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Examining Critical Factors Affecting the Interaction of Farmers with Researchers in Agricultural Innovation in Ethiopia

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Ethiopia is the second most populated country having more than 90 million people in Africa. Ethiopian economy largely depends on agriculture. Low agricultural production has created national food insecurity. This was because of insufficient knowledge transfer between researchers and farmers. The interaction of researchers with farmers was weak. Therefore, it was inspiring to investigate critical factors hindering the interaction of researchers with farmers in agricultural innovation in Ethiopia. A qualitative research design was used. A snowball sampling technique was employed. The study revealed that resource limitations, ineffective extension system, weak coordination among different stakeholders and lack of strong attention for research from government critically hindered the interaction of researchers with farmers. The research affirmed that the number of researchers was not sufficient to conduct demand driven research. Besides inefficient use of resources, it was monopolized by a few elite researchers. The different actors working in agriculture had less readiness and willingness to learn from one another. Moreover, there was weak institutionalized body that coordinate the efforts of different stakeholders. The results of the research show a number of implications in Ethiopian agriculture in the future. Primarily it discourages the initiation of the different stakeholders especially the government and donors that are struggling to bring food security. Moreover, it elongates the time required to bring the right innovation in Ethiopian agriculture to cause social learning that is the base for the use of modern technologies to bring food self-sufficiency. Furthermore, this will affect the moral of researchers and divert their attention from conducting demand driven research that solve farmers problems to research that has little relevance to farmers need to bring development in the country.

Key Words: Agricultural research; interaction; researchers; farmers; linkage; innovation

Introduction

Ethiopia is the second most populated country having more than 90 million people in Africa next to Nigeria and the 13th populated country in the world. Ethiopian economy largely depends on agriculture. It accounts 47% of GDP of the country (D. D. Bayissa, 2015; Bayissa and Mansingh, 2015; Spielman D. and K. Davis, 2011). Moreover, agriculture accounts 90% of exports and 85% of employment while 90% of the people live on agriculture (Wigboldus et al., 2011). Development in the country can happen if there is yield increment both from crops and livestock in the sector of agriculture. The country has different agro ecological zones which is conducive for the production of different types of crops and rearing of animals. There is high prospective both in the area of crops and livestock sectors and the country has the highest number of livestock per capita in Africa. The livestock sector accounts 40% of agricultural GDP. There is high opportunity to use the dairy potential to bring agricultural development to alleviate poverty (Pender J. and B. Gebremedhin, 2008).

Ethiopia has focused on improving agricultural production and productivity to bring food security in the country. The government has focused on Agricultural development led industrialization (ADLI) policy as a strategy, which was formulated in 1991, to bring sustainable development. In accordance with this strategy, the government has devoted extensive resources in agricultural research, extension and input supplies. Participatory Demonstration and Training Extension System was introduced to pilot dissemination of technological packages to alleviate farmer's problem. The government has put great effort to increase agricultural production and productivity. However, the expected benefits, increment in agricultural output, have not been realized. Low agricultural productivity is the major problem for food insecurity. This problem emanated from the use of traditional farming practices, natural hazards like drought, lack of appropriate technologies for farmers, low adoption of agricultural innovations by farmers, poor access to market, and lack of strong and effective linkage between researchers and farmers.

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This has led to low agricultural productivity exposing the country to food insecurity (Wigboldus et al., 2011; Abate et al., 2011). Innovation in the agricultural sector is weak and slow in adoption, i.e., the use of inorganic fertilizer is limited to 37% of farmers, and application rate is 16% per hectare. Use of improved seed and agricultural technology is low. In spite of recent favourable rainfall and positive policy reforms, the production of agriculture is still low. Agricultural innovation is weak because of lack of effective interaction between researchers and farmers in the country (Bayissa and Mansingh, 2015; IFAD, 2009).

Background of the Problem

Low agricultural production has created national food insecurity in Ethiopia. It is happened because of lack of sufficient knowledge transfer from researchers to farmers. This problem emanates due to lack of effective interaction between researchers and farmers. To alleviate the problem of weak linkage and knowledge transfer between researchers and farmers, the government has made efforts to increase extension activities since 1930 (Belay, 2002).

Agricultural extension was started 80 years ago in the country. It goes back to the establishment of Ambo Agricultural School (now called Ambo University) which began teaching agricultural extension in 1931. Ambo University is one of the oldest institutions in delivering extension works. The extension activities delivered by Ambo Agricultural School was limited to Ambo areas in delivering seedlings, advisory services, improved crop varieties and animal breeds to the local community. Ministry of Agriculture, which was established in 1943, started working on expanding the area coverage of extension activities beyond Ambo area to different parts of the country. The extension activities of Ambo Agricultural School and Ministry of Agriculture were limited to the central part of the country because of limited capacity to work in the different parts of the country. Other Agricultural Colleges like the Imperial Ethiopian College of Agriculture and Mechanical Arts (Alemaya College which was established in 1950), now called Haramaya University, started agricultural extension in the Eastern part of the country. Alemaya College was given the responsibility to build the national agricultural research and extension systems since the College was getting fund from America. Still the extension activities were limited to Haramaya areas where the College was working (Belay, 2002).

In August 1963, the government took the mandate for agricultural extensions from Alemaya College and gave to Ministry of Agriculture to outreach the extension activities to the farmers in the country. In 1966 the responsibility for agricultural research and extension was given to Institute of Agricultural Research (IAR) which was replaced by Ethiopian Agricultural Research Organization (EARO) in 1997. Nowadays, EARO is changed to Ethiopian Institute of Agricultural Research (EIAR) for coordinating national research activities to create better linkage between researchers and farmers (Belay, 2008).

Despite of all these efforts by the government, agricultural production and productivity remains low because of low adoption of agricultural innovations in the country. Different evidences indicate that yields of crops under farmers' condition are far lower than the yield obtained under research plots. This indicates that there is a wide gap between researchers and farmers. Woodhill et al. (2011) argued that the problems of low adoption of agricultural innovation emerge from lack of strong interaction between researchers and farmers. Lack of strong interaction is created from weak and limited collaboration and coordination. This weak interaction resulted in weak linkage between farmers and researchers. This weak linkage resulted in fragmentation of knowledge system. The knowledge or technologies produced by researchers or farmers are not well exchanged or transferred to the different stakeholders that are working in agricultural innovation (Bayissa, 2015).

The interaction between farmers and researchers in Ethiopia is very weak because of loose linkage between both stakeholders in agricultural innovation system to bring food security (Wigboldus et al., 2011; Belay, 2002). Therefore, it is inspiring to examine the constraints that hampered the interaction of researchers with farmers in agricultural innovation. Identification of these factors enables policy makers and public authorities to pay utmost attention to problems affecting effective interaction between researchers and farmers.

Theoretical Framework

Since interaction is an attribute of agricultural innovation system (AIS), it was used as a theoretical framework to guide the study.

Different methods have been used to increase agricultural output to feed the growing world population. Agricultural innovation has been started before 40 years in different approaches (Klerkx et al., 2012). Induced Innovation, Training and Visit System, Transfer of Technology system, Participatory Research and Participatory Technology Development, Farmer First, Agricultural Knowledge and Information Systems and Agricultural Innovation Systems are some of the different agricultural innovation approaches to increase agricultural productivity to alleviate poverty (Klerkx et al., 2012). AIS is the most recent thinking in a family of systems approach. It gives an understanding of

the different actors and other factors which determine innovation in agriculture to increase agricultural output. It gives holistic approach to the study of agriculture to increase yield beyond research activities (Klerkx et al., 2012; Brooks S. and M. Loevinsohn, 2011). Theoretically, AIS gives due attention to the relevant actors for a co-development process of innovation in agriculture. AIS is defined as "a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions that affect the way different agents interact, share, access, exchange and use knowledge'' (Hall et al., 2006).

The role of research in agricultural innovation system

The relationship between farmers and researchers is changing since the linear process is ineffective and these change created agricultural innovation approach. The conventional institutional view to researchers has been looking as a source of new agricultural knowledge and transferring the knowledge to farmers separately through extension. This centralized model separate researchers from farmers which limit the productive collaboration of researchers and farmers. Because of this linear problem, agricultural innovations come from different actors including research staff and farmers to have impact on making research relevant to farmers need by involving them in knowledge and technology production, diffusion and utilization. Effective interaction of researchers and farmers solved the problem of farmers in many countries like Indian farmers from post-harvest loss. Direct and effective linkage of researchers with farmers brings practical solution since farmers are involved in the actual innovation process of knowledge and technology development. From innovation systems perspective, innovation emerges from systems of actors. These systems are rooted in an institutional setting that affects how individual actors (researchers and farmers) behave and interact with each other. Learning is the critical part of the system which comes from the interaction of researchers and farmers involved in knowledge production and use. Collaborative relationships are important in innovation since the benefits in innovative performance derived from productive relationships between researchers and farmers in the use of new knowledge in economic production (Klerkx and Leeuwis, 2009; Hall et al., 2001; Andrew et al., 2003).

AIS in Africa lacks proper linkage among the different interrelated parts in the system to bring food security. Researchers have ineffective interaction for proper collaboration with farmers to exchange knowledge and to increase learning and innovation. High level of fragmentation, low level of professional training, high staff turnover, lack of financial independence and poor coordination among the different actors engaged in the sector resulting in low productivity, increasing levels of poverty and declining per food production. The impact of agricultural research is limited since the findings are not relevant to farmers need and is not often used by them (Sumberg, 2005).

The importance of partnership between farmers and researchers

Strong linkage between researchers and farmers is critical for creation of knowledge that is relevant to farmers need and produced when researchers have active interaction and collaboration with farmers. Effective interaction of researchers with farmers for productive partnership results in utilization and acceptance of knowledge which is intended for farmers (Sumberg, 2005). From AIS outlook, farmers are important in making contribution in terms of articulating knowledge demands and adding knowledge to the innovation process (Klerkx L. and C. Leeuwis, 2009). Partnership as a collaborative relationship between researchers and farmers in decentralized manner is highly important to create innovation and learning. But hierarchal institutional arrangements centralized agricultural research systems which created difficulties to deal with the needs of farmers at the grassroots levels. The institutional view of research is the arrangements of different actors at different levels which either include or exclude and determine the role of these actors. This hierarchy created problems in addressing the need of farmers who are marginalized from contributing their share in the innovation processes since agricultural innovation is not produced by organized science alone unless farmers are involved (Hall et al., 2001; Andrew et al., 2003).

The importance of the interaction of farmers with researchers

According to Hellin et al. (2008), participatory agricultural research "can be defined as a systematic dialogue between farmers and scientists to solve problems related to agriculture, and ultimately to increase the impact of agricultural research." The interaction of farmers with researchers is highly important to analysis the interface between farmers and researchers who are directly affected by the agricultural research in agricultural innovation. Interaction of farmers with researchers is a crucial aspect of participatory practice in agricultural research project. The interaction between farmers and researchers helps to answer questions like "who contributes to knowledge generation and who controls the research process?"

According to Neef and Neuber (2011), stakeholder participation in agricultural research is regarded as a multi-dimensional process and these different dimensions have different attributes. Interaction between farmers and researchers is one of the dimensions of stakeholder participation in agricultural research in agricultural innovation. The interaction between farmers and researchers has different attributes like the engagement of farmers and researchers in the research process; centres of decision-making and control of research; contribution to the generation of knowledge; frequency, type and intensity of farmers and researchers interaction; and investment of resources and payment. These factors affecting the interaction of researchers with farmers are discussed as follows.

Engagement of farmers and researchers in agricultural research process

With the increased attention on "sustainable agricultural development", where social, economic and ecological factors need to be well-adjusted, it has been recognized that a wide range of actors like consumers, farmers, researchers and extension workers are relevant in the research process in agricultural innovation. As a result today "participation in agricultural research is defined as the involvement of all individuals and groups who are directly and indirectly affected by the research activities and its outcomes (Neef et al., 2006."

Centres of decision-making and control of research

The question of the centres of decision-making and control of the research process should be separated from the concern of pure stakeholder engagement in the research process; it traces the quintessence of power relations between farmers and researchers (Ashby, 2003). Even in cases where proper engagement of farmers is crucial in agricultural research, researchers do still control the research practice and are at the heart of decision-making. Farmers may or may not be consulted about the decisions or they may not be informed before decisions are made.

Contribution to the generation of knowledge in agricultural research

It is recognized that researchers and farmers have diverse comparative benefits in creating knowledge. For example, Maori farmers from New Zealand, in a research project, were insisting that their own traditional knowledge - obtained through long term experience and passed down through elders would be merged with researchers' technical knowledge rather than being by it (Hoffmann et al., 2007).

Frequency, type and intensity of interaction between farmers and researchers

The frequency, type and intensity of the interaction between farmers and researchers can be a significant factor for the success of agricultural research project. In most cases, researchers meet farmers only when they need to visit their experiments on the farm. The "one-shot character" of short-term research projects has been criticized. Most of the time, meetings of researchers with farmers in agricultural research are limited to discussing technical and logistic aspects of the agricultural research. Farmers and researchers have to meet regularly in formal meetings to evaluate outcomes, discuss the research process and plan the necessary step for the future together. It is important also to give response of the research outcomes to farmers in a way that they can comprehend (Neef, 2005).

Investment of resources and payment

Resources allocation critically affects the interaction between farmers and researches in agricultural research. This attribute asks the question who provides the necessary material inputs for the research works. Researchers can provide all the necessary inputs for research like inputs, rent the land for experimental plots and pay farmers for their labour contribution in the research. In the opposite, in a rare case, farmers pay researchers for their help in finding solutions and contribute all the research inputs like animals, plots and labour. Most of the time researchers and farmers provide a realistic share of the research inputs that may be determined by the definite nature of the research project. Compensation for farmers who are involved in the research work needs to be wisely considered, as it may run in counter to the standard that farmers should engage voluntarily in the research processes, rather than being driven by monetary incentives (Asten et al., 2009).

Research Methodology

Contemporary researchers in social sciences have started to put more attention on the use of qualitative research methods, i.e., methods by means of which one can study non-quantitative characteristics of empirical phenomena (like categories, meanings, assumptions and understanding underling peoples' languages and practices). Data were generated primarily from knowledge institutes (Wallaga University, Ambo Plant Protection Research Centre), Development agents and Farmers from Western Oromia region through in-depth interviews. A total sample size of 39 respondents comprising 16 farmers, 14 researchers and 9 development agents were interviewed purposively based on snowball sampling technique.

A qualitative research design was used in this research. Triangulation between different data sources took place to ensure validity (Yin, R.K, 2003). Respondents were identified through snowball sampling and semi-structured interviews were held. Interviews were fully transcribed, translated and coded applying principles of grounded theory (Glaser, B. and A. Strauss, 1967) before it was descriptively analysed. Translation follows transcription of data before analysis. Facilitating a qualitative research interview is a hard work and difficult to write down responses while maintaining eye contact, providing encouragement and planning the prompt, probe or link to the next topic of interest, listening and other activities. Therefore, the interview was recorded on memory recorder. Key informants were mostly used as a means of gaining access to the interviewee. Focus group discussions (FGD) were used in this research since it has the advantage over one -to-one interviews of providing access to interaction among the participants and give some insight in how knowledge and innovation was produced. It was also used to augment the individual interview. Moreover, FGD can be a critical way of researching some sensitive matters such as dissatisfaction of farmers with researchers. Also observation was taken place in the role of observer-as- participant (Angrosino, M, 2007), in which the research relates to and was known to the subjects under study as a researcher. Observation was performed during annual prioritization meeting, research reviews, and field demonstrations. Existing documents were used as sources of data for this research since it can be efficient sources for qualitative questions.

In qualitative research the sample size for the interview depends on the aim of the research. Most qualitative research has the aim of purposive sampling which is explicitly selecting interviewees who it is intended will generate appropriate data. The overall aim of purposive as opposed to probability sampling is to contain information rich cases for in-depth study. To achieve this different sampling techniques are used. These include typical case sampling, extreme or deviant case sampling and snowball sampling. In this research respondents were identified through snowball sampling technique. The best methodological answer to sample size in qualitative research is a grounded theory approach. The grounded theory approach is a qualitative research method that uses a systematic set of analytical, interpretative, and coding procedures, to develop an inductively derived grounded theory about a phenomenon. Grounded theory emerged in reaction to the formerly common practice of considering research only as a means of testing hypotheses. That means that the research started with theory that was subsequently tested. Grounded theory was developed as a systematic approach to develop theory on the basis of empirical research. The theory is then the 'finding' of the research. Grounded theory approach advocates theoretical sampling or including interviewees (the incidents and events that interviewees and other sources do provide) in the sample on the bases of both an emerging hypothesis from on-going data analysis, an understanding of the field and a delicate attempt to test such hypotheses. The objective is to keep sampling and analysing data until nothing new is being generated. This point is called saturation and the techniques are called sampling to saturation. When sufficient data are gathered it reaches theoretical saturation. In qualitative research 'statistical significance' of relations between the empirical phenomena which are being described is not a major criterion (Glaser, B. and A. Strauss, 1967). A better criterion is what has been called sociological significance. This shows that the researchers' interest is to examine whether the descriptions of these conceived relationships are understandable, meaningful and convincing for the people involved and for the outside world (Elias, and Scotson, 1976).

In general, a systematic approach to qualitative data analysis is the use of the grounded theory. The procedure in grounded theory lies in a cyclical process of data collecting, analysing it, developing a provisional coding scheme, using this to suggest further sampling, more analysis, checking out emerging theory and so on until a point of saturation is reached, when no new constructs are emerging. At this point rich, dense theoretical account is achieved (Judith Green and Nicki Thorogood, 2009).

Results

The result revealed that interaction of farmers with researchers was affected by a number of factors like resources limitation; problems of the extension system; lack of strong coordination and integrity among the different stakeholders; and government policies. These factors affecting the interaction of farmers with researchers are described and discussed as follows.

Resource limitations

The result of the findings showed that resources were one of the limitations hindering the interaction of farmers with researchers in agricultural innovation in the study areas. These limited resources include number of researchers; finances; and resources control.

Limited number of researchers

The result of the research revealed that there were problems of well-educated manpower both in number and areas of specialization in the study areas.

The number of researchers was not sufficient to conduct research at different agro-ecological locations to bring agricultural innovation. The proportion of researchers to farmers was very low. The number of researchers was limited and insufficient because of a number of reasons. Primarily the number of educated manpower was small in number since the country is one of the developing countries in the world. Moreover, brain drainage was a critical problem since experienced and well-educated people were leaving the country for the search of better payment and services. This problem of brain drainage was caused by lack of good payment, conducive working environment, merit based appointment, and incentives. Besides the limitation of researchers in number and specialization, most of the researchers did not have good attitude to work with poor farmers. Low number of researchers and lack of interest to work in rural areas with poor and illiterate farmers resulted in weak interaction of researchers with farmers in agricultural research.

Financial limitations to purchase agricultural technologies

The findings showed that farmers in the study areas had financial limitations to use agricultural technologies. Lack of sufficient money to buy these inputs hindered farmers to use the results of agricultural technologies. For the use and purchase of research results like selected seeds, fertilizers, animal breeds and herbicides, most of the farmers did not get enough money. Agricultural technologies were expensive and unavoidable for poor farmers. Since farmers did not have sufficient money to use agricultural technologies, they did not want to work in agricultural research with researchers to bring food security in their lives. Lack of sufficient money to use agricultural technologies hampered the interaction of farmers with researchers.

Problems of resources monopolization

The findings indicated that resources like cars, offices, and laboratories were insufficient for researchers to conduct demand driven research. Besides scarcity of such fundamental resources for research, there was problem of sharing these limited resources effectively and efficiently. This was due to lack of common vision among the different stakeholders especially researchers. Senior researchers wanted to use the scarce resources (cars and laboratories) only for themselves. This resource monopolization discouraged other researchers who did not have access to resources to conduct demand driven research with farmers. This hindered the interaction of farmers with researcher to conduct research that was relevant to farmers need.

Problems of the extension system

The research findings showed that extension system in the study areas was one of the critical factors that affected the interaction between farmers and researchers. The extension systems hammering the interaction between farmers and researchers were problems of the linear model of extension; pluralistic activities of extension workers; weak interaction between researchers and extension workers; loose linkage between farmers and extension workers; and Weak interaction between extension workers and the government. These factors are interpreted and discussed as follows.

Problems of the linear model of extension (research-extension-farmer model)

Researchers were mostly engaged in technology development in the research process in the study areas. Dissemination of the technology was given to Ministry of Agriculture which gave the mandate to the extension wing of the ministry. It was the extension that was totally responsible for the dissemination of agricultural technologies. Researchers did not have direct contact (structure) with farmers in the study areas unless they got permission from the agricultural office. Farmers were told not to work with anyone including researchers unless they came through the government structures starting from the Woreda agricultural offices to the Kebele level. If researchers wanted to work with farmers, they had to get permission from the Woreda agricultural offices. Getting permission from these offices was not simple. People who were working at woreda agricultural offices were bureaucratic. It was also difficult to get the concerned bodies for getting permission. The existence of agricultural office (extension office) at different levels between researchers and farmers created gap between farmers and researchers and hindered effective interaction among them.

Pluralistic activities of extension workers

Extension workers in the study areas were given a number of activities that included both extension and non-extension works. Extension workers were busy with the extension works like dissemination of the agricultural technology to farmers for implementation. Moreover, they were given assignment from the political offices to organize farmers in to different groups for political purposes. Extension workers were also given the task to collect government tax from farmers. Because of these pluralistic activities, extension workers did not have sufficient time to work with farmers to bring impact on farmers life though agricultural research. These multiple assignments from different bodies without proper payment and incentives discouraged

extension workers to teach farmers properly about innovation in agricultural research to change their life. Since farmers did not have enough knowledge and attitude about research, they did not have good attitude to participate in research. This limited the interaction of researchers with farmers.

Weak relationship between researchers and extension workers

The relationship between researchers and extension workers was not strong in the study areas. The reasons for weak and spoiled relationship between them emanated from different sources. One of the basic factors was that researchers undermine extension workers for their academic status. Moreover, researchers did not pay attractive incentives for extension workers when they helped researchers for the work that was not extension workers' obligations. Researchers did not even have good attitude for extension workers because they thought that extension workers were engaged in political activities instead of working in agricultural research to bring innovation in agriculture to change the life of the poor farmers. Moreover, extension workers did not have good attitude for research and researchers and they did not tell good things to farmers about research. Since farmers did not have good information about researchers, they did not have the interest to work in agricultural research to bring impact on their life using agricultural technologies.

Weak linkage between farmers and extension workers

Extension workers did not have good relationship with farmers since they were engaged in non-extension activities like tax collection for the government. Extension workers were given assignments to implement government policy like teaching the politics of the ruling party. Since agriculture is seasonal, farmers did not have the interest and time to attend several political meetings. Moreover, extension workers were engaged in dissemination of agricultural technologies. Most of the time extension agents promised to farmers about the success of technologies but did not succeed in these promises. This created mistrust between farmers and extension workers. As a result, most of the farmers did not have good attitude for extension workers. Due to these problems, it was very difficult for extension workers to convince farmers to work in agricultural research with researchers for knowledge creation and social learning. This created strong gap between farmers and researchers to have strong interaction to bring innovation in agriculture.

Weak interaction between extension workers and the government

Extension workers spent most of their time in the village to implement government policies. They were engaged in routine activities in the rural areas. Extension workers were trying to improve the lives of poor farmers through the dissemination of new agricultural technologies. Even though extension workers were working for the betterment of farmers live, the government was not working to improve the lives of extension workers. Their salary was low and not sufficient to support their family. The government cadres did not have good attitude for extension workers since some of the extension workers did not support the politics of the ruling party. The government thought that extension workers were supporting opposition parties because they were not satisfied with their work. These matters created mistrust and gap between the government and extension workers. Due to these problems, extension workers did not convince farmers to work in agricultural research. Lack of good information about research from extension workers hindered the linkage between farmers and researchers and resulted in loose interaction between them hammering innovation in agriculture which was the base for knowledge creation and social learning.

Problems of integrity among the different stakeholders

Integrity and common vision were the factors which affected the mentality of the different stakeholders to work towards a common goal to bring national food security in the country. The factors related to this issue included poor coordination between research and agricultural offices; absence of common vision among the different stakeholders; lack of willingness to learn from one another; and lack of institutionalized body for coordination. These important issues are discussed as follows.

Weak coordination between research and agricultural offices

The working relationship between research institutes and agricultural offices was not strong and attractive to work together towards a common goal to bring food security in the regions. There was complexity between these offices. People who were working in the research institutes were more educated than people who were working in the agricultural offices. But people who were working in agricultural office were politicians and had more political power than researchers. Most of the researchers were not affiliated to government politics and they did not have the interest to be accountable for these politicians. Most of the time when the research institutes asked agricultural office for support they did not give positive responses. When there was a call for meeting from the research, the agricultural offices did not often come to share vision about the

future to bring innovation in agriculture. This weak coordination resulted in fragile interaction between farmers and researchers.

Lack of common vision among the different stakeholders

Lack of common vision for the development of the country was one of the major problems that hindered effective interaction of researchers with farmers. The way the government looked at things to bring development was not accepted positively by researchers and other stakeholders. The government had the ambition to bring national food security as soon as possible but researchers' conducted research that was not relevant to farmers need and had less relevance in bringing food security. Researchers conducted this type of research for publications for their own promotion. Even researchers both at university and research institutes did not have shared vision for national food security. University researchers thought that conducting routing research activities was the work of research institutes'. For research institutes, university researchers were the cause for lack of well skilled researchers since these people were teaching without conducting research. From researchers that were working in research institutes point of view, University researchers themselves did not have good skills in conducting research and they were producing graduates who did not have skills, commitment, responsibility and concern for the society. These problems created weak interaction between farmers and researchers.

Lack of willingness to learn from one another

The study revealed that there was a big problem to learn from one another among the educated people. There was a gap between senior and junior researchers in terms of willingness to learn from one another. Senior researchers did not have the interest and willingness to hear from junior researchers. Senior researchers thought that they had to be respected both for their academic status and age. But junior researchers thought that seniority was a matter of age. Someone could hold a PhD over time and did not need to give due attention to academic status and age. Seniority had to be from the angle of technology development that was demand driven and relevant to the needs of the farmers. Junior researchers argued that there were little or no experiences that were learned from senior researchers. Even senior researchers did not have the culture to share their experience to the junior researchers. Moreover, researchers did not have the interest to learn from farmers since they consider that farmers did not have the knowledge and skills to share with researchers. The study showed that most of the technologies developed by researchers were not demand driven and relevant to farmers need. As a result farmers were not changing their life and willing to learn from researchers about the new technologies. These problems hindered the linkage between farmers and researchers to bring innovation in agriculture. This hammered the interaction of farmers with researchers.

Lack of institutionalized body for coordination

There was no strong institution which coordinates the different stakeholders to have common vision for the development of the country. Because of lack strong coordinating institution, there was duplication of research and wastage of resources. Research institutes, universities and agricultural offices were accountable to different bodies and it was difficult to get even support from each other. Most of the researchers in research institutes were junior researchers. Senior researchers had left the institutions for the search of better payment and working environments. Universities had experienced researchers to conduct demand driven research that was relevant to farmers need. However, they were not conducting problem solving research due to dissatisfaction with the working environment. There was no institution that forces the educated people to conduct demand driven research for the society. Lack of strong institution that coordinate the efforts of different institutions to bring food security in the country resulted in weak linkage between the different stakeholders that were involved in bringing food security.

Government Policy

Government policies affected the interaction between the different stakeholders especially farmers and researchers working for the development of the country in the study areas. The research revealed that lack of attention for research from the government; lack of culture to use research results for policy formulation; lack of continuity in government policy directions; problems of originality, plagiarism and patent rights; and communication problems among the different stakeholders were the critical factors hindering the interaction of farmers with researchers in agricultural research inhibiting innovation in agriculture. These factors are elaborated as follows.

Lack of strong attention for research from the government

The research revealed that the government did not give much attention for research in the study areas. Research was the last topic on government agendas and ranked as the last priority for poverty alleviation. It was not common to hear about research from the government. Respondents told that the

government was not happy with the research and did not consider researchers as development partners. This was because of insignificant research impact on the lives of the society especially on poor and marginalized farmers. From the government point of view, researchers were not conducting demand driven research that was relevant to the need of end-users by involving the necessary stakeholders like farmers. Moreover, researchers were not committed, concerned, and responsive to the welfare of the society. Lack of positive and significant research impact on the lives of farmers discouraged the government from giving due attention especially on allocation of sufficient budget.

Lack of culture to use indigenous research results for policy formulation

There was problem of using local research results to solve problems of the country. Policy makers and government advisors did not give due attention to the importance of local research results. Policy makers did not have the trust in the recommendations given by researchers in the country. As a result they did not use the recommendations for policy formulations. They used recommendations from other countries that were developed under different context. The results of the research findings developed in the country were shelved and not used by the government for policy formulation. These discouraged researchers to conduct and give relevant recommendations to policy makers. Hence, this hindered and discouraged researchers to work with farmers having strong interaction to bring food security through innovative agriculture.

Lack of continuity in government policy directions

The respondents in the study areas revealed that the government was changing development policies and strategies from time to time. The aim of the government was to bring development in all sectors through the use of effective and efficient development policies and strategies by adopting or adapting to Ethiopian condition. But when the government changed development policy and strategic directions, it did not participate the different stakeholders to share the common vision to know the directions of the policies and strategies. Mostly it was the top politicians who knew why it was important to change policies from time to time without evaluating the limitations of the pervious policies. For researchers it was confusing and challenging to follow the every changing development policy directions. It was also discouraging for researchers to change their research direction from time to time without being convinced about the changes. These demoralized researchers to have strong and effective interaction to work with farmers to bring agricultural innovation to improve the lives of farmers.

Problems of originality, plagiarism, and patent rights

The laws protecting plagiarism and copy right in the country were weak. Researchers did not get the benefit from their research findings because of these problems. This discouraged researchers' initiation to work on demand driven research to bring national food security in the country.

Communication barrier between researchers and farmers

The language that researchers use was not the one that farmers were using. Researchers were not often using the local languages that farmers were using in their daily practices. Researchers used English for proposal writing, and for writing of the research results. Farmers were not using this language in their life. Moreover, there are different languages that are used by both farmers and researchers in different regions. For farmers, it was difficult to understand what was written on agricultural technologies during implementation. It was difficult to use the recommendations of the technologies under their field conditions because of the language problems. Even researchers tried to use English and other languages on awareness creation or on research trainings which farmers could not understand. This created gap in communication and created problems in establishing strong linkage between farmers and researchers. This created problem of good interaction between researchers and farmers.

Discussion

The research findings revealed that one of the problems affecting the interaction of researchers with farmers in agricultural research was limited number of researchers both in quality and quantity. According to (D. D. Bayissa, 2015; Bayissa and Mansingh, 2015; Neef and Neubert, 2011; Asten et al., 2009) the engagement of the different stakeholders (both farmers and researchers) in agricultural research highly affects the interaction of both farmers and researchers in knowledge creation and utilization for economic use. However, the number of researchers critically affects farmers' interaction with researchers in agricultural innovation. Moreover, financial strength of the beneficiaries of the technology was another critical factor hindering the interaction of researchers with farmers. The result of this research supports the assertion of (Hall et al., 2001; Andrew et al., 2003; Neef et al., 2006; Asten et al., 2009) that the interaction between the different stakeholders (farmers and researchers)

who participate in agricultural research can be affected by the financial strength of beneficiaries to use the agricultural technologies that is produced by the research. Besides the scarcity of resources to conduct demand-driven research, the research findings showed that resources were monopolized by a few elite people and hindered effective interaction of researchers with farmers. The result of this findings is in favour of (Hellin et al., 2008; Neef and Neubert, 2011; Ashby, 2003) that resources monopolization by elite researchers create gap between farmers and researchers and critically affect the interaction of both stakeholders in agricultural research to bring innovation in agriculture.

From the research it was affirmed that the extension system was ineffective to bring innovation in agriculture in the country. The extension system was the pipeline system and separated researchers from farmers through extension workers. The result of this finding supports the work of (Spielman D. and K. Davis, 2011; Pender J. and B. Gebremedhin, 2008; Abate et al., 2011; Klerkx L. and C. Leeuwis, 2009; Klerkx et al., 2012) that the transfer of technology from the research to farmers is through the linear process, i.e., using the research – extension - farmers' model. In this model, technology development is given to researchers where as its dissemination is the work of extension workers and farmers are expected for implementation of the technology without getting the knowledge and skills on how to implement it. This model critically limits the interaction between farmers and researchers since extension system is working between the two stakeholders. Besides the weak extension system to bring innovation in agriculture through the interaction of researchers with farmers, extension workers were not fully dedicated in disseminating agricultural technologies to the end-users. Extension workers were given a number of activities from different bodies. The result of this finding support the work of (Wigboldus et al., 2011; Abate et al., 2011; Belay, 2002) that the interaction of farmers with researchers is affected by the pluralistic activities of extension workers since they are working as agent between both stakeholders. Since extension workers are intended to work between farmers and researchers, the assignments given to them from different government bodies discouraged them to make the interaction between farmers and researchers strong. Moreover, the interaction of researchers with farmers was affected by the weak or spoiled relationship between researchers, extension workers and famers. According to (Belay, 2002; Neef and Neubert, 2011) loose relationship between researchers and extension workers indirectly affect the interaction of researchers with farmers. Farmers' attitude for researchers critically affects the interaction of both stakeholders in agricultural research and results in weak innovation in agriculture hindering food security in the country. Also the works of (Abate et al., 2011; Belay, 2008; Klerkx et al., 2012) show that the engagement of extension workers in non-extension activities and giving false promises crucially affect the interaction of extension workers and farmers. This problem indirectly affects the interaction of farmers with researchers. These factors are significantly affecting innovation in agriculture.

The research conducted revealed that poor coordination among the different actors engaged in agricultural developed was one of the limiting factors for researchers to have strong interaction with farmers to bring innovation to assure food security in the country. The finding shows similar results with the work of (Spielman D. and K. Davis, 2011; Belay, 2002; Klerkx L. and C. Leeuwis, 2009; Andrew et al., 2003) that there is poor coordination between research institutes and agricultural offices. These create gap between researchers and agricultural officers. This problem weakness the interaction between farmers and researchers. Coordination for efficient use of resources among the different stakeholders is weak. Agricultural research institutes and agricultural bureaus are different bodies working to bring food security in the country. But there is rough and weak relationship between these two bodies. Lack of common vision among the various stakeholders in agricultural development was also hindering the interaction of researchers with farmers limiting agricultural innovation in Ethiopia. The finding shows similar results with the works of (IFAD, 2009; Klerkx et al., 2012; Hall et al., 2001) that lack of common vision among the necessary stakeholders affects the interaction of farmers and researchers and limit innovation in agriculture. Furthermore, the different actors working in agricultural development was not as such willing to learn from one another. I argue that the result of this finding is in line with the work of (Belay, 2002; Klerkx et al., 2012; Hall et al., 2001) that stakeholders (farmers and researchers) interaction is affected by the readiness and willingness to learn from one another to bring innovation in agriculture. Innovation is the result of the interaction of the different actors that are involved in the research for the creation of knowledge and social learning.

The research showed that weak interaction of researchers with farmers was emanated from lack of strong institutionalized body for coordination. The findings support the exertion of (Belay, 2008; Brooks S. and M. Loevinsohn, 2011; Andrew et al., 2003) that lack of strong institution that coordinates the different stakeholders' results in duplication of efforts and wastage of resources. These problems weaken the interaction between researchers and farmers. The existence of an institution that coordinates the different stakeholders is highly important to bring innovation in agriculture to feed the poor and marginalized farmers. Additionally, the research revealed that lack of strong attention from

the government critically hindered the interaction of researchers with farmers. The research findings is similar to the works of (Spielman D. and K. Davis, 2011; Belay, 2002; Sumberg, 2005) that the contribution of research in the development process of the country in the eyes of the government is not demand driven, relevant to farmers need and significant to alleviate poverty. This is because of lack of significant research impact on the lives of poor and marginalized farmers. This disheartened the government to give strong attention for research. This intern affects the interaction of researchers with farmers. These problems hinder innovation in agriculture to bring food security in the country. This implies that if this condition (lack of attention and commitment from both researchers and the government) continues in the future, the fate of improvement and development in Ethiopian agriculture to bring innovation will be slow to bring food security for the every rocketing mouth of individuals in the country especially for the poor and marginalized farmers. Finally the research indicated that the culture of using indigenous research results for development policy formulation and program planning was weak. The findings revealed resemblance with other researchers (Andrew et al., 2003; Hall et al., 2001; Sumberg, 2005) in that the recommendations of indigenous research results are not effectively used by the government to formulate policy and develop development strategies to bring development in the country. Indigenous research recommendations for the solutions of local problems are highly important to alleviate the existing problems and give relevant remedies. Non-use of researchers' recommendations by the government affects the initiation and moral of researchers to conduct relevant and demand driven research. These also affect the interaction of both stakeholders.

Conclusion

The study revealed that the interaction of researchers with farmers was affected by factors related to resources limitation to conduct demand driven research in the rural areas; extension systems; integration among the different stakeholders working in agriculture; and government policies.

Resources significantly limited the interaction of researchers with farmers in the country. The number of researchers was not sufficient to conduct demand driven research. Besides the limitation of researchers both in quality and quantity, the resources that were basically needed for research was not sufficient to conduct research in different agro-ecological zones. Even these limited resources were monopolized by a few elite researchers. This monopolization of resources discouraged other researchers to work with farmers. Moreover, farmers did not have sufficient money to use agricultural technologies produced by researchers. These problems negatively affected the interaction of researchers with farmers in agricultural research to bring innovation in agriculture.

It was affirmed from the study that the extension system was one of the factors hindering researchers from having strong interaction with farmers in agricultural research. The linear model of the extension system which located extension workers between researchers and farmers separated both actors. There were little opportunities for researchers to work with farmers since the system gave different tasks for both farmers and researchers. Farmers were technology implementers whereas researchers were technology developers. The dissemination of technology was left to extension workers. Extension workers were not engaged only in technology dissemination but also in tax collection and teaching the ideology of the ruling party. These multiple tasks given to the extension workers hindered them to have strong interaction with farmers and researchers. As a result farmers and researchers developed negative attitude for extension workers. Lack of strong interaction among researchers, government, extension workers and farmers limited innovation in agriculture. Weak interaction among these actors hindered knowledge creation and social learning in the country.

From the research it was concluded that there was poor coordination among the different actors working for the development of the country. These actors were not as such ready and willingness to learn from one another. These resulted in duplication of efforts and wastage of scarce resources. The attention of the government for research was weak. Moreover, policy makers did not use locally produced research results effectively for the formulation of development policies and strategic directions. These problems reduced initiation of researchers to conduct demand driven research.

From the study it was concluded that weak attention from the government for research greatly affected innovation in agriculture. This weak government policy on research will have critical implication on reducing active engagement of the different stakeholders who are working in agriculture to bring development in the country. The research revealed that there was little or lack of culture to use research results for policy formulation. This implies that the role of research in Ethiopian agriculture will be reduced in the future since this discourage researches to conduct demand driven research to bring innovation in agriculture to bring food security

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