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Research Extension Linkage – A Review

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Abstract

The flow of information from research centres to farmers requires continuous contact between actors. If the link is weak the agricultural productivity will not increase. With the introduction of improved technologies, food production can be increased at a geometric pace in response to population growth. *However, large numbers of production technologies developed by research institutes over time have not achieved food sufficiency due to poor linkage between research and extension. At times, it takes unnecessarily too long for promising technologies to develop to achieve their objectives.* The broad objective of this review is how weak links can be strengthened to improve agricultural communication between research and extension organisations. The specific objectives are to: (i) examine factors influencing research, extension and farmers' linkage; and (ii) highlight the strategies for strengthening the connection between research and extension. *A random sampling technique was used to review 20 relevant articles from Google Scholar.* The review concludes that strengthening the link between research and extension is vital for improving agricultural productivity and achieving food security. Key recommendations include fostering collaborative partnerships amongst the stakeholders, enhancing public-private cooperation, and ensuring active involvement of farmers in the research and extension process

Keywords: information, productivity, technologies

Introduction

Effective research-extension linkage is crucial to the creation of new technology and its distribution to farmers, who are its final consumers. The different entities involved in the system of technology generation, distribution, and usage are linked together with a wide

variety of collaborations and the sharing of helpful information. Research and extension in agriculture are two instances of systems that need to be connected via feedback and information exchange. Farmers are caught between extension and research. They are the primary beneficiaries and targets of research and extension operations. The interaction between farmers, research, and extension is seen as a continuum that is both interrelated and interdependent. Researchers, extension agents, and farmers form a close-knit team that fosters the development of pertinent technology. The target population experiences perceived benefits or directly measurable effects from the usage of such technologies. A "top-down" one-way communication paradigm has typically served as the foundation for research and extension linking networks of agricultural technology development and transfer, with information flowing from researchers to end users (Udoye, C. E and Dimelu, 2024).

According to the apparent demands that scientists have identified, farmers are viewed as passive recipients of research outcomes in this regard. Additionally, this paradigm sees researchers, extension officials, and farmers as three distinct strata with weak connections between them. Due to the "top-down" approach to technology development and transfer, farmers now have few choices when it comes to selecting technologies that meet their unique farming requirements and fit into their local social, cultural, political, and economic contexts (Olayemi et al. 2021). One of the main factors reportedly impeding the exchange of knowledge, information, and resources among the participants in the technology-delivery-utilization chain is the insufficient connection between research and extension (Ahmad and Karim, 2019).

It has been noted that the most significant institutional issue in creating research and extension programs is bridging the gap between research and extension. Therefore, it is crucial to stress that the entire process of developing and disseminating technology must be built on an equal collaboration between extension agents, farmers, and researchers who share knowledge and expertise and learn from one another. Moreover, enhancing Public-Private Partnership (PPP) is necessary for research and technology transfer initiatives.

Farmer Participatory Approach (FPA) is the current status of research-extension relationship, nevertheless. With this method, farmers can actively participate in the planning and execution of projects at every level. Lack of this one component—farmers' participation—made many previous ventures fail. Participation from farmers is necessary for problem diagnosis, process implementation, monitoring, assessment, and feedback-giving. It is necessary to identify the old knowledge and technologies and to build new ones with consideration for the local environment. To make this happen, a friendly relationship between the farmer and the extension agent is necessary.

Objective of the study

The study examined how weak links can be strengthened to improve agricultural communication between research and extension organisations. The specific objectives

are to: (i) examine factors influencing research, extension and farmers' linkage; and (ii) highlight the strategies for strengthening the connection between research and extension.

Methodology

The review was conducted using a random sampling technique to select 20 relevant articles from the database (Google Scholar). Articles were selected based on their relevance to research-extension linkages and agricultural productivity. The analysis focused on identifying key factors influencing these linkages and effective strategies for improvement

Result and Discussion

Factors Influencing Research, Extension and Farmers' Linkage

Institutional and organizational factors: Extension from the top down and research management. Approaches to both research and extension are typically centralized. in most parts of the world and follow a top-down approach. However, the extension program in Nigeria has been decentralized to the state level. Extension programs and policies more often than not have been developed without taking into account the opinions of farmers (Maulu et al., 2021). Farmers consequently don't have enough time to choose the priorities for research and extension.

The rule of engagement among extension workers in most parts of the developing world has been centrally planned, institutionally monolithic, purely production-focused, and structured on the idea that public sector extension mechanisms may successfully reach the village level (Rashid et al., 2021). Therefore, it is challenging for extension agents to react flexibly to local requests due to the bureaucratic structure of personnel procedures and extension management (Baloch et al., 2019). Furthermore, it has been claimed that the extension systems created in this way prioritize successful and role model farmers, excluding marginalized and impoverished farmers from programmes' planning, execution, and assessment (Lee et al., 2023). This makes it difficult to work together and coordinate with farmers, extension, and research

Administration glitches: Extension agencies and agricultural research institutes are run and controlled independently, with little interaction and collaboration between them. The Ministry of Agriculture and Rural Development oversees extension, but research institutes are responsible for the majority of research efforts. Furthermore, the majority of developing nations have weak links between research and extension because these organizations compete with one another for the limited resources available to them rather than working together toward a common goal (Baloch et al., 2019). Furthermore, there is ineffective monitoring and assessment of the current connection mechanisms.
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Absence of incentives for linking activities: People are not very motivated to engage in linkage activities. According to FAO (2023), rewards for journal publications are greater than those for linkage activities. The incentives for extension workers to remain in their roles and deliver the required results are frequently inadequate at the field level. Because

of this, extension employees are constantly quitting the systems in search of higher paying positions. Additionally, there is ineffectiveness in the incentive systems designed to encourage farmers to actively utilize the training facilities (FAO, 2023). Thus, rather than working with farmers and academics to promote agricultural development, Extension personnel are compelled to look for better employment.

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Insufficient financial budget for linking activities: According to FAO (2023a), there is frequently a deficiency of funds for linkage functions like publications, testing of research findings, and extension worker training. Furthermore, rather than working together to achieve shared development objectives, research institutes and the ministry of agriculture are in competition with one another for funding (Hirnoven and Hoddinott, 2020). The disregard for connectivity efforts results from the competition for the same resource.

Structure-related factors: In rural areas, road networks are few and do not connect to many villages. Fair prices are not paid to farmers for their produce. Farmers are deterred from implementing new technologies as a result (Debele et al., 2019). Road transport systems in most developing nations cannot support an efficient and market-based production and distribution system. Nearly 75 per cent of farms are more than half a day's walk from all-weather roads. The development of road network in some countries has been seriously impeded by wide topographical variations, extremely rugged terrain, severe climatic conditions and a widely dispersed population. It is estimated that about 70 per cent of the developing countries' land area is not served by a modern transport system (Antwi-Agyei and Stringer, 2021). Moreover, development agents go through a lot of stress by travelling up to 8.5 kilometres to see some of their target farms, and in a recent study, approximately 50% of the respondents said they travelled on foot while 36% claimed they travelled by horse or mule. (Antwi-Agyei and Stringer, 2021). This suggests that there are no transportation options available for researchers and extension workers to hold visits with farmers.

Insufficient expertise: Insufficient capacity development obviously impedes expansion system. Low morale and technical knowhow characterize many development agents and specialists in the developing world (FAO, 2023b). Furthermore, according to FAO (2023a), development agents, extension administrators, and bureau heads lack the necessary abilities to engage in the planning, evaluation, and setting of priorities for extension programs. Antwi-Agyei and Stringer (2021) found that 52% of the extension agents lacked sufficient practical abilities. Nonetheless, scholarly works have indicated that robust connections between farmers and research are unattainable in the absence of highly skilled and experienced extension agents (Lee et al., 2023). This makes it clear that one of the reasons for weak connection is the existence of extension workers who are less competent. In order to effectively work with farmers, many front-line extension workers in Africa lack the competencies (skills, knowledge, attitude, and consequent behaviour) that are necessary (Antwi-Agyei and Stringer, 2021). Antwi-Agyei and Stringer (2021) state that professional extension workers with sufficient training in extension methodologies and communication skills must be hired in order to establish productive connections between research, extension, and farmers.

Furthermore, research and extension workers have quite different value systems, educational backgrounds, and communication styles. Extension agents believe that researchers are working in "ivory towers" because they are viewed as professionals who possess greater education, training, and status than other people. They also believe that academics are creating technologies that are not applicable to farms. Researchers also doubt extension agents' comprehension of study findings, their ability to interact effectively with farmers, and their capacity to offer beneficial inputs (FAO, 2023b).

Lack of motivation: MTD Training Academy (2019) states that someone who is driven to achieve a goal, target, or objective may be positively motivated. A person's reason for acting is characterized by their motivation. Therefore, it was anticipated that when development agents are driven at work, they will cooperate with other development agents, such as researchers and farmers, to work for a nation's optimal development.

The importance of effective linkage between various development actors to achieve sustainable agriculture was one of the key discussions of COP28 in Dubai in 2023. It welcomes the ongoing work of the Climate Technology Centre and Network as part of its projects selected for support under the Challenge Program for Adaptation Innovation of the Global Environment Facility as well as the collaboration of the respective national designated entities and operational focal points in the context of the project FCCC/CP (2024).

Also, it welcomes the collaboration between the Climate Technology Centre and Network and the operating entities of the Financial Mechanisms on identifying ways to enhance information-sharing and streamline coordination processes among national designated entities, nationally designated authorities of the Green Climate Fund and operational focal points of the Global Environment Facility and emphasizes the importance of continued coordination among those national focal points FCCC/CP (2024).

Strengthening research-extension linkage

Better results for the efficient delivery of technologies and services in the rural agro-based community come from strengthening the link between research and extension. Implementing practical steps at all levels of the research and extension organization could prove to be more efficient, pertinent, long-lasting, and expandable. Comprehensive structures for research and extension agencies were outlined by FAO in 2023b. Since extension and research staff play complimentary roles in agricultural development, the success of each group is primarily based on how well connection activities work. As a result, suitable methods to reinforce connections must be created. It is necessary to comprehend the guiding principles that determine the effectiveness of connection activities in order to develop such mechanisms. Essentially, six linking principles have been found (FAO, 2023b):

- Sharing a shared goal; the linkage that is activated should be in line with each group's activity.

- Employees in research-extension should believe that taking part in linking activities is beneficial to them.
- To encourage cooperation, there should be a common area or close proximity to one another.
- As work plans are being developed, incentives for engaging in linkage activities should be decided upon.
- There should be open communication and efficient exchange of information amongst members of various organizations.
- Regular financing and connectivity are necessary for long-term research and extension planning, budgeting, and shared responsibilities with partners. More connections between farmers in various communities and agro-dealers are needed for guidance and agricultural inputs (seeds, fertilizers, herbicides, etc.). Therefore, it is important for the research and extension agency to provide Agro-Dealers with customized training together with location-specific technology and extension messages. As a result, agro-dealers are now able to effectively provide farmers with technology and services. The relationship between research and extension employees would be reinforced by their shared commitment to ongoing education and training. The following are the managerial mechanisms: creating collaborative reviews of research and extension initiatives; and redefining job descriptions to fortify connections.
- Increasing personal rewards for teamwork.
- Modifying the methods of evaluation.
- Changing employees.
- Collaborative training for complex positions in a technological system.
- Sharing resources and services.
- Taking part in technology demonstrations together.
- Fostering unofficial connections.
- Sharing data via protocols that were designed in concert.
- Collaboratively plan synchronized community-based farming to increase technology adoption.
- Collaboratively validate promising innovations before releasing them widely.

Strategies to strengthen the connection between research and extension

Most of the world's agricultural research and extension systems are run by independent administrative and managerial organizations (Akinnagbe et al., 2024). In order to increase agricultural productivity, production, and net farm income, research and extension linkages must be strengthened. To do this, these institutions must work together in a coordinated and complementary manner. The following are suggested as steps to take in order to accomplish the goal:

- The identification and setting of research priorities and agendas for addressing particular issues should be based on feedback from extensions, involving researchers and extension staff.

- It is recommended that extension agencies and researchers collaborate in the planning, execution, and oversight of applied research.
- Development of vibrant extension approaches with active participation from research institutes and relevant NGO's for efficient delivery of technologies and services to various stakeholders; oversight, coordination, and guidance of various committees formed for research extension linkage purposes; support, monitoring, and evaluation of the impact of extension services and on-farm research results; and creation of an enabling environment and close working relationships between research and extension by the government.
- Creation of a committee inside research and extension institutions to determine the requirements for technology and the distribution process at various levels.
- Research and extension staff should actively participate in on-farm research and development, which should be viewed as a hub for technology validation and dissemination.
- Creation of public-private partnerships with academics and extension agents involved for marketing, entrepreneurial development, and the spread of agricultural technology
- Promote the establishment of strong farmer groups and their affiliation with research and extension agencies for efficient technology distribution, market access, value chain, and feedback.
- Enhancing the connections between the two groups (Research & Extension) can be achieved through planning agro-tours both domestically and overseas. Research and extension personnel should work together to provide the content for videos. Before going into mass production, videos should be developed locally and vetted. Videos ought to be utilized directly with farmers as well as for training trainers.

- Research and extension should collaborate to create a plan for the supply, manufacturing, and sale of inputs. They will assign accountability for certain tasks that need to be completed at various points throughout their collaborative plan. Collaborative program activities, like on-farm trials and demonstrations, as well as combined decision-making on technical recommendations and in-market linkage efforts, are really carried out by researchers and extension people. Researchers and their extension counterparts share responsibility for various duties during the execution of these various program activities, and they routinely confer with one another informally. To put it briefly, research and extension staff build a strong professional rapport through cooperative program activities that is crucial for enabling the exchange of technology and feedback throughout agriculture technology and marketing systems.

- The main course of action for bringing the three actors (REE) into effective linkage is to form a taskforce with members from each institution to develop a framework for effective linkage policies. To reduce misunderstandings and have a common vision, this is why joint problem diagnosis, joint priority setting, and review meetings are necessary. In particular, working with the scientific community and the Research, Extension, and Education Advisory Services is essential to creating

the novel and cutting-edge agricultural strategies needed to achieve successful partnerships.
•Both research and extension staff would be expected to maintain regular, informal interactions with various farmer organizations in their respective service areas in addition to these formal connectivity systems.

- Given the current situation, the agricultural higher education sub-system's primary challenge is to change to adapt to the constantly shifting external environment. Therefore, it is the responsibility of these universities to put reforms into their curricula that unite researchers and extension. The connection that would result would be crucial.

- To reduce misunderstandings and create a common vision, a team comprising representatives from each institution (education, research, and extension) should develop a structure that facilitates efficient connection, such as collaborative problem diagnosis, priority setting, and review sessions (Zajac, 2021).

- Strategies for agricultural research and extension at the national level must identify and specify the responsibilities that connect research and extension. It is equally crucial that they incorporate pertinent local factors and national agricultural research priorities into the formulation of their research strategy plans.

- It is relevant enough to mention that improving research-extension ties in underdeveloped nations necessitates institutional restructuring, legislative adjustments, and organization building.

- Rather than working together with a common goal, all of the research and extension groups are vying for the few resources available in the nation. Since agricultural research institutes and extension organizations are run independently, research goals are not always closely aligned with farmers' priorities (Baloch, et al., 2019). As a result, one organization should oversee both research and extension.

- There should be a policy to support educators and researchers in obtaining the required field experience in a variety of development and service organizations, as well as to provide opportunities for these professionals to teach (Diery, 2021).

- Colleges and universities specializing in agriculture should work more to bring scientific discoveries, innovations, and methods to farmers via field trips, farmers' training centres, and demonstration centres.

- One of the most important factors in the success of providing extension and consulting services is the involvement of the private sector (Akinnagbe et al., 2024). In particular, efforts should be made to boost the effectiveness of the government extension system by turning over a portion of the delivery of agricultural services to the private sector. In order to bring about the expected

growth and transformation in agriculture through technology and innovation, a policy framework that sustainably synergizes the linkages of the essential players should be in place.

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Conclusion and Recommendations

The review concludes that strengthening the link between research and extension is vital for improving agricultural productivity and achieving food security. Key recommendations include fostering collaborative partnerships amongst the stakeholders, enhancing public-private cooperation, and ensuring active involvement of farmers in the research and extension process.

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