessions can educate them on IPM principles and their application in their farming practices.

Crop diversification and Sustainable farming: There are many crop diversification strategies that can help make cooperative farming more sustainable. Obag and Mwawa, (2018), notes that these strategies involve introducing new crop species, modifying existing cropping systems, or introducing different varieties of the same crop to enhance environmental sustainability and member wellbeing. For-example, revisited studies indicates that crop diversification reduces risks associated with relying on a single crop (Elbers et al. (2021), stabilizes income throughout the year (FAO, 2022), enhances soil fertility (Martins et

al. (2018), and enables farmers to access diverse market opportunities (Barreiro-Hurle, (2019). The study by Adjimoti et al. (2017) indicated that farmers who have experienced drought or floods may adopt climatically resistant crops to mitigate risks and maintain subsistence levels in case of future shocks. As noted by Rwekaza and Maeda, (2022), Co-operative diversification is crucial for coffee cooperatives to address sustainability challenges and livelihoods impacted by declines in production and market prices. Rwekaza and Maeda (2022) highlight that urban Africa's population growth necessitates increased food production from cooperatives, as rural populations rely on agricultural support. However the study by Obog and Mwawa, (2018) indicated that most farmers lack crop diversification skills and knowledge suggesting the urgent need of intensive training on how to produce sunflowers and secure good seeds they can grow and sell via co-operative as raw material or as a value-added product in form of oil and animal feeds. Similarly, as a result of green training, Achary and Levine (2020) indicates that in the Philippines one of the banana cooperatives decided to add value to their sweet banana by making banana bread and smoothies which brought a significant impact to their member well being. On the other hand, the study conducted in Tanzania by Fujimoto and Suzuki (2025) reveals that poor farmers diversify crops to manage drought and food price fluctuations, while non-poor farmers above the threshold diversify to stabilize market income and maintain balanced dietary intakes. Also, the same study indicated that, poor farmers plant drought-resistant crops like sorghum/roots/tubers to cope with agronomic shocks, while those who lost livestock specialize in staple crop production. For effective soil management in India cooperative sector, Rao and Jacob (2020) proposed the adoption of lowland-based ecotechnology for improving agricultural productivity and mitigating environmental impacts of land degradation in a region requiring food security.

Green skills influence on sustainable farming: Green skills focuses on the psychomotor dimension required by workers to promote sustainable development in social, economic, and environmental aspects (Obog and Mwawa, (2018).

Green technical skills and Sustainable farming: Green technical skills are job-specific abilities necessary for working with green technologies and processes, such as renewable energy engineering or waste management (Elbers et al. 2021). These are specific skills which are related to job content and are acquired by formal education, apprenticeships and internships, and on-the-job training (Nnko, 2024). The study found that as a result of the growing demand for green solutions in agriculture green technical skills are becoming increasingly valuable in the farming cooperatives. In farming cooperatives green technical skills encompass practical environmental protection skills not limited to waste management skills, energy conservation skills, and the use of eco-friendly technologies. Numerous empirical studies empirically showed that farmers in cooperative sector need a combination of green technical skills for effective operations (Martins et al, 2028), adaptability to market changes (Davies & Howard, 2021), Barrein and Hurle, 2019) technology utilization, (Lele and Sharma, 2020) and farm sustainability. As noted by Archery and Levine (2021) farmers in in South Africa access to diversified technical skills such as farm operation skills will to help them in both crop cultivation, and machinery operations, adopting and utilizing new technologies as well as risk identification and management skills. The study by Mvungi et al. (2020) indicated that, farmers in water scarce regions in Ghana utilized green technical skills to effectively conserve water scarce resource through efficient irrigation systems and rainwater harvesting, which were vital for sustainable farming in their region. As insisted by Rao and Jacob (2020) these skills promote sustainable food production, biodiversity

conservation, and responsible land use, enabling farmers to adapt to climate change challenges and enhance their resilience and long-term viability. Cooperatives may struggle with green technical skills adoption due to limited training programs, lack of awareness, and resources, and may prioritize traditional business models over sustainable practices.

Green Soft skills and Sustainable farming: Green soft skills are transferable non-technical skills that enable individuals to effectively utilize their technical knowledge in a changing green economy. The adoption and promotion of green practices can be supported by individuals' interpersonal and cognitive abilities (Yu et al. 2023). This study found that green interpersonal skills are essential for farming cooperatives to promote sustainable agricultural practices, facilitate effective communication, and share knowledge, fostering a shared commitment to sustainability. As a result of members' willingness to adopt environment-friendly agricultural practices increases though social interaction, information exchange, and cognitive factors adoption, members are likely to support each other and promote sustainable practices. This result is consistent with the research result by Dey and Roy, (2021) who indicated that social relationships significantly influence cooperative members' adoption of environment-friendly practices, with village cadres' social relations positively correlated at 1%, highlighting the importance of social capital in farmers' practices. Furthermore, the results support the AMO theory which suggests that, cognitive social capital can influence individuals' intentions, transforming green awareness into environmentally friendly practices and promoting value identification among cooperative members. However, Nkomoki (2018) opine that many agricultural cooperatives lack specific training programs focused on green soft skills and therefore members may not fully understand the advantages of of these skills and the potential environmental and long-term livelihood impacts it offers. Therefore, targeted raining programs on sustainable agricultural practices, effective communication, and collaboration can enhance green soft skills in farming cooperatives, enabling them to adapt to changing consumer demands and manage resources efficiently.

Green knowledge and Sustainable farming practices: Fujimoto and Suzuki (2021) suggest that knowledge empowers farmers to tackle sustainable agriculture challenges like soil degradation, water scarcity, and pest management through targeted practices. Understanding the nuances of local conditions and traditional knowledge is vital for effective sustainable farming. Local terminology helps in conveying these details effectively, ensuring that all members are on the same page**.**

Factual Knowledge and Sustainable farming: This study found that the factual knowledge about sustainable farming, including its terminology and specific practices, is crucial for effective adoption and implementation of sustainable farming. Okondi (2021) emphasizes the importance of farmers understanding the language and concepts of sustainable agriculture to effectively communicate, make informed decision as they implement these practices. This study found that due to the complexity of sustainable agricultural practices, individual farmers are required to possess extensive knowledge about the its systems and operation to acquire new insights, and forget old customs in order to make them behave in a sustainable way. Moreover, the study by Kumar et, (2023) asserts that once farmers are well aware of principles and practices of sustainable farming they promote a culture of continuous learning and adaptation, resulting in continuous improvements in farm sustainability. However Pretty and Bharucha (2021) warn that the factual knowledge about sustainable farming is not just about understanding the terminologies and principles, but it is all about making informed

decisions, adapting practices, and fostering innovation to create more sustainable and resilient farming systems.

Procedural Knowledge and Sustainable farming: As indicated by Cademir, (2021), procedural knowledge, which is the "knowing-how" to perform tasks, is crucial for farmers to implement sustainable agricultural practices. This study found that farmers need procedural knowledge of green processes and practices for various reasons including enhancing farming methods like tilling, rotating crops, covering the ground, terrace forming, fertilizing, among others (Kreilling & Paul, 2023). In China, studies indicate that since both small scale and large scale cooperative farmers encounter wind erosion and water runoff in their farms they need procedural knowledge on how to fix strip cropping and contour plough as a way to prevent wind erosion and water runoff in in their fields (Yu et al. 2023; Martins et a. 2018). Therefore, with effective application of procedural knowledge, Dey and Roy, (2021) affirm that farmers will e able to understand soil health, crop management, animal husbandry, pest control, market trends, sustainable practices, and adaptability to ensure efficient production, profitability, and long-term farming sustainability.

Meta-cognitive Knowledge and sustainable farming: Meta cognitive knowledge refers to the understanding one's own thought processes and tactics, which is essential for better sustainable decisions, adjusting to changing circumstances, and maximizing the farming methods (Utting, 2020; UNEP, 2020). The study found that meta cognitive knowledge is highly relevant in farming cooperatives as it can significantly enhance a farmer's ability to adapt to new technologies, manage resources effectively, and collaborate within a cooperative structure.Therefore by understanding their own learning processes and decision-making, farmers can improve their problem-solving skills, optimize their farming practices, and contribute more effectively to the cooperative's goals (Rwekaza & Maeda, 2022, Nnko, 2024). None the less, most studies examining determinants meta cognition among farmers indicates that meta cognition promotes sustainable practices by enabling individual farmers to challenge their assumptions and biases (Lele and Sharma, 2020; Rao & Jacob, 2020; Macknon et al. 2020) evaluate their actions' effectiveness (Barrein & Hurle, 2019) and make necessary farming adjustments. It also aids in developing critical thinking skills for informed decisions about sustainability (Sern, 2018) allowing farmers to understand their environmental impact (Adjimoti et al. 2018; Davies and Howard, 2021; Akery et al. 2019). Importantly, Zhang and Chabay (2020) affirms that because of meta cognitive knowledge, farmers in cooperative organizations may not take two opposite paths of environmental conservation when they experience any kind of environmental shocks.

Conceptual knowledge and sustainable farming: According to Pretty and Bharucha, (2021),conceptual knowledge involves comprehending the underlying principles, relationships, and meanings within a subject or domain, rather than just memorizing facts or procedures, to understand the "why" behind different ideas.This study found that conceptual knowledge is crucial in farming cooperatives, enabling members to participate in democratic decision-making, build social capital, and ensure cooperative identity and sustainability. In the same vein, since sustainable farming is a comprehensive approach that considers environmental, social, and economic aspects, hence utilizing conceptual knowledge to enhance decision-making and promote resilience is paramount. None the less, some studies indicate that sustainable farming requires continuous learning and adaptation, leveraging conceptual knowledge to understand interconnected farming practices, enabling farmers to innovate and adjust their methods as needed (Faday, 2022; Sern et al. 2018; Sugden et al.

2021). Other studies also showed that crop diversity in farmland increased in response to timely and correct decision making resulting from conceptual knowledge (Nkomoki et al.2018). Coromaldi et al., 2015). Conversely, other studies showed that crop diversity decreased in response to past drought and flood due to poor resilience systems (Diao and Somwaru, 2021; Kenya in Wanyama et al. 2021). Therefore, conceptual knowledge is vital for sustainable farming practices, enabling farmers to make informed decisions, allows them to adapt techniques to their specific farm conditions, optimize resource use, minimize environmental impact, and build resilient systems (Vogella et al. 2021).

DISCUSSION

This study offers a comprehensive summary of research exploring the potential of green training in enhancing farming sustainability in agricultural cooperatives in Tanzania.The analysis which included publications done within the past 10 years, organized the findings into green training strategies, green skills and green knowledge application and the contribution on farming sustainability. Regarding the adopted green training strategies to enhance farming sustainability in cooperatives, the study grouped them into a number of themes that emerged from existing literature, each presented separately. Concerning the role of different types of green strategies on sustainable farming, studies show that that the different green training strategies clearly contributing to sustainable farming in a number of ways. The study explored, for example, the benefits associated with the adopting of sustainable soils management and its influence on farming sustainability. The results indicated that deforestation and shifting cultivation practices in farming cooperatives cause soil degradation, nutrient loss, and hinder sustainable agricultural production, exacerbated by shifting practices in. Green training addresses this challenges by providing farmers with access practices aimed at promoting soil health like crop rotation, cover crops, conservation tillage, and integrated pest management. Farmers can as well promote integrated pest management and crop diversification practices by combining ecological knowledge, collaborative action, and resource access for healthy crops, environment, and community to enhance farming sustainability. While different green strategies adopted by cooperative organizations offers significant benefits to farmers there exists a potential benefits of green skills practices imparted to members through green conceptual skills and green soft skills. As as a result of the growing demand for green solutions in agriculture, green technical skills are becoming increasingly valuable in the farming cooperatives. In farming cooperatives green there is a serious need of practical environmental protection skills not limited to waste management skills, energy conservation skills, and the use of eco-friendly technologies. On the other hand, the need of interpersonal skills are also essential for farming cooperatives to promote sustainable agricultural practices, facilitate effective communication, and share knowledge, fostering a shared commitment to sustainability. As a result of members' willingness to adopt environment-friendly agricultural practices increases though social interaction, information exchange, and cognitive factors adoption, members are likely to support each other and promote sustainable practices. Individual knowledge an have a profound impact on the activities performed and it can be adopted as a standard in the achievement that could be improved through training and development. In order to determine the implications of farmers to exposed green training practices in their sustainable agricultural activities their cognitive pattern applies. For example, the adoption of modern varieties of seeds and fertilizers tend to be incline when the information about the pro-environmental awareness increases. As a result of the complexity of sustainable practices in

agricultural sector, individual farmers are required to possess extensive knowledge about the its systems and operation to acquire new insights, and forget old customs in order to make them behave in a sustainable way.Therefore, continuous offering farmers with comprehensive learning experiences will improve farmers' knowledge with a positive relationship outlining sustainable farming practices

CONCLUSION AND RECOMMENDATIONS

This study was carried out to establish the influence of green training practices on sustainable farming in agricultural cooperatives. The study found that green training has immense potentials of implementing the sustainable farming practices among cooperative members. That can be achieved through adoption of the relevant green training strategies, provision or imparting farmers with the relevant green skills as well as provision of green knowledge. The study also established that the adoption and promotion of green practices can be supported by individuals' interpersonal and cognitive abilities. Also the participation of farmers who received knowledge from an extension officer had a will have a significant effect on probability to adopt the sustainable farming practice. One challenge identified is that many agricultural cooperatives lack specific training programs focused on green training and therefore members may not fully understand the advantages of of these practices and the potential environmental and long-term livelihood impacts it offers. In addition, there are potential challenges in practical adoption of green training in farming cooperatives since sustainable farming is not just about understanding the terminologies and principles, but it is all about making informed decisions, adapting practices, and fostering innovation to create more sustainable and resilient farming systems. Overall, the benefits of green training in enhancing sustainable farming outweigh its challenges, provided that appropriate appropriate training strategies are implemented. Basing on the study findings and conclusions, the study puts forward a number of recommendations. Farming cooperatives should consider green training as an opportunity for enhancing members farming sustainability awareness. However, training institutions should develop a tailor made programme specifically for farming cooperatives due to its unique form individual membership, values and of farming operations. On the other hand, cooperative by-laws need to be updated to include the missing aspects of green training and farming sustainability practices. Further, extension officers should from time to time conduct practical awareness and training to cooperative farmers to update their knowledge and skills the to cope with the changing pace of sustainable farming practices.

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