

Research Article

Linkage Behavior and Practices of Agencies in the Agricultural Innovation Transfer Sub System in Nigeria: Issues for Agricultural Extension Policy

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Received: 📅 2023 Oct 19

Accepted: 📅 2023 Nov 07

Published: 📅 2023 Nov 19

Abstract

Agricultural innovation is essential for addressing the challenges faced by farmers and achieving sustainable agricultural development. Agricultural innovation System comprises of actors such as government, NGOs, stakeholders, farmers and extension agents. Agricultural Innovation System transfer in Nigeria is influenced by a number of factors ranging from lack of coordination, cooperation and support among the various actors in the innovation transfer process, inadequate training, lack of physical and financial infrastructure, limited capacities, poor stakeholder accountability and interactions, lack of intermediaries, and institutional failures. A few recommendations were made which include fostering collaboration and partnerships, strengthening extension system, promote knowledge sharing and training and lastly support policy reforms.

Keywords: Innovation, Practices, Transfer, Extension, Policy, Linkage

1. Introduction

Innovation is the process that businesses use to perfect and put into practice the creation and manufacture of products and services that are novel to them, regardless of whether they are novel to their rivals, nations, or the entire world. In order to increase productivity, sustainability, and overall development, the agricultural industry disseminates new technology, practises, and knowledge [1]. This process is referred to as "agricultural innovation transfer." The role of input suppliers in the diffusion of technologies is valued in relation to innovation processes and information and communication technology (ICT), [2]. According to Kebebe et al., systemic defects and imperfections have also been identified as obstacles to the development of the dairy industry [3]. Nevertheless, solutions combining institutional and technical interventions have been put up to address these issues. In order to solve agricultural sustainability transitions to more sustainable systems, agricultural innovation research and practise should integrate viewpoints from the innovation ecosystem and agricultural innovation systems [4, 5].

The process of formally transferring new agricultural discoveries, improved agricultural practises, or innovations that may come from research institutes into the agricultural sector is referred to as "agricultural innovation transfer." Agricultural extension is the process of transferring scientific agriculture's technology to farmers so they can use it and

improve their economies [6]. Agricultural extension services aim to provide farmers with the know-how they need to carry out better agricultural operations, to make timely information and improved practises accessible to them in a manner that is suitable for their literacy and awareness levels, and to foster in them a positive attitude towards innovation and change [7].

Thus, innovative performance of an economy depends not only on how the individual institutions perform on isolation, but also on how they interact with each other as elements of a collective system of knowledge creative and use. A dynamic and progressive interaction results in a great innovation stride [8, 9]. According to Aremu, Gana and Adelere, "agricultural technology transfer" refers to the formal process of transmitting agricultural innovations, improved practises, and new agricultural discoveries that may come from research institutions [10]. Agricultural extension is the process of transferring scientific agriculture's technology to farmers so they can use it and improve their economies. Agricultural extension services aim to equip farmers with the knowledge and abilities they need to carry out better agricultural operations, to provide them with timely information and better practises in a format that is suitable for their level of literacy and awareness, and to foster in them a positive attitude towards change and innovation [11].

Agriculture extension has been playing a significant role in many developed and developing world so, this shift role in the development of agriculture sector. Agriculture will lead to increase food productivity, income generation-based technologies are being transferred to the diversified and ensure food security at macro level particularly group of farmers and other people through extension and furnishing the food demand of increasing population advisory services for their overall welfare.

1.1 Objectives

- identify the different agencies involved in agricultural innovation transfer and understand their roles and responsibility
- analyze the extent of coordination, collaboration and communication between these agencies
- evaluate the effectiveness and efficiency of linkage behaviors and practices in promoting agricultural development
- identify the issues and challenges that arise from these behaviors and practices.

1.2. Conceptual Framework

The objective of the conceptual framework of the study is to analyze the various organization involved in the agricultural Innovation system (AIS) and the transfer system of the innovations and technologies. It is important to note that all the elements involved in the dynamics and complex process of that influence's operation and performance of the AIS were analyzed. This framework is composed of several factors in the innovation transfer system ranging from private and public sectors, determinants of production and supply (producers, consumers) and agricultural extension services. Within this framework, farmers as actors become a bridge within these processes, while public policies, informal institutions, behaviors, practices and attitudes, sectors of the economy, STI (Science Technology, and Innovation) policies, international actors, knowledge sources, and markets, as well as the political system, also play a key role in the emergence of innovation.

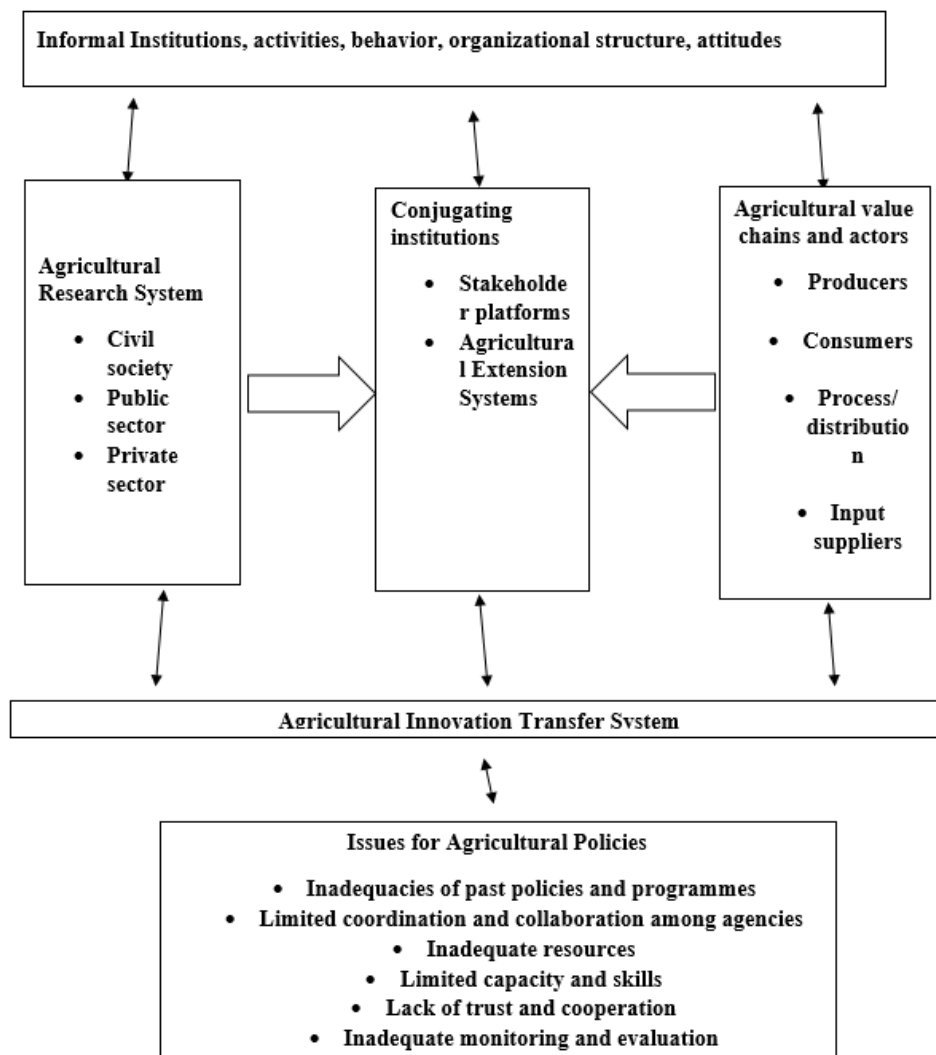


Figure 1: Conceptual Framework Showing the Relationship between the Factors AIS and Issues for Extension Policy

1.3. Theoretical Framework

Economics and the individuals who participate in the innovation system's process are the foundation of the idea of an innovation system. It is crucial to recognise the value of teamwork and interactions in accelerating the adoption of new technologies, as well as the connection between economic and institutional structure and institutions' contributions to innovation performance. Institutions also provide the framework for governments to influence innovation processes by putting in place channels and infrastructure for knowledge transfer.

According to the United Nations Conference on Trade and Development, the systemic capacity of the innovation system is dependent on the connections, the framework conditions, and the enabling environment, but developing countries have limited systems, while high-income countries focus on advanced technology without achieving sustainable and inclusive growth, and most IS having weak enabling environments [12].

1.4. Agricultural Innovation Systems (AIS)

A complex network of individuals, organisations, and procedures involved in the creation, dissemination, and uptake of agricultural inventions is referred to as an agricultural innovation system. All parties participating in agricultural research, development, and technology transfer are included, as are their interactions and connections with farmers, researchers, extension agents, policymakers, private sector actors, and other stakeholders [13]. Understanding the interactions between farmers, researchers, extension agents, and input and service providers using the Agricultural Innovation System approach enables the discovery of limits and levels of intervention to create long-term innovations. In order to build relevant and sustainable solutions that meet the needs of the region, local actors must be brought together [14].

To increase agricultural production, sustainability, and resilience, agricultural innovation systems work to make it easier for different players to share knowledge, technology, and practises. They involve tasks like research and development, the creation and adaption of technology, the development of capacities, the distribution of knowledge, and the formulation of policies. In order to solve agricultural sustainability transitions to more sustainable systems, agricultural innovation research and practise should integrate viewpoints from the innovation ecosystem and agricultural innovation systems [4].

1.5. Agricultural Policies in Nigeria

Agricultural policy refers to a body of rules that control both domestic agriculture and the importation of agricultural goods from other countries. Governments often employ agricultural policies in an effort to influence domestic agricultural product markets in a particular way. The objectives of Nigerian agricultural policy are to boost productivity and competitiveness, provide food security and safety, and foster long-term development [15-17]. The resilience of agricultural landscapes and livelihoods dependent on agriculture must

be built and strengthened through agricultural policies and practises. Growing production in response to the rising need for food was the main objective of early Nigerian agricultural policy.

1.6. First National Development Plan (1962-1968)

Between 1962 and 1968, the first national development plan was systematically implemented and maintained. The plan first prospered by boosting the economy and enhancing control over the economy, with a focus on transportation and communication, specifically the export of raw materials and the import of finished goods [18]. It highlighted, among other things, the introduction of more contemporary agricultural practises through farm settlements, cooperative (nucleus) plantations, the provision of improved farm implements (such as hydraulic hand presses for processing oil palm), and a greatly expanded agricultural extension service [19-21]. From 1962 to 1968, agricultural policies were largely based on regional governments' efforts and orientation toward economic development and the agenda of that region.

1.7. National Accelerated Food Production Programme (NAFPP) (1972-1973)

The NAFPP was launched as a pilot programme in eight states in 1973: Benue, Kano, Plateau, Anambra, Imo, Oyo, Ogun, and Ondo. There were four features that make the NAFPP unique as a strategy for increasing food production in Nigeria: (a) Crop-based research and extension efforts are organized; (b) the farmer is involved directly from the start in identifying the improved seed varieties and cultural practices that are most acceptable to him; (c) extension workers receive intensive training in crop production techniques and are closely involved in research; and (d) the supply of production inputs is transferred to the producer. Mini-kit, production-kit and mass adoption phases were the three phases of the programme [22]. The NAFPP was abruptly aborted due to the introduction of the Green Revolution programme [22, 23].

1.8. Agricultural Development Programme (ADP) (1974-1986)

In Malawi, the Agricultural Development Programme was initially created to address the issue of rural poverty. The first three basic projects were established in Nigeria's Northern region in 1974, marking the adoption of the "basic concept" there. Agricultural Development Programmes in Funtua, Gusau, and Gombe are among them [24]. Average yields for all of Nigeria's primary crops have increased since the ADPs were established in comparison to the time before to their implementation, according to Omonijo et al. [24]. Data on yields collected between 1982 and 1991 for the Agricultural Development Programmes in Bauchi, Kano, Sokoto, Ilorin, and Oyo-North revealed a rise in millet, cassava, and cotton yields in the state. Lack of funding as a result of the 1982 oil price decline, which delayed hiring qualified employees and the availability or purchase of supplies and facilities needed for the project's launch, was one issue that cropped up during the project's implementation. Furthermore, the subsidisation of inputs was delayed significantly. The complexity of technology transfer, high labour mobility, low input agency involvement, diminishing financing poli-

cies, and counterpart funding are some of the additional difficulties [22].

1.9. National Fadama Development Project (NFDLP) (1990-2020)

FADAMA I, which started in 1992, was a pilot agricultural project, designed to offer basic irrigation and other support to farmers in selected states. The primary goal of NFDLP-I was to increase the incomes of Fadama users in a sustainable manner by expanding farm and non-farm activities with high value-added output. Adamawa, Bauchi, Gombe, Imo, Kaduna, Kebbi, Lagos, Niger, Ogun Oyo, and Taraba were among the twelve states covered by the programme, which also included the Federal Capital Territory (FCT). FADAMA grew from seven states to all 36 and Nigeria's Federal Capital Territory, establishing itself as a key instrument to be used to stimulate agricultural growth and reduce rural poverty. In FADAMA II, approximately 12,570 consumer corporations and 1,470 network institutions had been created throughout 12 states. The Fadama experiment in constructing social capital for development arose from lessons learned over the years from the implementation of various agricultural and rural development projects [25]. According to Bature et al. and Benjamin and Victoria, the "Fadama III operation will support the financing and implementation of five main components designed to transfer financial and technical resources to the beneficiary groups in [26, 27].

- institutional and social development
- physical infrastructure for productive use
- transfer and adoption of technology to expand productivity, improve value-added, and conserve land quality
- support extension and applied research provide matching grants to access assets for income-generation and livelihood improvements".

1.10. River Basin-Development Authorities (RBDAs) (1976-2020)

These objectives were to be achieved through surface impoundment of water by constructing dams that would enable all year-round farming activities in the country [28]. According to George nearly four decades since the inception of the River Basin Development authorities, it has failed to achieve the aim behind its development and has failed outrightly. The RBDAs have simply failed to harness the country's water resources in order to boost agricultural development within the country through irrigation farming [28].

1.11. Application of Innovation System Concept and its Relevance to Agriculture

The perspective of the national agricultural research system was developed in the latter part of the 1980s and tends to be linear in the flow of information from a known source (formal research) to some end users. The traditional agricultural research, extension, and education institutions are only a small portion of the entities that make up the agricultural innovation system (AIS). Innovation occurs across the entire economy. The idea of a national innovation system that used the sectoral level as the analytical unit immediately informed the development of the agricultural innovation system. A set of agents that jointly and/or individually contribute to the

development, diffusion, and use of new technologies related to agriculture and that directly and/or indirectly influence the process of technological change in agriculture are referred to as an agricultural innovation system, according to various definitions of the term [29]. Organizations that provide public services include research institutes, training and education facilities, lending institutions, policy and regulatory authorities, private consultants and NGOs, farmers and farmers' associations. It covers the complex interrelationships between many players, institutional learning and change processes, market and non-market institutions, public policy, and socioeconomic and poverty reduction [30].

The idea of a national innovation system that used the sectoral level as the analytical unit immediately informed the development of the agricultural innovation system. Its early implementation, for instance, began with the introduction of ideas like institutional learning and change as well as the connections between innovation and the institutional context in which innovations take place. In general, institutional structures in research and innovation were the main focus of its implementation across nations. For instance, Hall et al. placed a strong emphasis on public-private cooperation in agricultural research in South Asia, Sub-Saharan Africa, and India [31].

2. Result and Discussion

According to Dimelu and Anyanwu's study on the linkage behaviour and practices of agencies in South Eastern Nigeria's agricultural innovation transfer sub-system, the findings showed that the agencies in the sub-system had a poor innovation culture. The findings also showed that the linkages between profit-making NGOs and the organizations that generate and distribute agricultural innovation were either poor or nonexistent. Without a doubt, this may have had a significant role in the widespread inefficiency and ineffectiveness among policymakers.

In addition, Mekonnen et al. asserted that the interactions of an A.I.S.'s components are necessary to ascertain the technical efficiency of agricultural production in low- and middle-income countries [32]. In light of this, it is suggested that cellular subscriptions and the quantity of scientific and technical journal articles may help these countries' agricultural production achieve greater technical efficiency. Household size, education, access to official and informal information sources, the socioeconomic state of the community, and farmers' reliance on technology adoption are all factors that affect farmers in West African nations to acquire agricultural knowledge and accept technology [33]. Multi-stakeholder platforms (M.S.P) are cooperative networks of stakeholders that, depending on the intended objectives and activities, accomplish varying degrees of innovation. The existing research on the M.S.P. has four shortcomings, nevertheless, including disciplinary silo thinking, a narrow focus on politics and informal institutions, and a disregard for power relations [34].

Consequently, Minh, concluded that there are discrepancies in the positions and functions of the participants in the co-

coa innovation system [35]. It is suggested that for the I.S. of cocoa to operate effectively, the government's role in providing policy support structures is crucial. The report highlights structural restrictions, such as inadequate knowledge, a lack of physical and financial infrastructure, restricted capacities, poor stakeholder accountability and interactions, a lack of intermediaries, and institutional failings as the cause of the A.I. S's poor performance.

Finally, Aplogan et al. suggested modifying agricultural advice to socioeconomic and institutional realities, increasing the number of agricultural advisors, improving farmer training, and improving mutual trust between partners to implement a participatory and inclusive approach to agricultural extension [36]. They emphasized the necessity for operational tools and procedures, suitable working standards, and an assessment and monitoring system that was focused on the effectiveness of the councils.

3. Conclusion

From the various reviewed literatures in the study, it can be concluded that the so-called actors involved in agricultural innovation are part of the major problems as a result of their lack of interest, coordination and cooperation. Result also revealed poor innovation structure, lack of adequate training and, poor stakeholder accountability, lack of intermediaries, institutional failures. Lastly, inefficiency and ineffectiveness on the part of the institutional factors were all recognized as problems affecting innovation transfer system in Nigeria and posing an issue for extension policy [37].

3.1. Recommendations

- Foster collaboration and partnerships: Collaborations and partnerships should be encouraged among different actors in the agricultural innovation system, including farmers, researchers, extension agents, policy makers and private sector companies through the establishment of platforms for knowledge exchange, networking and joint research projects.
- Strengthen extension services: Enhance the capacity of extension agents to effectively disseminate knowledge and information to farmers. This can be done through training programs, provision of resources and tools, and use of innovation communication technologies.
- Promote knowledge sharing and learning: Establish platforms for knowledge sharing and learning among different actors in the agricultural innovation system. This can include creation of online databases, organizing workshops and conferences, and facilitating farmer-to-farmer exchanges.
- Support policy reforms: Advocate for policy reforms that create an enabling environment for agricultural innovation. This can include policies that promote research and development, provide incentives for private sector investment, and ensure access to markets for farmers.

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