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CONTRIBUTIONS AND CHALLENGES IN RESEARCH AND EXTENSION LINKAGE FOR AGRICULTURAL TRANSFORMATION IN ETHIOPIA: A REVIEW

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ABSTRACT

Research and extension are the main pillars of agriculture system and their effectiveness largely depends on strong linkage among each other. This paper is organized with specific objective of contributions and challenges in Research and extension linkage for agricultural transformation in Ethiopia. As different data approve that, the existing research-extension linkage is weak in Ethiopia. This very weak linkage has been major limiting factor in increased food productivity, agricultural transformation and sustainable development. Its well-coordinated and strong linkage can facilitate agricultural commercialization, promote sustainable agriculture and help to dissemination of useful Information. But it is mainly constrained with weak organization system, poor Infrastructural, lack of incentives for linkage activities, lack effective motivation system, poor communication, personal and psychological skills. So, government and any concerned bodies should be invested on establishing strong linkage between research-extension, improving infrastructural facilities, professional skills of extension staffs and should be established better salary, motivational techniques, monitoring and evaluation system.

Keywords: Agricultural Linkage, Research, Extension, Agriculture, Transformation, Ethiopia.

INTRODUCTION

Ethiopia is located in the horn of Africa with a diverse geographical setup, different agroecology's and farming systems. Agriculture is the backbone of Ethiopian economy. Being the dominant sector, agriculture contributes about 46.3% of the total gross domestic product (GDP), 60% of exports, and 80% of total employment (EEP, 2015). However, the agricultural sector suffers from poor cultivation practices and frequent drought, but recent joint efforts by the Government of Ethiopia and donors have strengthened Ethiopia's agricultural resilience, contributing to a reduction in the number of Ethiopians threatened with starvation (EEP, 2014).

In Ethiopia, agricultural research and extension services are major pillars of agricultural system and mainly public funded. Both have started half a century ago and witness a widespread structural and institutional

extension service in Ethiopia born in the 1950s with the establishment of the then imperial Ethiopian college of agriculture and mechanical art, now known as Haramaya University (Kassa, 2008). Since then, different extension methods and approaches have been implemented in order to escalate the productivity and achieve food sufficiency.

Research and extension effectiveness is largely depended on strong linkage among each other. Strong interaction, active and effective collaboration among all the stakeholders fundamentally increases the agricultural production and improve the living situation of the rural community (Ashraf *et al.*, 2007). Any of agricultural research output is not of worth without appropriate linkages to extension service (Pezeshki-Raad & Dehkordi, 2006). A weak linkage between the research and extension means the flow of information is restricted and the farmers wouldn't bear getting benefits from the new agricultural information that can lead farmers to high production and productivity (Adesoji & Tunde, 2012). In all countries, agricultural

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Challenges and parallel effectiveness agricultural

transformation is based on policy, land tenure system, resource constraints, skills and education, status of research and development, level of infrastructure, climate condition and financial regulation (CAPSA, 2012). The rapidly evolving nature of agricultural innovation processes in developing countries requires strong agricultural extension service (Chowdhury *et al.*, 2013).

Flow of information from agricultural research to farming communities and vice versa requires that continuous contact be maintained for information to be useful to farmers. If the link is weak the agricultural productivity will not increase. This system criticisms and categorized with technical weakness, patronizing only big farmers, insufficient coverage of farmers, practicing top-down administration, poor dissemination of improved agricultural technologies (Fisseha, 2009).

Still the extension system in Ethiopia is limited with the consistency and quality of extension implementation, weak coordination between actors, inadequate logistics and facilities for extension workers, low motivation leading to high turnover of extension staff, limited use of communication media (ICTs) and technology multiplication centers, minimum involvement of the private sector, lack of clear line of command for the extension management, weak planning, monitoring, learning, and evaluation and feedback systems (Abebe & Hailemariam, 2018). In agricultural transformation process Research and extension linkage have a vital role and it fully contribute on the improvement of farming sector with modernization principle. Ensuring effective coordination, integration and communication among the major agricultural development actors remains a crucial development issue in Ethiopia. There were many data organized related to role and challenges of extension service in Ethiopia (Belay & Degnet, 2004; Belay, 2002; Belay, 2014).

Both research and extension service have been experienced with several structural changes to achieve a coordinated technology development and transfer system. Understanding the current contribution and challenges in Research and extension linkage help in policy makers for agricultural transformation improvement. So, this review paper attainment to examining the contributions and its challenges in Research and extension linkage for agricultural transformation in Ethiopia.

Definition and concepts of agricultural research and

extension linkage: In worldwide, the transfer of information on science and technology in the agricultural field plays an essential role to enable farmers to utilize actual knowledge and to improve their economy through different stakeholder linkage. Linkage is a communication and collaboration that established between two or more organizations for commonly shared objectives in order to have regular contact and improved productivity. The concept of linkage implies the communication and working relationship established between two or more organizations pursuing commonly shared objectives in order to have regular contact and improved productivity. It is facilitated when research institutions and extension agencies organizations recognize the value of shared or complementary information and promote group or team approaches to solve any common problem that ensure improvement (Adesoji & Tunde, 2012).

According to Munyua *et al.* (2002), agriculture research and extension are examples of two systems that can be linked by information flow and feedback. The farmer falls in between research and extension and is expected to be the main target and beneficiary of their activities. The conventional argument for research and extension linkages is that by working together actors stand better chances for establishing the institutional relationships that can facilitate access to technology, information, capital and marketing arrangements, which can in turn enable farmers to be competitive.

Agricultural transformation in Ethiopia: Agricultural Transformation is a fundamental change of the form of agricultural environment (Dawe, 2015). For agricultural transformation, an effective linkage between the research and extension is the initial for effective input supply, market outlet and related infrastructure (Kumar *et al.*, 2010). The Ethiopian state has been planned to transform agricultural sector with a view to achieving the status of a middle-income country by 2025 (ATA, 2014). The state has recognized that promoting agricultural extension can help to uphold its growth, and provide peace and stability. Accordingly, since 2003, significant investments have been made to increase production, ensure food security and end extreme poverty (ATA, 2014; Spielman *et al.*, 2012; MoARD, 2010). Further, as a UN member state, Ethiopia is also committed to the pursuit of sustainable development growth of ending poverty (SDG-1) and hunger (SDG 2) by 2030 (FAO, 2015; Griggs *et al.*, 2013; UN, 2013)

through proper implementation of the agricultural extension. The country also considers an investment in agriculture as a means to reduce poverty and ensure food security (Devereux & Guethe, 2009). The primary objective of the country is improving the livelihood of smallholder farmers through agricultural extension. The government seeks to double agricultural production during the Growth and Transformation Plan (GTP) period by scaling up best practices, incentivizing production of high value crops, and expanding irrigation development and natural resource conservation.

The country adopted a PADETES in 1995, which was eventually replaced with the PES in 2010. The PES intends to increase the coverage of the agricultural extension service, focus on natural resource management, involve the disadvantaged groups of the society, and increase farmers' participation in introducing new technologies or best practices. As it is participatory, it minimizes cost, increased confidence to implement any development activities and help to understand farmers need. But it is more work for extension agents to organize and motivate farmers (Alemayehu & Marta, 2018).

Currently the government use an integrated approach that encourage farmers participation in planning and implementation. The country also establishes agricultural research center in all regions with emphasis to specialized farmer's in agricultural practice. Overall, the agricultural policy inspires farmers to produce high value crops based on the current market demand and agroecology of the areas (Alemayehu & Marta, 2018).

Agricultural production in Ethiopia is characterized by subsistence orientation, low productivity, low level of technology and inputs, lack of infrastructures and market institutions, and extremely vulnerable to rainfall variability. According to Mulat *et al.* (2004) the Ethiopian economy is among the most vulnerable in Sub-Saharan Africa. It is heavily dependent on agricultural sector (Berhanu, 2009), which has suffered from recurrent droughts and extreme fluctuations of output. As explained by Jordan *et al.* (2011) the opportunities and constraints facing Ethiopian agriculture are strongly influenced by conditions which vary across geographical space. Poor resource endowments, minimal use of inputs (fertilizer, improved seeds, and irrigation), lack of transport infrastructure and market access and adverse policies that continued for a long period have been identified as the major causes of the low and declining

performance of the agricultural sector in the country (Kate & Leigh, 2010). Under this all problem the main economic source agriculture is traditional. So, it needs an improvement and transformation to ensure food security for growing population and improve the livelihoods of rural communities through boosting production and productivity, cultivating of diverse crops variety, expanding irrigation, mechanized farming, and expanding agro-processing and industry. As stated by MoARD (2010) increasing productivity in smallholder agriculture is the Government's top priority. This recognizes that smallholder agriculture is the most important sub-sector of Ethiopia's economy; there remains a high prevalence of poverty among smallholder farming communities; and there is a large potential to improve crop and livestock productivity using proven, affordable and sustainable technologies.

Contribution of research and extension linkage to agricultural transformation: Agricultural research identify, produces, analyzes and interprets innovative ideas to resolve the challenges being faced by the farmers. Extension officers educate farming communities about the particular innovation through demonstration, specific trainings and group meetings (Aremu *et al.*, 2015). The extension officers are mainly responsible for dissemination of information, providing institutional support and facilitating farmers about crop production (Maponya & Mpandeli, 2013).

With well-organized extension services the necessary skills are provided to farmers to improve their farming. They do it in an easily understandable way, suited to their level of literacy and awareness. It creates in them a favorable attitude for innovation and change (Altab *et al.*, 2015). For successful operation, it needs an independent interaction between research and extension. Extension needs research findings as production recommendations to provide solutions to the technical problems of the farmers. Extension should serve as a main source of research to develop an orientation to maintain an awareness of actual farmers' problems. Research focuses on the technical aspects for generating useful technologies, while extension focuses on the acceptance and adoption of those technologies by users (FAO, 2005).

Facilitate agricultural commercialization: The rate of agricultural growth in Ethiopia is depends on the speed in which a subsistence-based production system is changed in to commercialization production system

(Berhanu *et al.*, 2006). Among the many institutional support services, research and agricultural extension service plays a critical role, as they contribute to change farmers skill, knowledge and attitudes in agricultural technology, farming activities and agricultural marketing (Berhanu *et al.*, 2006). Effective agricultural development in a sustainable manner requires a strong linkage among all actors particularly between research and extension workers so as to promote agricultural development.

The role of research-extension linkage is more critical for commercial oriented farmers than for subsistence farmers. When farmers produce primarily for the market its quality and standard of the produce become much more important than subsistence production. Meeting quality of produce depends heavily on the use of the right technologies and methods of production. Overall, their linkage can facilitate farmers to become more commercialization that improve the significance contribution of agriculture in day to day life change of rural farmers (Berhanu *et al.*, 2006).

Help to dissemination of useful Information: Extension worker usually encourage farmers to adopt new practices that introduce from different research institute and groups (Zwane, 2012). Agriculture research and extension are examples of two systems that can be linked by information flow and feedback. The farmer falls in between research and extension and is expected to be the main target and beneficiary of their activities. Close bonding among the two key players can facilitate development of relevant technologies that lead transformation of agriculture with adopting new technology in local conditions.

Promote sustainable agriculture: According to Mengistie & Belete (2015), extension could play a central role in fostering sustainability through its educational programs. Since sustainable agriculture requires a new kind of knowledge, which differs from other forms on the basis of conventional agricultural practices. In the current Ethiopian agricultural research system, the stakeholder emphasis on farmers participate in any research output technology evaluation. Most of the research topic was derived from the farmers' need based on the current problem that challenges in the particular area (Alemayehu & Marta, 2018).

The current extension system is good in structure and poor in its effectiveness. For technology evaluation and well dissemination, farmers organized as farmer's research extension group and fully participate on the

evaluation of any technology that support farmers to learn from the farmers as well as to know the relevance of the technology. When new agricultural technologies are generated by research institutions (universities and private companies) and by the farmers, agricultural extension services are expected to disseminate these technologies among their clients. Extension services are organized and delivered in a variety of forms, with the ultimate aim of increasing farmers' productivity and income.

Challenges in research- extension linkage: Extension systems so far have focused on model and well doing farmers in Ethiopia. The marginalized and poor farmers are not included in extension planning, implementation and evaluation activities (Adugna, 2013). In the sense of centralized and a top down approach, extension programs and policies have been formulated without consideration of farmers' opinion (Davis *et al.*, 2010). As a result, farmers lack adequate opportunity to decide on research and extension priorities. Extension policy in Ethiopia has been exclusively production-focused, institutionally monolithic, centrally directed, and organized on the premise that public sector extension structures can effectively reach down to village level. Thus, the bureaucratic nature of extension management and personnel procedures make it difficult for extension agents to respond flexibly to local demands (Feder *et al.*, 2010).

In fact, conventional extension system cannot accomplish sustainability in agriculture; because today's agricultural extension must consider environmental implications, social issues, and overall economic growth within the agriculture sector (Mohammad, 2009). To bring development in agricultural sector, agricultural research has a critical role in stimulating modernization and development (Belay, 2008). Though, the lack of strong linkage causes disruption in technology flow and low adoption rates, increased time lags between development and adoption of new technology, reduced efficiency in the use of resources, unnecessary competition and duplication of efforts, and increased cost of agricultural research and extension activities (Ashraf *et al.*, 2007).

In Ethiopia weak linkage between research and extension is one of the challenges of extension services providing in agriculture (Kassa 2008; Atalay, 2012). Conventional approaches to agricultural development in Ethiopia have tended to regard innovation as the result

of research and see its dissemination as linear technique limited to researchers, extension staff and farmers. This does not result in increasing agricultural production and productivity and resulted in food insecurity. The research findings, once packaged for extension workers, are expected to be inherently suited to transfer to farmers in which farmers do not learn from the production of knowledge since they are not involved. Researchers have been separated from farmers in production of knowledge and technology.

This is due to lack of direct linkage between researchers and extension workers in knowledge and technology production, diffusion and utilization. More recent approaches to improving the impact of research on farmers live through effective collaboration put greater emphasis on partnership in which researchers do have strong linkage with extension to conduct research which is relevant to farmers need to alleviate poverty (Klerkx *et al.*, 2012).

Administration challenge: Agricultural research institutes and extension organizations are managed and administered as separate entities with very limited contact and working relationships. While extension falls under the Ministry of Agriculture and Rural Development (MOARD), most research activities falls under the Ethiopian Institute of Agricultural Research (EIAR) and the regional agricultural research institutes (RARIs). A linkage strategy was developed by a task force comprising of staff from the Ethiopian Institute of Agricultural Research and the Ministry of Agriculture. However, the arrangements is unsuccessful due to various reasons like; frequent restructuring of organizations, poor farmer representation, high staff turnover, budgetary limitations and lack of commitment (Fasil & Habtemariam, 2006).

Lack of incentives for linkage activities and employee's turnover: Individuals have little or no incentive to perform linkage activities. Rewards for journal publications are higher than those for performing linkage activities (Mehadi, 2012). At the field level the incentives for extension workers to stay in their position and to perform as expected is often weak. As a result, extension workers are continuously leaving the extension systems and looking for better paying jobs. Further, the incentives mechanisms for farmers for enhancing active participation is also limited (Davis *et al.*, 2010). At the end, farmers become inactive in utilizing new technology and the extension workers are

forced to search better incentive jobs instead of serve as a master key for agricultural development through working with farmers and researchers

The extension workers (DAs) are to provide training to farmers with technical orientation to their followers to ensure proper implementation of technology packages or best practices advocated by the state (Leta *et al.*, 2017a). But in Ethiopia the development agents' position suffers from high turnover and looking for better salary paid jobs (Gebremedhin *et al.*, 2006). A high turnover of staff creates a difficult situation to establish long-term relationships and linkages among the researchers and extension workers that bring low agricultural production and productivity.

Financial challenges: Sufficient financial resources for linkage functions such as publications, testing of research results and training of extension workers are often lacking in Ethiopia (Mehadi, 2012). Moreover, research institutes and ministry of agriculture are competing with each other for budgets rather than complementing to attain a common development goal (Fasil & Habtemariam, 2006). This tendency to compete for the same resource leads to neglect of linkage activities.

A low salary of employees is also one the main challenges in establishing strong extension system. DAs are the key source of appropriate agricultural information to farmers since they are working closely with farmers beside to their profession than other stakeholders in agriculture. However, development agents in Ethiopia found working under areas characterized by extremely low salary and lack of incentives such as per diems, overtime and holiday payments (Gebrehiwot *et al.*, 2012). The presence of low salary and incentives creates low development agent's motivation which contributes for the presence of weak linkage either with farmers and/or researchers.

Poor Infrastructural: Road networks are limited and do not reach many villages in the rural areas of Ethiopia and farmers do not get fair prices for their produces. This discourages farmers from adopting new technologies (Efrem, 2006). Ethiopia's road transport system cannot support an efficient and market-based production and distribution system. Nearly 75 percent of farms are more than half a day's walk from all-weather roads. The road network has been seriously impeded by wide topographical variations, extremely rugged terrain, severe climatic conditions and a widely dispersed

population. It also affects extension-farmers linkage in delivering any agricultural service.

Moreover, according to Belay & Abebaw (2004) the respondents revealed that development agents have to travel up to 8.5km to visit some of their target farmers, and About 50 per cent of them indicated that they travelled on foot and about 36% reported that they travelled on horse/mule back. Close to 12 percent and 1 percent reported using bicycles and motor bikes, respectively. Basic infrastructure and resources at the FTC and woreda level remain a major constraint, particularly in relation to financial constraints. The vast majority of FTCs and kebeles do not have operating equipment's or inputs to pursue typical extension activities on the demonstration farm (Devis *et al.*, 2010). Personal and psychological skills: in other case Lack of adequate skills and motivation also have a negative impact on research extension linkage. In principle, agricultural extension services implementation needs professional soft skills related to critical thinking, problem solving, organizational development and negotiation (GFRAS, 2010). Moreover, development agents, extension administrators, and bureau heads in Ethiopia lacks skills to effectively participate in priority setting, planning, and evaluation of extension programs (Devis *et al.*, 2010).

According to Belay & Abebaw (2004) study about 52 percent of the extension agents' practical skills were less than adequate. However, literatures stated that strong linkages between research and farmers cannot be realized without well qualified, highly trained extension agents (Adugna, 2013). From this it is easy to understand that the presence of less qualified and incapable extension workers is the cause of weak linkage. Many front-line extension staff in Africa lacks the competences (skills, knowledge, attitude and resulting behaviour) they need to be effective in their work with farmers. But researchers stated that to create effective linkages among research and extension, needs strong communication skill to help more the farmers by establishing effective linkage. Moreover, there is a wide difference in value systems, educational backgrounds and communication methods between research and extension workers. Extension workers perceive researchers as working in ivory towers; as they are considered professionals; and producing technologies which are not useful at farm level. At the same time, researchers question extension workers' capability to

understand research outcomes, to communicate properly with farmers and to provide valuable inputs (Mehadi, 2012).

In other side, lack effective motivation system also a great challenge for establishing better Research-extension linkage in the country. Motivation is the inner feeling or desire that initiates with a people either intentionally or unintentionally to complete the job excellently because it's pleasurable and not obligatory for what will be expected in arrival (Gouws, 1995). For any organization and institution, employee motivation is one of the best policies to improve effective work management that motivate their workers. Accordingly, it assumed that when development agents are motivated at their workplace they are working for the best development of a country with hard work and honesty by collaborating with the other agents of development like researchers and farmers. On the contrary to these ideas' motivation and morale of extension workers in Ethiopia are very low due to low incentives, high duties/burden of extension workers, and low infrastructural developments (Gebrehiwot *et al.*, 2012).

CONCLUSION AND RECOMMENDATIONS

The Ethiopian agricultural research developed many technologies. However, these technologies had limited impact on the lives of farmers; due to lack of coordination and integration between research and extension, little feedback from farmers to researchers, irrelevance of research for farmers and lack of farmers participation in research process. But there has been a growing realization that traditional extension models have not been sufficiently effective in promoting adoption of sustainable agricultural practices. Those weak linkage systems bring, low adoption rates, increased time lags between developments and reduce efficiency in resource in Ethiopia.

As the literature indicate that, In Ethiopia research and extension are administered separately that bring competition on limited resource rather than complementing to attain common development and this affect their linkage.

Due to lack of incentives and low employee salary leaving the position of extension workers is huge in number. Thus, the linkage of research – extension more affected the rural, especially poor smallholder farmers. Overall the research and extension linkage are play a key role in agricultural transformation as both of them work toward on the improvement of farming activities in

agricultural sectors.

- But its linkage is constraint in realized on Administration challenge, Lack of incentives for linkage activities, employee's turnover, financial problem, poor infrastructural, poor in personal and psychological skills, lack effective motivation system and poor communication skill among all actors especially; Extension Agents. So, to improve linkage between research and extension; -
- Government and any concerned bodies should be invested on establishing strong linkage to ensure their collaboration and interaction with participating local technology user groups.
- The research institute including public, private and any individual partner should be work with extension agent until any technology is adopted by farmers in expected manner with providing training for extension workers and farmers.
- The government also should be established better salary and motivational techniques by allocating budget with planned monitoring and evaluation system.
- Improvement of infrastructural facilities for rural village is vital to increase research- extension linkage, and every responsible body should be gives attention and allocate budget for implementation.
- Improving professional skills of researchers and extension staffs is input for increasing linkage of two organizations so government should allocate budget to increases human resources.

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