



Extension Officers' Capacity Building and Sustainable Agricultural Practices in Kwara State

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Abstract

Original Research Article

This seminar paper examined the efficiency of the capacity-building programmes of agricultural extension officers with regard to the promotion of sustainable agricultural practices in Kwara State. The study was underpinned by the Diffusion of Innovations Theory and Human Capital Theory, and adopted a narrative review design of a qualitative study, which was based on the evidence of peer-reviewed journal articles, government policy documents, Agricultural Development Programme (ADP) reports or other empirical studies published between 2020 and 2026. Review of the literature available identified that extension officers' capacity-building programmes have improved farmers' technical knowledge, communication and professional competences which have resulted in improved farmer's advisory services and farmers' uptake of sustainable agricultural practice in certain parts of Kwara State. However, poor follow up training, lack of adequate extension officers to farmer ratio, weak logistics and financial support, inadequate institutional support and limited availability of agricultural inputs and credit facilities to farmers have limited the effectiveness of these programmes. The paper posits the need for continuous capacity building of extension officers in order to build strength on sustainable agriculture development in Kwara State. It recommends the establishment of a long-term extension impact tracking system, development of an extension innovation and learning hub, creation of specialized units in extension to meet emerging challenges in agriculture, development of competency-based certification of extension officers, development of a knowledge retention and succession scheme, and institutionalizing farmer feedback as an extension performance evaluation tool to promote long term sustainable agriculture in Kwara state.

Keywords: Capacity building, agricultural extension officers, sustainable agricultural practices, on-farm demonstration, narrative review.

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1.0 Introduction

One of the oldest and most significant occupations in the world is Agriculture. It can be used as a source of livelihoods, food, feed and raw materials for industries, and is a key factor in economic

development and rural transformation in many parts of the world (Sunkad, 2020). The sector continues to play a strategic role as it is expected to meet food needs of the increasing population, ensure food security, protect natural resources, and provide raw materials to the textile, pharmaceutical, cosmetic



and energy sectors (Selahattin & Bayyigit, 2025).

Agriculture is the major driving force for major sub-Saharan African countries of the world; it stimulates sustainable rural development and enhances the living conditions of local communities (Corral et al. 2017). In Nigeria, it contributes considerably to the growth of GDP, i.e., a unit change in agricultural output brought about 34.4% changes in GDP (Olajide et al. 2012). Likewise, Ogbalubi & Wokocha (2013) found that agriculture contributed to GDP of countries like Argentina, 1.1%; China, 13%; Egypt, 13.5%; South Africa, 9%; the United States, 1.1%; and Nigeria, 26.8%. However, it provides labour force in Israel, 3.7%; Egypt, 32%; Brazil, 32%; and Nigeria, 70%. This infers that the richer the country, the lesser the agricultural contribution to GDP. (Bello, 2020).

Agriculture remains and still contributes a lot to Nigeria's economy and livelihood, particularly to smallholder farmers (Bello, 2020). Crop farming and animal husbandry are important livelihood activities adopted by a large proportion of the rural households in Kwara state for food security. Despite the success achieved in agricultural production, a lot of challenges still exist in the state that are inhibiting farm productivity and jeopardizing the sustainability of the agricultural sector (Sikiru et al., 2025).

Agricultural Development Programme (ADP) is the biggest governmental programme for providing Agricultural Extension Services in Nigeria and Kwara State Agricultural Development Programme (KWADP) is one of these programmes. Abdulrahman et al. (2022) indicated that extension officers, zonal supervisors and subject matter specialists directly interact with farmers to disseminate new farming practices and farmer knowledge and skills. However, several challenges continue to limit farmers' ability to implement sustainable practices and enhance their resilience to climate change (FAO, 2022).

With this background, this seminar paper looks at the following: (i) Modalities of extension officers' capacity building in Kwara State, (ii) On-farm demonstration activities by extension officers in Kwara State.

Kwara State was also purposively selected as one of the States with long institutional experience in extension delivery as the Agricultural Development Project (ADP) of the World Bank was implemented in the past. The study is expected to impact farmers, extension officers, Agricultural Development Programmes and researchers, while the capacity building and sustainable farming practices of extension officers will be evaluated through literature study in the period 2020 to 2026 in Kwara State, North-Central-Nigeria.

2.0 Literature Review

This review is organised thematically based on the two study objectives (modality of capacity building and on-farm demonstration activities) and based on some important constructs of agricultural extension, capacity building and sustainable agricultural practices. The review is not just a description of each source individually, but attempts to compare results from one source to another in order to find some areas of commonality and differences, and to pinpoint areas of gaps that call for the current study.

2.1 Capacity Building Modalities

Capacity building has become a central component of agricultural extension systems because it enhances the knowledge, technical competence, and professional capabilities required for effective advisory service delivery. Rather than a one-time training activity, contemporary literature conceptualizes capacity building as a continuous, systematic process through which individuals, organizations, and institutions acquire, strengthen, and sustain the competencies needed to respond effectively to evolving developmental challenges (FAO, 2022; GFRAS, 2021; Swanson & Rajalahti, 2010). Within agricultural extension, this process extends beyond the acquisition of technical knowledge to include communication skills, participatory facilitation, leadership, digital literacy, innovation management, and problem-solving abilities that enable extension officers to support farmers in adopting sustainable agricultural practices (Davis & Sulaiman, 2014; Davis et al.,

2020).

Although scholars differ in their emphasis on the dimensions of capacity building, there is broad consensus that continuous professional development is fundamental to improving extension effectiveness. The FAO (2022) emphasizes strengthening technical expertise, leadership, and innovation management to address emerging agricultural challenges, whereas the Global Forum for Rural Advisory Services (GFRAS, 2021) views capacity building as a long-term investment that enables extension systems to remain responsive to changing technologies, farmer needs, and policy priorities. These complementary perspectives suggest that effective capacity building should be viewed as an integrated process combining technical, managerial, institutional, and behavioural competencies rather than isolated training interventions.

In the context of sustainable agriculture, capacity building assumes even greater significance because extension officers serve as the principal link between agricultural research and farming communities. Their effectiveness in promoting climate-smart agriculture, integrated pest management, soil conservation, efficient water management, and other sustainable production practices depends largely on the quality and continuity of the professional development opportunities available to them (FAO, 2022; Davis & Sulaiman, 2014). Consequently, investment in extension officers' capacity is increasingly recognized as a strategic mechanism for enhancing agricultural productivity, strengthening farmers' resilience to climate change, and promoting environmentally sustainable farming systems.

2.1.1 In-Service Training

In-service training remains one of the most widely adopted capacity-building modalities for enhancing the competence and effectiveness of agricultural extension personnel. It is a structured and continuous learning process designed to update extension officers' knowledge, improve technical skills, and strengthen their capacity to respond to emerging agricultural challenges without

interrupting their official responsibilities. Given the dynamic nature of agriculture, characterized by technological innovations, climate variability, evolving government policies, and changing farmers' needs, continuous in-service training has become indispensable for maintaining a competent and responsive extension workforce (Swanson & Rajalahti, 2010; Davis & Sulaiman, 2014).

The Food and Agriculture Organization (FAO, 2022) emphasizes that in-service training equips extension personnel with contemporary competencies in climate-smart agriculture, digital extension services, integrated pest management, sustainable soil management, and participatory advisory approaches. Similarly, the Global Forum for Rural Advisory Services (GFRAS, 2021) views continuous professional development as a strategic investment that enhances institutional effectiveness and strengthens the quality of extension service delivery. These perspectives collectively underscore that effective extension systems depend not only on the initial qualifications of extension officers but also on sustained opportunities for professional learning throughout their careers.

Empirical evidence consistently supports the positive contribution of in-service training to extension performance. Abdulazeez et al. (2022) found that continuous capacity-building initiatives significantly improved the technical competence and service effectiveness of agricultural extension personnel in Nigeria. Likewise, Agwu and Okorie (2023) reported that regular professional development programmes enhanced extension officers' ability to disseminate innovations and provide timely advisory services to farmers. Ejem et al. (2023) further demonstrated that continuous training strengthened communication competence, enabling extension personnel to engage farmers more effectively and facilitate the adoption of improved agricultural practices. Although these studies emphasize different dimensions of professional competence, they converge on the conclusion that sustained training is essential for improving extension effectiveness.

Beyond improving technical competence, in-service training enhances extension officers' capacity to

interpret research findings, facilitate participatory learning, and adapt advisory services to local farming conditions. It also promotes problem-solving, innovation, leadership, and digital literacy, all of which have become increasingly important within modern agricultural extension systems (Davis et al., 2020). Consequently, extension personnel who receive regular training are better positioned to bridge the gap between research institutions and farming communities, thereby accelerating the adoption of sustainable agricultural technologies and practices.

Synthesis

From the foregoing literature, there is broad scholarly consensus that in-service training constitutes the foundation of capacity building for agricultural extension personnel. While previous studies have emphasized different outcomes including technical competence, communication effectiveness, innovation dissemination, and institutional performance, they collectively demonstrate that continuous professional development remains indispensable for effective extension service delivery and the promotion of sustainable agricultural practices. This suggests that investment in regular in-service training should be viewed as a strategic mechanism for strengthening extension systems and improving agricultural productivity.

2.1.2 Workshops and Seminars

Workshops and seminars constitute important capacity-building modalities that facilitate continuous professional development among agricultural extension personnel. Unlike routine in-service training, these programmes provide structured platforms for knowledge exchange, practical learning, professional interaction, and the dissemination of emerging innovations in agriculture. They enable extension officers to update their competencies, share field experiences, and acquire new approaches for addressing evolving agricultural challenges. As agricultural systems become increasingly knowledge-driven and

technology-oriented, participation in workshops and seminars has become indispensable for enhancing the quality and responsiveness of extension service delivery (FAO, 2022; GFRAS, 2021).

The effectiveness of workshops and seminars lies in their participatory and experiential learning approach. According to Swanson and Rajalahti (2010), such programmes encourage active engagement through discussions, demonstrations, case studies, and collaborative problem-solving, thereby enabling extension personnel to translate theoretical knowledge into practical field applications. Similarly, Davis and Sulaiman (2014) argue that workshops provide opportunities for extension officers to interact with researchers, policymakers, development partners, and fellow practitioners, thereby strengthening knowledge networks and promoting institutional learning. These interactions foster innovation, improve decision-making, and enhance the capacity of extension personnel to respond effectively to farmers' diverse needs.

Empirical evidence further supports the significance of workshops and seminars in improving extension performance. Abdulazeez et al. (2022) observed that extension personnel who regularly participated in professional development programmes demonstrated higher levels of technical competence and service effectiveness than those with limited training opportunities. Likewise, Agwu and Okorie (2023) reported that workshops significantly enhanced extension officers' knowledge of modern agricultural technologies, resulting in improved advisory services and increased farmer adoption of recommended practices. Ejem et al. (2023) similarly found that seminars strengthened communication and facilitation skills, enabling extension personnel to deliver more effective farmer education programmes. Although these studies examined different aspects of professional development, they collectively affirm the value of workshops and seminars as instruments for enhancing extension capacity.

Beyond technical competence, workshops and seminars contribute to the development of leadership, teamwork, communication, digital

literacy, and problem-solving skills required in contemporary agricultural extension systems. They also expose extension officers to emerging issues such as climate-smart agriculture, precision farming, digital extension platforms, integrated pest management, and sustainable natural resource management, thereby improving their ability to support farmers in adopting environmentally sustainable agricultural practices (FAO, 2022; Davis et al., 2020). Consequently, regular participation in such programmes strengthens both individual competencies and institutional effectiveness.

Moreover, workshops and seminars provide an avenue for evaluating existing extension approaches and identifying innovative strategies for improving service delivery. Through interaction with experts and peers, extension personnel are able to reflect on field experiences, exchange best practices, and adapt successful interventions to local contexts. This continuous process of learning and professional reflection enhances organizational learning and contributes to more responsive and farmer-centred extension systems.

Synthesis

The reviewed literature demonstrates a strong consensus that workshops and seminars are indispensable components of agricultural extension capacity building. While scholars emphasize different outcomes—including technical competence, communication skills, professional networking, leadership development, and innovation adoption—they collectively acknowledge that these learning platforms strengthen the effectiveness of extension personnel and improve their capacity to promote sustainable agricultural practices. Therefore, continuous investment in workshops and seminars remains essential for developing a competent, adaptive, and knowledge-driven agricultural extension workforce capable of addressing contemporary agricultural challenges.

2.1.3 Field Demonstrations and On-the-Job Training

Field demonstrations and on-the-job training are practical capacity-building modalities that play a vital role in strengthening the technical competence and professional effectiveness of agricultural extension personnel. Unlike conventional classroom-based training, these approaches emphasize experiential learning by allowing extension officers to acquire knowledge and skills within real-life agricultural settings. Through direct observation, practical engagement, and continuous field interaction, extension personnel develop a deeper understanding of agricultural technologies and improve their ability to transfer innovations effectively to farmers (Swanson & Rajalahti, 2010; Davis & Sulaiman, 2014).

Field demonstrations provide opportunities for extension personnel to observe, test, and validate improved agricultural technologies under actual farming conditions before recommending them to farmers. This practical learning approach enhances technical competence and increases the credibility of extension officers, as recommendations are supported by firsthand experience rather than theoretical knowledge alone. According to the Food and Agriculture Organization (FAO, 2022), demonstration-based learning promotes greater understanding of climate-smart agriculture, improved crop management, integrated pest management, soil fertility improvement, and sustainable water conservation practices. Consequently, extension personnel become better equipped to address farmers' practical challenges while promoting environmentally sustainable agricultural production.

Similarly, on-the-job training enables extension officers to learn continuously while performing their routine responsibilities under the supervision of experienced professionals. This approach facilitates immediate application of acquired knowledge, strengthens problem-solving skills, and encourages continuous performance improvement. Davis et al. (2020) argue that workplace learning enhances technical proficiency because extension personnel encounter real agricultural challenges,

receive immediate feedback, and gradually build confidence through repeated practice. Such experiential learning not only improves individual competence but also strengthens institutional capacity by fostering a culture of continuous professional development.

Empirical studies provide substantial evidence regarding the effectiveness of practical learning approaches in agricultural extension. Abdulazeez et al. (2022) found that extension personnel who regularly participated in field-based capacity-building programmes demonstrated significantly higher levels of technical competence and service effectiveness than those exposed primarily to theoretical instruction. Similarly, Agwu and Okorie (2023) reported that practical demonstrations enhanced extension officers' ability to disseminate improved agricultural technologies, resulting in greater farmer confidence and increased adoption of recommended practices. Ejem et al. (2023) further observed that experiential learning strengthened communication, advisory, and facilitation skills by enabling extension personnel to translate technical information into practical guidance that farmers could readily understand and implement. Although these studies focus on different dimensions of professional competence, they collectively affirm the value of practical learning in improving extension performance.

Beyond technical skill acquisition, field demonstrations and on-the-job training encourage innovation, critical thinking, adaptability, and evidence-based decision-making. Extension officers are exposed to diverse farming systems, interact directly with farmers, and gain practical insights into local production constraints. Such experiences improve their ability to tailor advisory services to specific socio-economic and environmental contexts rather than relying on generalized recommendations. Furthermore, practical engagement strengthens collaboration among research institutions, extension agencies, and farming communities, thereby facilitating more effective technology transfer and sustainable agricultural development (FAO, 2022; GFRAS, 2021).

From a sustainability perspective, field demonstrations serve as effective platforms for promoting climate-smart agriculture, conservation farming, integrated nutrient management, efficient irrigation techniques, and environmentally friendly pest control strategies. By acquiring firsthand experience in these practices, extension personnel become more competent in supporting farmers to adopt innovations that improve productivity while safeguarding natural resources. Consequently, practical capacity-building approaches contribute not only to improved extension service delivery but also to the broader objective of achieving sustainable agricultural development.

Synthesis

The literature consistently identifies field demonstrations and on-the-job training as indispensable experiential learning strategies for strengthening agricultural extension systems. While scholars emphasize different outcomes—including technical competence, practical problem-solving, communication effectiveness, and innovation dissemination—they unanimously acknowledge that experiential learning bridges the gap between theory and practice. Collectively, these findings suggest that integrating field-based learning into extension capacity-building programmes significantly enhances the ability of extension personnel to promote sustainable agricultural practices and improve farmers' productivity.

2.1.4 Mentoring and Coaching

Mentoring and coaching have increasingly gained recognition as essential capacity-building modalities for strengthening the professional competence of agricultural extension personnel. Unlike conventional training programmes that often emphasize knowledge acquisition, mentoring and coaching focus on continuous professional guidance, experiential learning, skills transfer, and career development through sustained interactions between experienced professionals and less experienced extension officers. These approaches facilitate the practical application of knowledge,

encourage reflective learning, and enhance professional confidence, thereby contributing to improved extension service delivery (Davis & Sulaiman, 2014; GFRAS, 2021).

Mentoring involves a long-term developmental relationship in which experienced extension professionals provide technical guidance, institutional knowledge, and career support to junior officers. Coaching, on the other hand, is generally more structured and performance-oriented, focusing on improving specific competencies, addressing identified performance gaps, and enhancing problem-solving abilities. Although the two approaches differ in scope and duration, both contribute significantly to continuous professional development by promoting experiential learning and encouraging the practical application of acquired knowledge within real-life agricultural settings (Swanson & Rajalahti, 2010).

The Food and Agriculture Organization (FAO, 2022) recognizes mentoring and coaching as strategic mechanisms for strengthening institutional capacity, promoting innovation, and ensuring knowledge continuity within agricultural extension systems. Through these approaches, experienced officers transmit tacit knowledge, field experiences, and best practices that are often difficult to acquire through formal classroom instruction alone. Similarly, GFRAS (2021) emphasizes that effective mentoring programmes foster professional confidence, improve decision-making, and strengthen the adaptive capacity of extension personnel in responding to emerging agricultural challenges.

Empirical evidence supports the effectiveness of mentoring and coaching in improving extension performance. Abdulazeez et al. (2022) observed that extension personnel who benefited from structured professional support demonstrated greater technical competence and higher service effectiveness than those who relied solely on formal training. Likewise, Ejem et al. (2023) found that continuous professional guidance significantly enhanced communication, advisory, and facilitation skills among extension officers, thereby improving farmer engagement and technology dissemination. Agwu

and Okorie (2023) similarly reported that supportive learning environments characterized by continuous coaching contributed to improved innovation adoption and more effective agricultural advisory services. Collectively, these studies suggest that professional competence develops more sustainably when formal training is complemented by structured mentoring and coaching relationships.

Beyond enhancing technical competencies, mentoring and coaching contribute to leadership development, ethical practice, teamwork, and institutional learning. They encourage critical reflection, continuous self-improvement, and effective knowledge sharing, thereby strengthening organizational resilience and promoting a culture of lifelong learning within extension institutions. Furthermore, these approaches facilitate succession planning by ensuring that valuable institutional experience is transferred to younger professionals, thereby enhancing the sustainability of agricultural extension systems (Davis et al., 2020).

From the perspective of sustainable agricultural development, mentoring and coaching equip extension officers with the confidence and practical expertise required to support farmers in adopting climate-smart agriculture, sustainable land management, integrated pest management, and other environmentally friendly farming innovations. Consequently, these capacity-building modalities not only improve individual performance but also enhance the effectiveness of agricultural extension systems in achieving broader rural development objectives.

Synthesis

The literature demonstrates that mentoring and coaching complement formal training by promoting continuous professional learning, practical skill acquisition, and institutional knowledge transfer. Although scholars distinguish between mentoring as a long-term developmental relationship and coaching as a performance-focused intervention, there is broad agreement that both approaches strengthen technical competence, communication, leadership, and problem-solving abilities among extension personnel. Their integration into agricultural extension programmes therefore

provides a sustainable mechanism for improving service delivery and supporting the adoption of sustainable agricultural practices.

2.1.5 E-Learning and Digital Capacity Building

The rapid advancement of information and communication technologies has transformed the delivery of agricultural extension services, making e-learning and digital capacity building indispensable components of professional development for extension personnel. Unlike conventional face-to-face training, digital learning platforms provide flexible, cost-effective, and continuous opportunities for extension officers to acquire new knowledge, update technical competencies, and access current agricultural information irrespective of geographical location. As agricultural systems become increasingly knowledge-intensive and technology-driven, digital capacity building has emerged as a strategic approach for enhancing the efficiency, responsiveness, and sustainability of extension service delivery (FAO, 2022; Davis et al., 2020).

E-learning encompasses the use of online platforms, virtual classrooms, webinars, mobile applications, digital resource repositories, and other information technologies to facilitate learning and professional development. These digital platforms enable extension personnel to access real-time information on emerging agricultural technologies, climate-smart agriculture, integrated pest management, market intelligence, and policy developments. According to the Food and Agriculture Organization (FAO, 2022), digital learning enhances knowledge accessibility and promotes continuous professional development by removing many of the financial and logistical constraints associated with traditional training methods. Similarly, the Global Forum for Rural Advisory Services (GFRAS, 2021) recognizes digital extension as a critical instrument for improving knowledge sharing, institutional learning, and innovation within contemporary agricultural advisory systems.

The increasing adoption of digital technologies has significantly expanded the capacity of extension

personnel to provide timely and evidence-based advisory services. Davis et al. (2020) argue that digital learning platforms improve technical competence by providing extension officers with immediate access to research findings, best practices, and interactive learning resources that support informed decision-making. Furthermore, digital technologies facilitate collaboration among researchers, extension agencies, policymakers, and farmers, thereby strengthening knowledge exchange and accelerating the dissemination of agricultural innovations. These developments have become particularly important in addressing emerging challenges such as climate change, food insecurity, and sustainable natural resource management.

Empirical studies equally demonstrate the positive contribution of digital capacity building to extension effectiveness. Danladi et al. (2023) reported that training agricultural extension personnel in information and communication technologies significantly enhanced their capacity to deliver extension services and improved the quality of interactions with farmers. Similarly, Abdulazeez et al. (2022) observed that continuous professional development programmes incorporating digital learning components contributed to higher levels of technical competence and improved service delivery among extension personnel. Ejem et al. (2023) also found that digital communication tools strengthened extension officers' ability to disseminate information efficiently while improving communication and farmer engagement. Although these studies examine different aspects of digital learning, they collectively indicate that information and communication technologies have become indispensable for strengthening agricultural extension systems.

Beyond improving technical knowledge, e-learning promotes lifelong learning, innovation, adaptability, and self-directed professional development. Digital platforms allow extension personnel to learn at their own pace, revisit instructional materials, participate in virtual professional networks, and exchange experiences with colleagues across different regions. This flexibility enhances continuous competency development while reducing the time

and financial costs associated with conventional training programmes. Moreover, digital capacity building supports institutional resilience by ensuring that professional development continues during emergencies, public health crises, or other situations that may disrupt traditional face-to-face training (FAO, 2022).

In the context of sustainable agricultural development, digital capacity building equips extension personnel with contemporary knowledge and technological skills required to promote precision agriculture, climate-smart farming, digital advisory services, remote sensing technologies, and sustainable resource management. Consequently, digitally empowered extension officers are better positioned to facilitate innovation adoption, improve farmers' decision-making, and support resilient agricultural production systems capable of addressing emerging environmental and socio-economic challenges.

Synthesis

The reviewed literature demonstrates that e-learning and digital capacity building have become integral components of modern agricultural extension systems. While scholars emphasize different benefits—including improved knowledge accessibility, technical competence, communication efficiency, institutional learning, and innovation dissemination—they consistently acknowledge that digital technologies enhance the effectiveness and adaptability of extension personnel. Collectively, these findings suggest that integrating digital learning into agricultural extension programmes is essential for developing a technologically competent workforce capable of promoting sustainable agricultural practices and responding effectively to the evolving needs of farming communities.

2.1.6 Monitoring, Evaluation and Reflective Learning

Monitoring, evaluation, and reflective learning have emerged as critical capacity-building modalities for enhancing the effectiveness and continuous

professional development of agricultural extension personnel. Unlike conventional training approaches that primarily focus on knowledge acquisition, these mechanisms emphasize continuous assessment, performance improvement, accountability, and organizational learning. Through systematic monitoring and evaluation, extension personnel receive constructive feedback on their performance, identify areas requiring improvement, and adopt evidence-based strategies for delivering more responsive and effective advisory services. Consequently, monitoring and reflective learning have become indispensable components of modern agricultural extension systems committed to achieving sustainable agricultural development (FAO, 2022; GFRAS, 2021).

Monitoring involves the continuous assessment of extension activities to determine whether planned objectives are being achieved, while evaluation provides a systematic appraisal of programme outcomes, effectiveness, efficiency, and overall impact. According to Swanson and Rajalahti (2010), effective monitoring and evaluation systems generate valuable information that supports informed decision-making, improves programme implementation, and enhances institutional accountability. Similarly, Davis and Sulaiman (2014) contend that performance assessment enables extension organizations to identify competency gaps, evaluate training outcomes, and design appropriate professional development interventions that respond to changing agricultural needs.

Reflective learning complements monitoring and evaluation by encouraging extension personnel to critically examine their experiences, assess the effectiveness of their advisory approaches, and continuously improve their professional practice. Rather than viewing learning as a one-time event, reflective practice promotes lifelong professional development through self-assessment, peer learning, and evidence-based adaptation. The Food and Agriculture Organization (FAO, 2022) recognizes reflective learning as an essential mechanism for strengthening innovation, improving service quality, and promoting adaptive management within agricultural extension systems. Likewise, GFRAS

(2021) emphasizes that organizations that cultivate reflective learning are better positioned to respond to technological change, farmer needs, and emerging environmental challenges.

Empirical evidence supports the role of monitoring, evaluation, and reflective practice in strengthening extension performance. Abdulazeez et al. (2022) found that extension organizations with structured performance assessment and continuous professional feedback demonstrated higher levels of staff competence and service effectiveness. Similarly, Agwu and Okorie (2023) reported that regular evaluation of extension activities improved programme implementation, strengthened accountability, and enhanced the adoption of agricultural innovations among farmers. Ejem et al. (2023) also observed that reflective professional practices improved communication, facilitation, and advisory competencies by encouraging extension personnel to learn from field experiences and continuously refine their service delivery approaches. Although these studies emphasize different aspects of organizational learning, they collectively demonstrate that continuous performance assessment is fundamental to effective capacity building.

Beyond improving individual competencies, monitoring and evaluation contribute significantly to institutional learning by generating evidence for policy formulation, programme redesign, and strategic planning. Continuous assessment enables extension organizations to identify successful interventions, replicate best practices, and address operational weaknesses before they become systemic challenges. Furthermore, reflective learning promotes innovation by encouraging extension personnel to experiment with new approaches, evaluate outcomes, and integrate lessons learned into future extension activities (Davis et al., 2020). This iterative learning process strengthens organizational resilience and enhances the overall quality of agricultural advisory services.

Within the context of sustainable agricultural development, monitoring, evaluation, and reflective learning enable extension personnel to assess the effectiveness of interventions aimed at promoting

climate-smart agriculture, conservation practices, integrated pest management, and sustainable natural resource management. Evidence generated through continuous assessment supports informed decision-making, facilitates adaptive management, and ensures that extension programmes remain responsive to the evolving needs of farmers and rural communities. Consequently, these capacity-building modalities strengthen both individual professional competence and institutional effectiveness while contributing to sustainable agricultural transformation.

Synthesis

The reviewed literature consistently identifies monitoring, evaluation, and reflective learning as integral components of effective capacity building within agricultural extension systems. While scholars emphasize different outcomes—including performance improvement, accountability, organizational learning, adaptive management, and innovation—they collectively acknowledge that continuous assessment and reflective practice enhance the competence of extension personnel and improve extension service delivery. Therefore, embedding monitoring, evaluation, and reflective learning into extension programmes provides a sustainable mechanism for strengthening institutional performance and promoting the successful adoption of sustainable agricultural practices.

2.2 On-farm Demonstration and Extension Officers' Competencies

The impact of capacity building is typically measured by the extension officer's competencies (technical, communication, digital, and leadership/facilitation) and the quality of on-farm demonstrations that can be provided by the extension officer (FAO, 2022).

On-farm demonstrations can be used to present innovations to farmers in their actual field conditions, which can help to promote the linkage between research and practice (FAO, 2022). Officers are well trained in the selection of

appropriate demonstration sites, and in the proper use of recommended practices; their work involves farmers in the implementation; and they arrange farmer field days to assess outcomes first hand. The experiential model is consistent with the observed adoption situation in Kwara State where Egbewole et al. (2025) found that farmers who had frequent contact with extension offices' were more likely to adopt mulching, crop rotation and integrated soil-fertility management than the farmers who had limited contact.

Despite this, there is also a consistent literature regarding the fact that training is not sufficient for better demonstration performance. Demos are not regularly implemented, and the extension officers are few in number, resulting in inadequate logistics and extension officer to farmer ratio which further constrains the frequency and quality of demos that can be conducted (Abdulazeez et al., 2022). This is an important qualification: research measuring the extent to which competencies gained in training are transferred to the field at scale (e.g., Ejem et al., 2023; Ozioko et al., 2022) generally does not measure whether these competencies were transferred, and research measuring institutional constraints (e.g., Abdulazeez et al., 2022) does not always disaggregate by officers' training history. The present review does not address this issue as a closed one but merely leaves the field open.

2.3 Agricultural extension - Is an activity that enables farmers to gain access to knowledge, technology and extension services to improve their productivity and improve their rural livelihoods. Extension officers are change agents who take research and present it in a hands-on fashion in demonstrations, farmer learning and problem-solving assistance (Grovermann et al., 2022). This role of a "knowledge-broker" has been generally understood in the recent literature, albeit with varying focus on the magnitude of this role; for FAO (2022), extension is an institutional service-delivery role while for Grovermann et al. (2022), extension is a relational and advisory process to support farmers' decision-making. Such a distinction is important for the present study because it impacts the definition of "effectiveness," which is assessed at either the institutional level (as

service coverage) or as observable changes in farmer practice.

2.4 Capacity building: Capacity building activities for extension officers involve in-service training, mentoring and exposure, aimed at building their technical knowledge and farming communication and facilitation, enabling them to effectively support farmers (FAO, 2022). The literature of the last few years has strengthened the focus on the need to practice capacity building and to be context-specific, with institutional capacity building resources (logistics, transport, digital tools, monitoring systems) which can be cascaded to sustainable service delivery improvements (Ziervogel et al., 2022). There exists variations in literature on the emphasis, some (e.g., Ejem et al., 2023) consider capacity building as a problem of communication skills while others (e.g., Danladi et al., 2023) consider it as a problem of technology/ICT-literacy. Both are correct, albeit partial, framings, but the present review view capacity building as a multi-dimensional concept, where technical, communication and digital capacities are included.

2.5 Sustainable Agriculture practice (SAP) refers to those agriculture production systems that attempt to sustain or improve productivity, whilst at the same time reducing and/or preventing potential damage to natural resources and the environment - including climate-smart agriculture, conservation agriculture (minimum tillage, mulching, crop rotation), integrated soil-fertility and pest management, agroforestry, efficient use of water. Uneven adoption of SAP is reported in Kwara State, through several studies. While reduced tillage and organic amendments are becoming popular among rice and maize farmers, their limited access to inputs, labour and extension contacts still constrain their adoption (Sikiru et al., 2025; Egbewole et al., 2025). They noted that use of high yielding seed and agrochemicals was least adopted in these trials, especially because of their high cost, while adoption of regenerative and conservation practices was delayed in small farm size, less educated farmers and when farmers have less contact with extension services (Sikiru et al. 2025). The results of Ahmed et al. (2025) further indicate

that many environmental-management practices of the peri-urban rice farmers of Ilorin are poorly sustainable which further calls for stronger extension support to the farmers. When considering barriers to use of regenerative agriculture in KWADP, the findings of Ibrahim-Olesin et al. (2025) revealed that resource constraints, weak policy enforcement, and high operating costs were the most significant constraints, with marital status, education, extension access, and market access among the strongest determinants of uptake.

2.6 Theoretical Review

This study is based on two theories: the Diffusion of Innovations Theory and the Human Capital Theory.

The Diffusion of Innovation Theory details how new ideas and technologies transfer from the point of innovation to the population as a whole, and designates the extension officer a crucial role for promoting the diffusion of an innovation by making it more comprehensible and allowing farmers to observe and test it at a small scale before it becomes more widely adopted. This mechanism is supported by recent applications of the theory in extension research, which showed that exposure to extension advisory service was strongly correlated with diffusion of climate-smart and conservation practices (Grovermann et al. 2022), and exposure to extension officers that demonstrate high communication and facilitation competence is more effective in moving farmers from awareness to trial adoption (Ejem et al. 2023). One of the core drawbacks of the theory, as mentioned in this literature, is that it tends to focus on limited aspects of structural constraints (pricing, access to credit, land rights, and infrastructure) that could be a barrier to adoption even if knowledge and demonstrated results are present. This is demonstrated by Ibrahim-Olesin et al. (2025) and

Sikiru et al. (2025) both showed farmer's well-informed knowledge of regenerative practices, but inability to implement them in cases where farmer resources were restricted. Though the theory is not used here, the focus of the study, the impact of extension officers' competencies on the transfer and uptake of sustainable practice is clearly within the explanatory space of the theory, with the structural blindness of the theory explicitly identified and not presumed away.

Human Capital Theory posits that investment in training, education, and skills development will lead to increases in individual productivity and performance. As applied to extension work, it would be expected that capacity building (training, mentoring, refresher courses) would increase the officers' problem solving, communication and technical competence, and consequently their effectiveness in the field (Ziervogel et al., 2022). The problem with its limitation is that it focuses on individual competence and ignores and underestimates the role of institutional constraints, such as funding, logistics and supervision, that limit performance even when officers are well-trained (Abdulazeez et al. 2022; Danladi et al. 2023).

Relevance of the theories. Both theories are not mutually exclusive, but complement each other: Human Capital Theory can be used to understand why officers' training investment should increase officers' competence; Diffusion of Innovations Theory can be used to understand how the increased competence of officers will lead to farmer-level uptake of sustainable farming practices. The conceptual basis of the framework below is provided by both together, as both are underweight: structural and institutional. Both are underweight: structural and institutional — this is the conceptual basis of the framework below which treats institutional support as a moderating variable.

2.7 Conceptual Framework

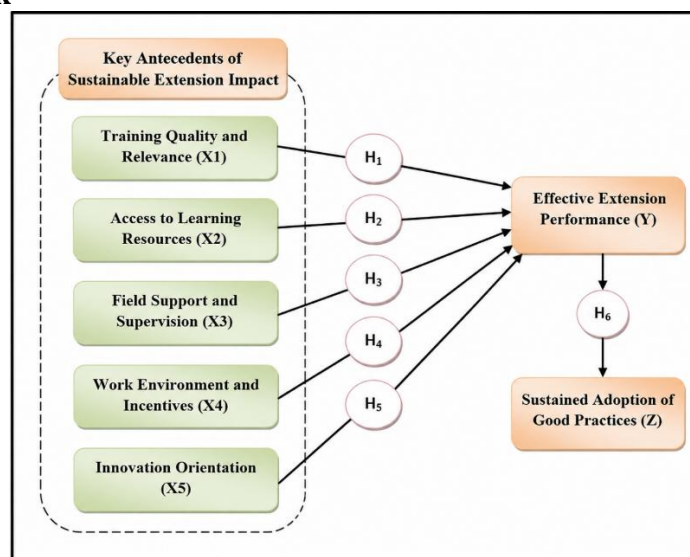


Fig 1: Conceptual framework

2.8 Empirical Review

Data from Kwara State - Empirical research in Kwara State has repeatedly shown that contact with an extension officer is associated with better adoption of sustainable practices, but not necessarily with the extent of the contact, but with contact quality, that is, extension officer's competence and institutional support. Increased adoption of regenerative and conservation practices by maize farmers in communities where KWADP is more active was noted by Sikiru et al. (2025). In Ilorin East LGA, mulching, crop rotation and integrated soil-fertility management were practices that were more popular and practiced by farmers who received frequent visits from extensionists as compared with those who received less visits by extensionists in the LGA as reported by Egbewole et al. (2025). Ibrahim-Olesin et al. (2025) also connected extension access to uptake of regenerative practices, and resource constraint and weak policy implementation as the constraints on scale up.

Findings from other ADPs in Nigeria - For modality, Agwu and Okorie (2023) discovered that officers trained through a training modality that involved practical and demonstration were found to perform significantly better compared to those

trained using the lecture-based training modality. This corroborates the findings of the previous section: that practical and demonstration-based training is effective. Many Extension Agents in Kaduna ADP lacked digital competence, and they were not leveraging the use of ICT platforms for Advisory Delivery, which is consistent with what FAO (2022) had claimed. The presence of many Extension Agents lacking digital competence in Kaduna ADP meant that they were not using Digital Platforms for Advisory Delivery, directly challenging FAO's (2022) assertion that digital modalities extend advisory reach easily. Abdulazeez et al. (2022) also found that job performance of extension personnel improved in the country following capacity building, with the improvement being more significant in the areas where logistical support was provided, highlighting the institutional-moderation pattern identified in the conceptual framework.

More general regional and international evidence. There is evidence that extension systems which demonstrated higher institutional performance (as measured by the FAO's Extension and Advisory Service Systems Yardstick) led to better farmer outcomes even though they did not necessarily have more trained staff, as competence gains and

institutional capacity must be measured together, and not rely on the number of trained staff as a proxy for extension system effectiveness (Grovermann et al., 2022). Similarly, Ziervogel et al. (2022) found that the effect of capacity building programmes on innovation and creativity was more long-lasting in the presence of ongoing mentoring and monitoring than in the absence of it.

The following is a summary of the literature review and gaps identified.

The literature reviewed suggests three common findings: (1) Technical and communication skills and digital competency can be reliably developed in extension officers through capacity building programs; (2) Technical and communication skills and digital competency are directly linked to the quality of on-farm demonstration and farmer adoption of sustainable practices, and (3) the relationship of capacity building to the development of technical and communication skills and digital competency is consistently moderated by institutional support, not by the quality of the capacity building program.

There are also two enduring gaps in the literature. First, the majority of studies measure gains in officer competence or outcomes of farmer adoption, but few have done both in the same study, leaving the middle link of the equation (competence → demonstration quality) less well documented. Second, there are few studies that differentiate between the contribution of specific modalities of capacity building (training vs mentoring vs digital learning) and that of capacity building as a single undifferentiated intervention. The goal of this review is to fill these gaps by synthesizing the evidence at both stages of the framework and by reviewing the evidence on each modality separately in Section 4.

3.0 Methodology

3.1 Research Design

The research design used in this seminar paper was the narrative review. Narrative review is a qualitative method to identify, review and summarise existing scholarly and policy evidence

on a topic, without the use of statistical analysis as in systematic review and meta-analysis (Hall, 2024). It was deemed suitable here because there was no intention to generate primary data, only to critically examine and synthesize the available evidence regarding the role of extension officers' capacity building for the promotion of sustainable agricultural practices in Kwara State and identify areas of agreement, disagreement and gaps in this available body of evidence.

3.2 Study Area

Kwara was purposively selected as one of the states in which the Agricultural Development Project (ADP) implemented by the World Bank had worked for a long time and the state has an extension service delivery system that had been in existence for a long time.

3.3 Sources of Data

This study used only secondary sources of data. Sources of literature included peer-reviewed journal articles, government publications, policy documents and institutional reports, including KWADP, Federal Ministry of Agriculture and Food Security, FAO and World Bank reports. The remaining materials were obtained from Google Scholar, ResearchGate and institutional repositories.

3.4 Search Strategy and Study Selection

Literature was retrieved from Google Scholar, ResearchGate and institutional/ADP repositories by using the combinations of the keywords: "agricultural extension," "capacity building," "extension officers," "sustainable agricultural practices," "on-farm demonstration," "Kwara State," and "Nigeria".

Inclusion criteria: Studies published from 2020 to 2026, studies that relate to agricultural extension, capacity building, extension officer competencies or the sustainable/regenerative practices of agriculture, peer reviewed journal articles, institutional/ADP reports or publications from recognised

development organisations such as the FAO, the World Bank or the OECD, where there is direct comparable extension-system evidence, with priority given to studies conducted in Nigeria, specifically in Kwara state.

Exclusion criteria: Studies published prior to 2020, lacking a methodology, or unable to be independently verified, duplicate report of the same study, and unable to be verified independently.

Quality appraisal: retained sources were evaluated with respect to relevance to the study's aims, methodological transparency (Data source and analytical strategy clearly stated) and consistency with other sources reviewed. Unverified claims or those not attributed to a specific source or year of publication were not included.

3.5 Scope of the Study

This review is for literature published from 2020 to 2026. The rationale for choosing this period was to reflect the latest trends in extension systems in Kwara State and Nigeria, such as the shift towards digital and blended extension delivery as well as the full consistency with the scope of the paper throughout.

3.6 Method of Data Analysis

Thematic narrative synthesis was used to analyze the data collected from the literature reviewed. Selected literature was read, compared, and sorted into themes that corresponded to the two objectives of the study namely: capacity building modalities and on-farm demonstration/ competency outcomes, in order to compare findings among the studies, identify common trends and conflicting views, and be able to synthesize the effectiveness of extension officers' capacity building in Kwara State based on the available evidence.

3.7 Justification for the Narrative Review Method

The narrative review method was suitable for the study as it aimed to synthesize and critically

evaluate the available knowledge, and not collect new primary data, which would give an evidence-based assessment of the impact of capacity building on the effectiveness of extension officers in promoting sustainable agricultural practices in Kwara State.

3.8 Study Limitations

The disadvantage of this study is that secondary data obtained from published articles, reports and institutional repositories are used. It is a narrative review which does not involve primary data collection from the extension officers or farmers in Kwara State, and therefore, the results rely on the quality, quantity and reliability of the literature reviewed; the scope and methodological strength of the literature reviewed is different between the various sources.

4.0 Thematic Synthesis and Discussion

This is a narrative review, not a primary empirical study, so this section will draw together and critically interpret evidence in literature reviewed, and not present statistical evidence. It follows the two thematic objectives of the study.

4.1 The first theme in this chapter is "Modalities of Capacity Building for Extension Officers in Kwara State.

The evidence synthesized indicates that capacity building approaches for extension officers in Kwara State involve in-service training, workshops, seminars, field demonstrations, farmer field schools, and less often, mentoring and digital learning (Egbewole et al., 2025; Ziervogel et al., 2022). In the reviewed literature, practical and demonstration learning modalities have proven to be more effective than lecture learning modalities (Agwu & Okorie, 2023; Suvedi et al., 2023), while combined learning modalities with two modalities being more effective than single-modality learning modalities (Ziervogel et al., 2022; Danladi et al., 2023).

Issues of digital modalities are less clear cut: while,

as FAO (2022) puts it, “digital learning is an important complement” to traditional learning, Danladi et al. (2023) concluded that the baseline technical skills of ICTs of many extension agents were not sufficient to use digital platforms effectively. This implies that digital capacity building in Kwara State is not just replicating what other literature reports, but must first address the competency gap in the context of Kwara State.

4.2 Theme Two: On-Farm Demonstration Activities and Extension Officers' Competencies

The reviewed evidence suggests that technical, communication, problem solving skills of extension officers were improved through capacity building (Ejem et al., 2023; Ozioko et al., 2022), and effective on-farm demonstration by better-trained officers was observed (Egbewole et al., 2025). But this does not mean that there is no limitation because Abdulazeez et al. (2022) and Danladi et al. (2023) both discovered that the training competencies of extension officers are not effectively converted to regular demonstration activities due to institutional constraints such as the high ratio of extension officers to farmers, logistics constraints, and funding constraints.

The conflicting findings from the literature reviewed is the tension that exists between competency-focused studies such as Ejem et al., (2023); Ozioko et al., (2022) and system-based studies such as Abdulazeez et al., (2022); Danladi et al., (2023) where individual gains are often limited at the system level. Together, they substantiate the main tenet of the conceptual framework, which argues that the quality of the training is not the determining factor in institutional support being a key factor for capacity building to be effective in improving on-farm demonstration and, in turn, on-farm adoption of sustainable practices.

4.3 Implications of Findings

The results of Theme One suggest that capacity building programmes must not only exist, but must be continuous and practical for the extension services to be effective in Kwara State. Disconnected or theoretical learning can leave

officers without the most up-to-date and accurate information about new climate-smart and digital extension tools, and farmers without timely, accurate information and advice. This suggests that capacity development needs to be made an ongoing project activity rather than a one-off initiative.

Theme Two results suggest that officer competence must be increased but not just enough. Investment in infrastructure (transportation, teaching materials, digital tools, and staff) must also be done to ensure that the competency improvements that can be gained from training are translated into demonstration activity and farmer outcomes in the field. This confirms the conceptual framework's view of institutional support as a moderating variable as opposed to a background variable and implies that future investments in the extension system in Kwara State should be considered in terms of training delivery as well as institutional capacity.

5.0 Conclusion and Recommendations

5.1 Conclusion

This paper is a seminar paper which investigated the effectiveness of the capacity building programmes of extension officers in the promotion of sustainable agricultural practices in Kwara state. The literature reviewed shows that capacity building is central to the development of the technical, communication and digital skills of extension officers, which in turn are linked to increasing on-farm demonstration of practices and farmer adoption of sustainable practices like conservation agriculture and integrated soil-fertility management.

The review also reveals that these benefits are always hindered by insufficient budgets, inconsistent training program schedules, too many extension officers per farmer, poor logistical support and a lack of digital skills on the part of extension officers. The evidence thus confirms the need for capacity building and institutional support as both necessary conditions: without capacity building, trained officers are not able to implement their skills and talents in practice; without institutional investment, officers will lack the skills

and knowledge required to tackle new agricultural challenges.

5.2 Recommendations

The following recommendations are directly related to gaps and constraints identified in the reviewed evidence:

Establish a long-term extension impact-tracking system. The reviewed studies (Section 2.6) primarily measure training outcomes at or shortly after training, thereby missing an opportunity to determine if and how competence translates to demonstration activity and farmer adoption, addressing the competence-to-adoption evidence gap identified in (Section 2.7).

Develop an extension innovation and learning hub. A dedicated hub would enable officers to experiment with new technologies, share their experience and receive ongoing mentoring, which is clearly more beneficial than one-off training (Section 4.1).

Create special extension units for upcoming problems. Specialized units on climate-smart agriculture, digital agriculture and agribusiness would enable targeted instead of generalized capacity building as digital and ICT competence gaps were identified as specific constraint (Danladi et al., 2023).

Develop competency-based certification for extension officers. As demonstrated, the effectiveness of extension is not only dependent on the attendance of trainers but also on the actual demonstration of practical and communication skills (Agwu & Okorie, 2023); thus, the minimum requirement for a trainer to be certified should be based on practical and communication skills as opposed to training attendance.

Create a knowledge retention and succession system! Successful field strategies should be captured with manuals, digital repositories, and mentored or structured training to prevent the loss of institutional knowledge when practicing officers retire.

Make farmer feedback a performance-evaluation

mechanism. Farmer feedback on the accessibility, technical competence, and usefulness of advisors within the extension service should be formally complemented with farmer level adoption outcomes within the conceptual framework of this review (Section 2.5), since farmer level of adoption outcomes are the ultimate measure of extension effectiveness.

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