

A SOUTH AFRICAN CASE STUDY OF THE PART AGRICULTURAL EXTENSION AND TRAINING PLAY IN ACHIEVING SUSTAINABLE FOOD SECURITY

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Article Info

Received: 29-12-2025 Revised: 11-01-2026 Accepted: 13-02-2026 Published: 15-03-2026

ABSTRACT

This study looked at how training and agricultural extension contribute to sustainable food security. Enhancing a nation's human output is a prerequisite for social and economic advancement. The intended function of agricultural extension and training for sustained food security among South African smallholder farmers is reviewed in this paper. The results showed that by providing farmers with information to help them make educated decisions, agricultural extension can support sustained food security. However, ongoing agricultural extension human resource development via investment in education is a precondition for the extension staff to be better prepared for information dissemination and to achieve the aim of sustainable food security. Additionally, in order to support sustainable food security and raise the relevance of knowledge and technologies transmitted down to farmers, higher education institutions must play a developmental role by forming connections between research, extension, and rural communities. Extension educators must thus make sure that training is sensitive to farmers' present requirements. Extension education methods that are adaptable to changes in the physical, social, economic, and environmental spheres are needed. As a result, the study's conclusions provide recommendations for changes to extension education programs. This is crucial for developing well-informed policies that will lead to better public extension services.

Keywords: Agricultural education, Agricultural production, Climate variability, Public extension, Smallholder farmer

1. INTRODUCTION

Agriculture has been the foundation of rural economies in sub-Saharan Africa and the developing world since the beginning of time. 60–80% of people in sub-Saharan Africa work in agriculture, which generates 15–50% of the region's GDP (Organization for Economic Co-operation Development (OECD), 2016; Staaz & Dembele, 2008). Comparably, 22–28% of South Asia's GDP comes from agriculture, which also employs around 60% of the working force (International working Organization (ILO), 2007). Between 40 and 50 percent of people work in agriculture in South East Africa, East Asia, and the Pacific; estimates for employment in Latin America and the Caribbean are around 20 percent (ILO, 2007).

According to the Department of Agriculture, one of South Africa's top priorities is agriculture, which is seen as a vital driver of economic expansion, sustainable development, and self-sufficiency.

(DoA), 2005. By assisting smallholder farmers at the household level in rural regions where the economy is mostly agro-based, it seeks to promote food security and decrease poverty. Since they produce the majority of the food in these regions, smallholder farmers play a significant role in the agricultural economy. Millions of South Africans rely on these resource-poor farmers as their primary source of food, and this trend is expected to continue for a few more years. According to the Department of Agriculture, Forestry and Fisheries (DAFF), 2011, the long-term objectives of South Africa's agricultural sector are to decrease poverty and enhance food security by assisting smallholders in raising agricultural output. There is substantial evidence that South Africa's subsistence farmers have not advanced or become more productive despite the government's best efforts and well-meaning initiatives.

Van Der Berg (2006) claims that while South Africa produces enough food to sustain its people, many families

nevertheless struggle with food insecurity. Abdu-Raheem and Worth (2011) claim that this circumstance is linked to the nation's high rates of poverty, especially in rural regions. When everyone has physical, social, and financial access to enough safe, nourishing food that satisfies their dietary needs and food preferences for an active and healthy life, there is food security (Abdu-Raheem & Worth, 2011; Food and Agriculture Organization of the United Nations (FAO), 2017). It is generally accepted that establishing family food security is a crucial step in raising the rural poor's level of life. Abdu-Raheem and Worth (2011) state that smallholder agriculture, which may be supported by suitable agricultural extension, education, and training, is one way to achieve this.

In order to ensure food security in smallholder farming areas, the DAFF hired 3369 extension staff in 2012 (Table 1). Farmers' needs are not met by the number of extension agents available in each province. The fundamental agricultural assistance that farmers need is provided by public extension agencies. For smallholder farmers who lack the resources to obtain private extension services, this is especially crucial (Raidimi & Kabiti, 2017).

Table 1: Breakdown of extension officers employed in South Africa per province

Province	Number	Percentage (%)
Eastern Cape	867	25.7
Free State	124	3.7
Gauteng	91	2.7
KwaZulu Natal	830	24.6
Limpopo	818	24.3
Mpumalanga	228	6.8
Northern Cape	55	1.6
North West	181	5.4
Western Cape	175	5.2
TOTAL	3369	100

Source: DAFF (2012)

The purpose of this paper was to outline the role of agricultural extension and training for sustainable food security, focusing on the potential role agricultural extension and training can play in addressing South African rural household food security concerns.

2. MATERIALS AND METHODS

In order to tie agricultural extension and education to sustainable food security among South African smallholder farmers, this report is based on a review of the literature. Information for this research came from government reports, administrative records, regulations, and existing literature. The first part reviewed the literature on agricultural extension's function in South Africa and contrasted it with food security. A evaluation of extension workers' readiness to use agricultural education and training to support sustainable food security was then presented.

3. RESULTS AND DISCUSSION

3.1 The role of agricultural extension in achieving sustainable food security

Agricultural extension programs are a crucial means of promoting food security. The practice of developing farmers' agricultural knowledge and abilities with the goal of boosting their production and achieving other desired improvements is known as agricultural extension (Collett & Gale, 2009). Agricultural extension serves a variety of purposes, such as imparting knowledge to farmers from international, national, and local researchers, assisting them in defining their own objectives and evaluating their opportunities, teaching them about decision-making procedures, and encouraging desirable agricultural development (Msuya et al, 2017).

In light of rising climatic variability, which leads to unpredictable weather and quickly shifting environmental circumstances, agricultural extension's role in knowledge transmission has gained momentum (Zwane & Montmasson-Clair, 2016). The average annual temperature and rainfall, as well as their distribution, are affected by climate change-related changes (Campbell et al, 2014). Additionally, illnesses affecting crops and

animals have become more common as a consequence of climate change. These situations increase the likelihood of agricultural and animal production failure, endangering the food security of households. Smallholder farmers, who often have little risk hedging techniques and depend on agricultural productivity for a basic food supply, are especially affected by this. In this instance, agricultural extension's function is to connect farmers with sources of information and expertise for risk mitigation and climate change adaptation. Additionally, extension services may help farmers make decisions on suitable choices for crop and livestock diversification (Waha et al, 2018). One crucial tactic for mitigating climate risk is diversification.

By raising farmers' earnings and productivity, agricultural extension helps to reduce poverty and improve food security. Increased productivity gives farmers who grow cash crops an opportunity to make money that they can use to buy food (Conceñ et al, 2016). Additionally, higher food crop output guarantees greater family food supply. Applying the right information in response to agricultural difficulties including pests, illnesses, and weather patterns increases farmers' productivity (FAO, 2017). By ensuring that initiatives to boost production are sustainable, agricultural extension may contribute. Sustainable agricultural production guarantees that present production practices do not jeopardise future production opportunities. Agro-ecological methods are one approach to do this (FAO, 2018). Agro-ecological methods are based on combining traditional, practical, and local practices and abilities for sustainable agriculture, empowering farmers as important change agents, and encouraging co-creation of knowledge (FAO, 2018). By connecting farmers to markets and providing market information, farmers' earnings are increased. Additionally, compared to selling raw agricultural goods, teaching farmers in product value addition might boost their earnings (Baipheti & Jacobs, 2009). Additionally, extension may connect farmers with dependable and affordable sources of agricultural inputs and outputs, leading to lower production costs and higher revenue. This helps achieve the sustainable development objective of eradicating hunger.

Smallholder farming in South Africa still has a significant productivity and profitability gap despite current agricultural extension initiatives (Bjornlund & Pittock, 2017). The adoption of current technology and management techniques is hampered by a knowledge, skill, and resource gap, which is one of the main causes of this (Tire, 2006). Information and training materials, including input supplies and employees of financial service agencies and non-profit organisations, have not received enough attention when it comes to putting them into forms that aid in educating farmers and extension workers (Bjornlund & Pittock, 2017). Therefore, it is imperative that the South African extension system improve development communication (Tire, 2006). The adoption of new and existing technologies for increased output is hampered by the current communication gap.

Reducing food waste is another approach to maintain food security, in addition to raising revenue and productivity. Despite having one of the highest rates of food waste in Africa, certain families in South Africa continue to experience food insecurity (Oelofse & Nahman, 2013). By teaching farmers about value addition and post-harvest loss hedging, agricultural extension services may help reduce food waste. After harvesting, proper food crop processing guarantees extended family food supply and prevents losses (Hodges, Buzby & Bennett, 2011). Agricultural extension services may make post-harvesting techniques and technologies more accessible.

In South Africa, information is mostly delivered to farmers via agricultural extension (Stevens & Van Heerden, 2016). Without relevant and trustworthy agricultural data, South Africa's agricultural output and sustainable food security may not be improved. Extension organisations in South Africa must rely on research institutes to provide relevant and trustworthy information on better technologies and practices in order to fulfill its purpose of successfully teaching and promoting learning among farmers (Davis & Terblanché, 2016). Additionally, in order to stay up to date on the latest technical advancements that assist farmers, extension staff members must undergo frequent training.

Munyua, Adams, and Thomson (2002) claim that the poor research-extension relationship is an unresolved institutional issue. This makes South Africa's agriculture and extension services even weaker. Extension groups in South Africa may stay up to date on fresh knowledge by investigating and institutionalising connections with other institutions. Extension groups in South Africa have not adequately recognised farmers,

colleges and universities, business organisations, and non-governmental organisations as possible information providers (Munyua et al, 2002). Extension and these institutions have only had indirect and informal ties (Raidimi & Kabiti, 2017). On the other hand, these institutions have a wealth of information. Additionally, they provide information generating dynamism that may significantly increase the information requirements of agricultural extension and, in turn, improve services offered to farmers, leading to sustained food security (Baiphethi & Jacobs, 2009). Institutional ties are essential, particularly in light of climate change, where quick information collection and application are required for sustainability and adaptation. Universities, farmer associations and groups, extension agencies, and research institutes are all significant players in the extension education process.

3.2 The role of agricultural education and training in achieving sustainable food security

In both developed and developing nations, education is essential for human growth and development and is one of the fundamental necessities (Rahman & Uddin, 2009). Learning is a process that alters knowledge and behaviour via instruction and experience, and it is induced by both education and training. According to Collett and Gale (2009), training is communication that is aimed at a specific audience and only focuses on what needs to be learned in order to build skills, adjust behaviour, and increase competence. The goal of education is to enhance fundamental intellect and knowledge while focusing on the transmission of particular abilities (Subedi, 2004).

With 5.3% of GDP and 20% of all state spending going toward education, South Africa has one of the highest rates of public investment in education in the world (Burger, 2011). Twelve colleges of agriculture provide formal agricultural education. Additionally, eleven colleges and six universities of technology provide a variety of nationally certified postsecondary agricultural education training programs (DoA, 2008). Numerous groups, including state agricultural extension and training agencies, corporate and non-governmental organisations, universities, colleges, and certain agricultural high schools, provide non-formal agricultural education (DoA, 2008). The performance of agricultural extension agents may be negatively impacted by a lack of chances for continuing education, which might have an effect on food security (Stevens & Van Heerden, 2016). Training agricultural professionals enhances their abilities in the field. Sustainable food security and the growth of human resources within extension organisations are directly impacted by the training of extension staff.

To enable fair participation in the agricultural sector to boost productivity and maintain sustained food security, the Department of Agriculture places a high priority on the development of suitable agricultural skills among individuals who were previously excluded (DoA, 2005). In order to promote suitable agricultural skills, the department formed a specialised unit. Education, Training, and Extension Services became the name given to this division. Ensuring that farmers and other stakeholders have access to the necessary skills for the growth of agriculture as an industry is the goal of the Directorate Education, Training, and Extension, Training and Extension Services (DoA, 2005). The ad hoc in-service training programs that this Directorate often administers do not sufficiently equip extension workers to handle challenging agricultural issues. In South Africa, training is a crucial need that is often not met by extension programs. For instance, in 2008, only 427 out of 2155 (20%) South African extension workers had a degree or higher, while 1728 out of 2155 (80%) held a certificate (Williams et al., 2008). In all, eight out of ten extension workers lacked the necessary training to function as subject matter experts or agricultural consultants. In South Africa, very few extension workers have access to formal training programs that deal with food security concerns. Out of 2155 extension officers, only 204 (9%) had finished communication training, 238 (11%) had finished project management training, 140 (6%) had finished computer training, and 143 (7%) had finished people management and empowerment training (Williams et al, 2008). Additionally, after entering the public sector, only 25% of extension employees have participated in technical training programs (Puhlisani, 2012; Williams et al, 2008).

It is consequently essential to improve extension agents' training for sustainable food security in light of the shortcomings that have been discovered. Both pre-service (universities and colleges) and in-service training for extension agents need to be improved. In addition to increasing focus on marketing, communication, computer training, people management and empowerment, farm management, technical training,

environmental issues, and the growth of farmer and other client organisations, training programs should highlight new extension concepts and methodologies (Spielman et al., 2008). This should be carried out while maintaining people's involvement as a key component of extension services (FAO, 2018). Investing in useful and comprehensive curriculum for university programs may serve as a foundation for preparing the next generation of extension agents for sustainable and long-term growth (Stevens & Van Heerden, 2016). One of the efforts of the South African Department of Agriculture, Forestry, and Fisheries is the Extension Recovery Plan (ERP), which is designated as an activity in all provincial budget allocations for agriculture to upgrade extension personnel's abilities (DAFF, 2011). A professional development program that emphasises the development of advanced skills for the benefit of the industry as a whole supports this (DAFF, 2011). It remains to be observed how this project will affect sustainable food security (Liebenberg, 2015). Agricultural education is crucial in preparing farmers, researchers, educators, extension workers, members of agribusinesses, and other key players to contribute positively to sustainable food security, even though there are numerous complex factors that affect it (Allahyari, Chizari & Mirdamadi, 2009; Chittoor & Mishra, 2012). The modifications and adjustments needed in agricultural education to effectively contribute to increased food security, sustainable agricultural output, and rural development are a crucial concern (Spielman et al., 2008). According to Davis and Terblanché (2016) and Williams et al. (2008), inadequate training of agricultural extension workers in South Africa has been cited as a contributing factor to the relative ineffectiveness of most of the field's extension. Curricula and instructional programs that are especially pertinent to the agriculture sector's demands for employment and output are necessary.

Consequently, an interdisciplinary system approach to agricultural education is required for extension workers' pre-service training (Spielman et al., 2008). South African agricultural colleges, universities, and schools encounter significant obstacles. New educational approaches, creative leadership, and institutional changes that consider the current trends and elements influencing agricultural and rural development will be necessary to meet these difficulties (Kabasa, Kirsten & Minde, 2015). Currently, there are insufficient institutional connections between agricultural education, research, and extension services (Raidimi & Kabiti, 2017). This is due to the intentional division of research, education, and extension into several departments and agencies, as well as the absence of functional methods to connect them in order to address shared issues (Spielman et al., 2008). Agricultural research is often carried out in government labs and research stations, most of which are not connected to universities. Though they are seldom directly connected to national research agendas and strategies, research activities are often conducted as part of postgraduate programs in higher agricultural education. Research results seldom make their way into practice or policy, even when they are connected (Kabasa et al., 2015; Spielman et al., 2008).

Similar to research, tight collaboration between extension systems and agricultural education institutions is essential to ensuring the value and relevance of agricultural education. According to Spielman et al. (2008), agricultural education institutes often have little engagement in community outreach and extension. Sustainable food security in South Africa requires strengthening the institutional ties between agricultural teaching, research, and extension services as well as the participation of agricultural education institutions in community outreach and extension (Kabasa et al., 2015). Universities should be responsible for agricultural extension as well, offering technical assistance and training via subject-matter experts (Spielman et al., 2008).

According to Davis and Terblanché (2016), universities and technical institutions may carry out development outreach initiatives by providing follow-up technical assistance to graduates who are operating their own production firms or working in agribusiness. Additionally, brief continuing education courses may be created to refresh the expertise of extension officers and prepare them for career growth (Spielman et al., 2008). Research and extension centers, NGOs, and farmers' groups (commodity associations) should all be used in continuing education wherever feasible. Agricultural universities must provide research and demonstration plots that directly address farmers' needs in collaboration with relevant government agencies and non-governmental organisations (Spielman et al., 2008). Communication between local producers and agricultural education institutions might be enhanced via commodity organisations and farmer cooperatives (Mhembwe & Dube, 2017).

Agriculture has historically kept up with scientific advancements, but the rate of change is now considerably

quicker, necessitating ongoing curriculum updates (Stevens & Van Heerden, 2016). Food security is impacted by environmental degradation and the loss of natural resources, hence agricultural education institutions must include environmental and sustainable agricultural development concerns in their curriculum (Hamdy & Aly, 2014). Curricula must emphasise and include women as leaders and role models in agriculture (Collett & Gale, 2009). This will encourage more women to actively participate in agriculture on different levels. Given the significant role that women play in agricultural households, this is crucial (FAO, 2017). In order to prepare students to work as agricultural extension workers who can effectively communicate with a variety of rural groups and assist marginalised groups like women and youth in a collaborative problem-solving process, educational institutions should prioritise offering the kinds of courses that are crucial (Collett & Gale, 2009). It is crucial to acknowledge that expert-driven, technology-transfer extension techniques have given way to collaborative learning approaches involving participant groups when updating curriculum for extension training (Collet & Gale, 2009).

Therefore, the actual application of research should be emphasised more in curricula than theoretical models. It is necessary to provide immersive, field-based learning activities as well as an interdisciplinary viewpoint that may include a variety of various disciplinary components (Ghadei & Rudd, 2017). In order for pupils to understand issues and come up with answers, learning must highlight inductive reasoning abilities (Sundtøl, 2004). To keep the knowledge base current and prevent a "cultural gap" between extension workers and the ultimate beneficiaries, farmers, it is necessary to periodically review and revise the curriculum with an emphasis on local agricultural development issues and solutions (Kabasa et al, 2015). Curriculum modifications guarantee that the next generation of agricultural extensionists is prepared to address contemporary issues without endangering present or future farmers (Stevens & Van Heerden, 2016). In order for students to comprehend the multifaceted character of sustainable agricultural production, the curriculum must include courses that encourage them to think holistically or in terms of integrated agricultural systems. According to Stevens and Van Heerden (2016), this calls for an interdisciplinary systems approach to agriculture education.

According to policy, outreach, research, and Agricultural Education and Training (AET) may all increase agricultural output (DoA, 2005). Additionally, enhanced agricultural knowledge and proficiency are necessary for the country's agricultural policies to be successfully implemented as well as for the processing, storage, and selling of food in addition to improving primary agricultural output (Sundtøl, 2004). A key factor in agricultural growth is agricultural education and training. The South African Agricultural Strategy for 2005 describes how agricultural education contributes to development by offering and maintaining high-quality instruction and training that promotes economically, socially, and ecologically sustainable farming practices. Therefore, agricultural education and training is essential for smallholder farmers' food self-sufficiency, poverty reduction, and environmental protection (Collier & Dercon, 2014). All types of education have the potential to empower individuals by boosting their self-esteem, ability to enhance their standard of living, and involvement in broader social and economic transformation processes (Stevens & van Heerden, 2016). Thus, sustained food security is enhanced.

4. CONCLUSION, RECOMMENDATIONS AND IMPLICATIONS

This study outlined many ways that agriculture training and extension might support household-level food security. Focusing on elements that will improve smallholder agriculture will result in a long-term solution to the issues of rural poverty and food insecurity since the majority of South Africa's impoverished people reside in rural regions and rely mostly on agriculture for their livelihood. The primary source of assistance for South African smallholder farmers is the public agricultural extension agency. However, there are few extension agents available, and they are ill-prepared for the dangers and production risks smallholder farmers now face. Therefore, it is crucial that agriculture and agricultural extension and training continue to be an essential element of the government's plan to address food insecurity and poverty at the family level. This is because the South African agricultural extension service has challenges in improving food security. One of the major purposes of agricultural extension is to help farmers develop their knowledge and abilities. As a result, extension programs should be reevaluated and modified to help create and sustain food security at the household level.

Without an efficient agricultural extension service that is closely connected to research data pertinent to farmers' requirements, increasing agricultural output for sustainable food security in South Africa could not be possible. Realising meaningful agricultural productivity and sustained food security therefore depends critically on the appropriateness and usefulness of research results and subsequent information utilised by extension workers to assist farmers. Through their research and training initiatives that improve agricultural extension information requirements and, therefore, crucial services offered to farmers, training institutions like universities give dynamism in information production, leading to sustained food security. Without well-aligned educational systems that address the people's urgent needs, no nation can progress. A critical mass of young, committed, and skilled men and women must be developed to work in the agricultural industry in order to provide food security for all.

In summary, this research demonstrated how crucial agricultural extension services are to attaining long-term food security in South Africa. The research made clear how crucial it is for extension staff to have comprehensive and suitable training in order to help them be ready to handle the present issues in agricultural planning, production, and marketing that have an impact on household food security.

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