

Investigating Key Institutional Factors Affecting the Linkage of Knowledge Institutes with Farmers in Agricultural Research in Ethiopia

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Agriculture is the main sector that dominates Ethiopian economy. Agricultural research is the focus for poverty reduction and development. Agricultural research in Ethiopia has established itself on the 'Green Revolution Model of Technology Development and Transfer' undermining the institutional contexts. Lack of conducive institutional conditions is one of the factors impeding the linkage of researchers with farmers. Therefore, the objective of this study was to investigate critical factors hindering the linkage of knowledge institutes with farmers in agricultural research in Ethiopia. The research was conducted in Western Oromia using qualitative research approach. The data was primarily collected using in-depth interview. Respondents were identified through snowball sampling technique. The research revealed that institutional factors hindering the linkage of researchers with farmers include researchers' limitation both in quality and quantity; financial problems; monopolization of the scarce resources; pipeline extension model; poor coordination; lack of culture to use local research results and weak rewarding system. The research concluded that resource shortage critically affected the linkage of researchers with farmers. Moreover, the linear extension system fundamentally hindered innovation. Furthermore, coordination among the different actors engaged in agricultural development was weak. Motivation system for outstanding researchers was not encouraging. The research recommends that the linear model of technology development and transfer should be changed to agricultural innovation system. In addition, there should be great attention on institutional innovation than pugnacious with technical innovation alone as institutional conditions are the fertile grounds on which technologies grow to bring economic growth.

Key Words: Agricultural Research; Farmers; Linkage; Institution; Innovation

Introduction

Agriculture is the main sector that dominates Ethiopia economy. It is vital for food security as it is the main source of revenue and livelihood for the majority of the people. However, many factors are holding back agricultural development in the country (D. D. Bayissa, 2015; Aberra and Fasil, 2005; Belay, 2008). Rapid population growth, weak linkage among the different stakeholders, weak institutions, low agricultural productivity, traditional farming practices, drought, lack of appropriate technologies, low adoption of agricultural innovations, conducting research that is irrelevant, poor access to market and poor linkage between researchers and farmers due to institutional limitations are among many (Belay, 2008; IFAD, 2009; Spielman D. and K. Davis, 2011; Wigboldus et al., 2011; Wigboldus, Seerp and Jan van der Lee, 2011). Many evidences indicated that yields of crops under farmers' condition are lower than the

yield obtained under research plots. The cause of this low yield is lack of strong relationship between researchers and farmers. This weak linkage resulted in fragmentation of knowledge system (Abate et al., 2011). The knowledge or technologies produced by researchers or farmers are not well exchanged or transferred to the beneficiaries of the technology that are working in agricultural innovation at different levels to bring national food security (Woodhill et al., 2011).

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Agriculture and agricultural research are the focus for poverty reduction and development for many nations in the world. Increasing the productivity of smallholder farmers in Africa, Asia and Latin America has been called the best bet for global food security in 2050 (Hounkonnou et al., 2012). To bring sustainable development, African countries agreed on the notion that agriculture must be the ‘motor of sustainable economic growth’. Moreover, agricultural research is the key source of the fuel – in relations to knowledge and technology- for this motor in innovation system (Sumberg, 2005).

Agricultural research in Africa including Ethiopia has established itself on the ‘Green Revolution Model of Technology Development and Transfer’ undermining the institutional factors and contexts. Lack of conducive institutional conditions is one of the factors for limited institutional and technical innovations. To bring development in holistic way, the countries demand an institutional rather than a purely technological one. Agricultural research in Ethiopia has yielded few benefits for the majority of the people as it is elitist and out-of-touch with rural realities, commodity or discipline as opposed to livelihood or system-oriented, focused on better endowed areas as opposed to the marginal areas, reductionist as opposed to holistic, top-down and supply driven (Spielman and Davis, 2011).

Food insecurity, poverty and degradation of natural resources have been the major challenges to the economic development of Ethiopia. Economic development is guided by agriculture led industrialization strategy to bring sustainable development. According to this strategy, agriculture is the base for the development of industry. Moreover, the government designed agricultural growth program to increase stakeholders’ participation in agricultural development and this program gives due attention to develop and strength pertinent institutions for agricultural growth in relation to agricultural innovation, and skill development. In accordance with this strategy, the government has devoted extensive resources in agricultural research. The government has put great effort to increase agricultural production and productivity. However, the expected benefits, increment in agricultural output, have not been realized due to weak linkage¹ between researchers and farmers (Woodhill et al., 2011).

Background of the Problem: Agricultural Research

Background of agricultural research

The beginning of agricultural research in Ethiopia dates back to the 1930s and even before. Earlier to

this time, activities focused on germplasm collection, scientific expeditions, characterization and identification of crops. The introduction of exotic wheat germplasm and testing under local situations began in the early 1930s. But until the early 1950s formal national research programme was not established. The commencement of formal research in agriculture began with the establishment of Ambo and Jimma Agricultural College in 1947 (now Ambo University and Jimma University respectively) and then Imperial College of Agriculture and Mechanical Arts (IECAMA) (now Haromaya University) central experiment station at Debre Zeit (known this time Debre Zeit Agricultural Research Centre) in 1955. In the decade following its formation, IECAMA was active in building the national agricultural research systems. The college and its central experimental station at Debre Zeit had a national obligation to conduct and organize agricultural research. The government shifted the responsibility for research in agriculture to the newly established Institute of Agricultural Research (IAR). The establishment of the institute marked a start of institutionalized and coordinated agricultural research in February 1966 with a mandate to frame the country’s agricultural research policy to conduct research on livestock, natural resources, crops and related disciplines under different agro ecological zones and to coordinate national agriculture. With the setting up of IAR, agricultural research, agricultural higher education and extension split up and were made answerable to three different and self-governing organizational structures. This structural change squeezed the linkage among the split structures (Aberra and Fasil, 2005; Belay, 2008).

Problems with the contribution of agricultural research (knowledge institutes) system

The work of Belay (2008) showed that knowledge institutes² lack proper linkage with farmers. Lack of proper coordination between Federal and Regional agricultural research institutes and universities has resulted in duplication of efforts which resulted in wastage of resources in the country. The major problems of researchers are that they address topics of their own interest for publication which have less relevance to the needs of farmers. Moreover, lack of research facilities, incentives, and attractive payment reduced the initiatives of researchers to make good linkage with farmers to conduct demand-driven research that is relevant to the needs of farmers. In Ethiopia, knowledge institutions have weak linkage with sister institutions and this affected inter-institutional links.

Since the beginning of IAR, the research system in the country was based on conventional research approaches that are discipline based, commodity oriented and transferred by a linear transfer

Model (Research-Extension-Farmers). Hence it was top-down research approach; farmers have little participation in the research process. Technologies that are developed with limited involvement of farmers are not usually relevant to farmers since there is little opportunity to consider the agro-ecological circumstances and socio-economics of end users of the technology. There has been increasing dissatisfaction with the poor rates of adoption of agricultural technologies for resources poor farmers emanating from the development of technologies with little involvement of farmers Aberra and Fasil, 2005).

According to the works of (Belay, 2008), problems facing universities working their research in agriculture are many even though it differs from one institution to another. Highly experienced and qualified researchers and teachers leave knowledge institutes to work for NGOs, private sectors, foreign universities or international organizations. These problems are caused, among others, by low salaries compared to NGOs and private sectors, poor social services, non-competitive terms of service, and lack of good rewarding system for outstanding researchers. Because of these problems, there is high turnover of experienced staff and have resulted in broken down of the transfer of knowledge and experience to farmers, students and junior members of knowledge institutes. Specialized and up-to-date references and literatures are critical for realizations of the diverse objectives of universities. Most of the periodicals and books available in universities are out dated, very old and have limited relevance to the courses and research in the university. Many evidences show that the higher education system in the country reveals that most of the curricula have not adjusted to the current demands and requirement for trained manpower in agriculture. Moreover, university students are given heavy doses of theory, without any or little exposure to real-life rural environments and problems similar to those they encounter after graduation. These problems have resulted in generating graduates who lack professional confidence and technical competence to work in the changing and complex rural environment. In current years, the increasing student population, universities are forced to use their existing facilities. This is detrimental to the practical components of the training programmes. Thus, students would not be taught to appreciate the fundamental problems confronting agricultural development in contemporary Ethiopia, thus not making them fully ready for what will be anticipated of them after graduation.

Different studies on Ethiopian universities found that universities failed to respond to the labour market and current rural realities because of lack of relevance of the curriculum which is no longer capable to create graduates who can deal

with the complex and wider problems of rural development. The problem is multifaceted by the fact that teaching materials or text books relevant to the Ethiopian environments are lacking in universities. This problem has resulted in graduates not being exposed to the objective realities of the country and having no or little understanding of the core reasons of the problems. Most of the universities in Ethiopia currently have weak relationships with one another and with other organizations. Subsequently, this has seriously affected the inter-institutional links (Aberra and Fasil, 2005; Belay, 2008).

Theoretical Framework

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

Innovation system

Innovation is conceptualized as putting a new technology or a new idea into social or economic use. An invention, the simplistic definition, is a creation of a new product merely becomes an innovation when it brings improvement on how things are done, is economically viable to adopt and brings a substantial impact in its areas of application (Woodhill et al., 2011). Scientific research and technology development are often confused with innovation. However, before a new technology or a new idea can be seen as innovation, it has to be efficiently and effectively adopted. As such, innovation requires not only introduction or creation of a new technology or idea but also creating suitable conditions so that it can be efficiently and effectively used and adopted. Moreover, an innovation is a new method of doing things for a particular organization, business or group. The fact the idea is already known by other people does not stop it being an innovation for the group or organization adopting. Innovation becomes effectively adopted in a system. According to (Sumberg, 2005) a system is described as a set of interconnected components functioning toward a shared objective. In this view systems- including innovation systems- are made up of components (the operating parts of the system), relationships (the links between components) and attributes (the properties of the components and the relationships between them). Greater interaction between components makes a system more dynamic, flexible and able to generate and respond to change.

The concept distinguishes that innovations arise from systems of actors. These systems are surrounded by an institutional context which gov-

erns how individual actors act and how they interact with other elements of the system. Learning and the role of institutions are critical components of such systems. Learning is an interactive and socially embedded process that cannot be understood without reference to its culture and institutional context. Successful systems are characterised by continuous evolutionary cycles of learning and innovation; combinations of institutional and technical innovations; interaction of various non-research and research actors; an institutional context that supports learning, interactions and knowledge flows between actors; shifting roles of information producers and transfers of knowledge dependent on a need bases. The innovation systems framework is a learning framework (Hall et al., 2003). An innovation system is conceptualized as a network of organizations concentrated on bringing new processes, new products and new methods of organization into economic use together with the institutions and policies that affect their performance and behaviour (Hall et al., 2006).

Agricultural innovation has been started before 40 years in different approaches. Induced Innovation, Training and Visit System, Transfer of Technology system, Farmer First, Agricultural Knowledge and Innovation Systems (AKIS) and AIS are some of the different agricultural innovation approaches (Brooks S. and M. Loevinsohn, 2011). 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). AIS is defined as “a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect the way different agents interact, share, access, exchange and use knowledge” (Klerkx et al., 2012). Even though, AKIS and AIS have resemblance in definition, AIS was developed from a research perspective while AKIS was developed from extension perspective. The basic difference between them is that AIS focus on the influence of institutions and infrastructures on learning and innovation, and its explicit focus to include all relevant organizations besides agricultural research and extension systems. Empirical evidences (Klerkx et al., 2012) showed that there are key enablers and disablers for innovation system in agriculture. Enablers of innovation systems are factors that enhance networking for innovation. These include well-established linkages and information flows amongst the various actors, shared visions, incentives that enhance adequate market, cooperation, policy environment and

legislatives and well developed human capital. A good functioning AIS is characterised by learning within and between organizations to innovate, network based knowledge dissemination, strengthening individual and collective capabilities to innovate, and innovation agents focusing on dynamic and complex interactions.

Disablers of innovation system are things that hinder innovation. Frequently innovation systems do not act as systems and display failures that hinder learning and innovation. Creating and fostering effective linkages amongst the heterogeneous actors is hindered by social, technological, institutional, cultural and economic divides. This divides is caused by differences between scientific knowledge systems and local indigenous knowledge systems, different incentive systems for different actors, cultural and social differences that cause exclusion of certain actors and ideological differences. Institutional failure is either hard or soft. Hard institutional failures are regulations, laws and any formalized rules or even lack of them, hindering innovation. For example, lack of environmental regulation, absence of IP regulation takes away incentives from innovators as they cannot defend their innovation. Soft institutional failures are unwritten rules, values, norms, and cultures. These affect how the different actors interact but also relate to their inability or ability to change their values and norms in order to facilitate innovation to take place. Innovation is a result of human interaction and fails since people do not understand each other since they belong to various worlds which have their own cultures and languages. Institutional failures, strong network failure, refer to actors locked into their relationship, which blocks new ideas from outside and prohibits important collaborations. Weak network failure is a condition where actors are not well linked and strong cycles or learning and innovation is prohibited since there is no creative recombination of resources and knowledge (Hall et al., 2006; Klerkx et al., 2012).

Currently there are attempts to use systems of innovation theory in agricultural research in developing countries. At the heart of these attempts is a re-conceptualization of research as part of increasingly interactive, complex and learning based systems, the boundaries of that are moving increasingly outward. Therefore, from a dominate situation within a linear or pipeline research-extension-farmer system, research is currently seen as one of the many stakeholders with a chain-link or network innovation system. This focus on agricultural change highlighting the existence of multiple sources of innovation and knowledge systems. However, the outward expansions of systems boundary raise the relationships between innovations, technology and research. Technology is a technical knowledge about the production of goods

and services and innovation is the development of useful new or improved products and processes. The idea of innovation is larger than technology, it includes technology but not solely or necessarily driven by or dependent on it. New technology may be at the core of many but certainly not all innovation. Formal research is only one amongst many possible sources of new knowledge or technology in innovation. Besides, research is not solely or necessarily either first or the most critical input to the process of innovation. The critical step in most innovations is not research but rather is a design. Design is crucial to innovation since it is both the means and domain of creativity by which technical possibilities are coupled with opportunities. It is the notion of opportunities, and the acceptance that generation, dissemination as well as utilisation, is an important function of an innovation system that shows the importance of end users or consumers of innovation. From innovation systems perspectives, an organised articulation of demand is chiefly important (Sumberg, 2005).

Conjectural consideration of institution

Conceptualization of institution

Institutions are defined as the rules of the game which decrease doubt in human interaction. They are deeply embedded values and norms, legal and regulatory frameworks, constitutions, governance, policies, and negotiated agreements that are institutionalized in different structure, value chains, and networks which rule individual conduct. Institutions are negotiated promises amongst the different actors about some social purpose. They are constantly reproduced and dynamic or adapted through interaction in networks. Institutional change comes from interaction by different actors. The interaction engages members in learning with the respect to the social purpose (Houkonnou et al., 2012). Institution is defined as it is used in the context of the innovation debate as 'social norms and rules' and hence cultural character shown by social groups. It is also seen as specific organizations intended to fulfil a specified set of functions. Institutions can be role-oriented institutions and rule-oriented institutions. The former is defined as organizations that have accomplished special legitimacy or status, while the latter are described as the 'rules of the game' in a society or the humanly developed limitations that pattern human interaction. In this paper, the all-encompassing innovation theorists' concept is used. The concept institution (al) is used to connote the combined environments of 'physical organizations' and 'rules of the game' and the interplay of both. The traditions in the innovation systems are to apply the everyday concept of the word institution: i.e., physical organizations dealing with

research, development and economic activities (Hall et al., 2001). In science and technology, the term institution is used as an embedded concept. This embedded definition refers to the behaviour of physical organisations dealing with research and economic activity- universities, research centres, research foundations, private companies, cooperatives, farmer's association and so forth. The concept of an institution in relation to the research processes refers to things that pattern behaviour-norm, routines, morals and shared expectations. It is rules as governance structures that regulate transactions. There is strict difference between institutions and organizations, the latter being seen as players or actors whose interaction is governed by institutions (norms, rules etc.) (Hall et al., 2003).

Institutional factors affecting smallholder farmers

An important strategy to increase the productivity of smallholders is participatory technology development (PTD). For someone who needs alternatives to top-down, linear technology transfer promotes participatory strategies to confirm that technologies not only are effective but also appropriate to the context and desired by smallholders, given their needs and circumstances. Nevertheless, PTD alone is insufficient to bring development in a given nation. Farmers might be skilled, knowledgeable, empowered and motivated and have participated in technology development that is suited to their farm management objectives and circumstances but if opportunity is missing, these technologies still permit only minimal improvement. To bring optimal development in farmers' live, institutional change is required at higher levels than the farm and field. Farmers themselves have inadequate power to change norms, laws, rules and procedures and to pull down the provision of interlinked services. In general, institutions determine farmers' opportunities in their live (Hall et al., 2001).

To bring development it is highly important to consider a specific institutional context. Embedding farmers in a suite of institutional supports, providing fund access to research, organizational development, information and training farmers are critically important to bring development. Recognizing farmer unions as partners in farm and rural development and exerting lobbying and political power is important. Developing agri-business to create market information support and integrated markets; insurance; land markets; input delivery services; market protection; mechanization and subsidy schemes should be in place to bring change in the lives of farmers at the higher levels than technology development. Setting up a State Commission or institutionalizing institutions to create enabling conditions as tenure law for tenants to invest in land is basic farm development. Setting a tiered

system of applied, fundamental, and adaptive research, education and extension in place is highly required. Land improvement and government subsidy programmes should be available for land consolidation and re-adjudication, farm building improvement, infrastructure development etc. are the bases for development. Networking of support institutions such as farmer unions, book keepers, banks, and agri-businesses, cooperatives, specialized transport services, value chains, subsidies, regulatory frameworks, insurances schemes, special Ministry that looks after farm interests and auction houses are vital. The creation of enabling institutional conditions has to predate the development of technology (Hounkonnou et al., 2012; Hall et al., 2003).

Institutions are formal or informal and often conflict since it represents the interest of various groups of actors and help to protect the power of the influential. It is critically important for development scholars to hold a common theme of looking for suitable response for a given problems in a particular context. Institutions have negative or positive effects on various people. They can be inclusive or exclusive, wealth creating or extractive, liberating or oppressive. At greatest, they give historically developed checks and balances that express an equitable civil society, level the playing field, limit corruption and create sustainable opportunities. Notwithstanding their significance, most people have trouble in distinguishing the role of institutions in their lives. Institutional conditions affecting smallholder farmers are the capacity of government bureaucracies to create and maintain competitive condition for value chains underdevelopment; low expenditure of national budgets on agriculture; dense network of , pluralistic, institutions that do not always reduce uncertainty in human interaction; weak credit scheme for small farmers; minimal command of two languages: the language of official rules and the language of informal practice; corruption; for gaining a hand-out from the state, giving a part to official in charge of allocating the credit; weak service provision, lack of subsidy on input supply; unaccountable and intransparent arrangements for revenue and marketing management of high value export crops. Other institutional issues include lack of infrastructure; insecurity of land tenure; uncertain markets and variable prices; lack of farmer organizations that can defend farmers' interest; probability that other people including state officials will cream off profits. These institutional conditions discourage innovation and entrepreneurship (Hounkonnou et al., 2012).

A fundamental element in the shift from supply-driven towards demand-driven research is granting end-users institutional influence in the research process. In developed nations, farmers

have well organized institutional influence on agricultural research and they are capable of telling researchers what they need in the farm and agro-industry. This contrasts with the situation in most developing nations, where end-users steering of research planning is inadequately institutionalized. In the dispute on farmers engagement in agricultural research, the attention would have shifted too much to participatory methods rather than concentrating on the principal institutional matters such as informal values, norms, practices and attitudes, and formal rules rooted in policy and legislation. The findings of (Klerkx L. and C. Leeuwis, 2009) showed that norms and rules of institutions within innovation systems direct processes and roles for research like: how research priorities emerge; how research performance is rewarded and evaluated; and how research is held accountable to various interest groups and society at large.

According to (Hall et al., 2003) innovation systems perspectives is an approach which gives due attention to the appreciation of institutional context and institutional learning and basic for the development of a nation since institutions highly affects the technology adoption or adaption under farmers condition. The institutional context of research concerns the norms and rules that govern it as a social process of learning. In practice the norms and rules govern: the role of different actors engaged in the production, use and transfer of knowledge; how research priorities emerge and executed; how research is rewarded (incentives) and evaluated and by whom; the relationship between the various actors and the limiting factors that hinder their relationships; how organizations learn and reflect and how knowledge is built up, used and shared. Moreover, the institutional context of research has the tendency of various arrangements to exclude or include various groups of actors and determine the role of these actors play. For instance the traditional convention has been to view scientists as the sources of new agricultural knowledge, with this knowledge being delivered to farmers through a separate extension service. The limitations of this hierarchy with its limited set of actors is the foundation for the criticism used to explain why agricultural research has trouble in addressing the particular needs of poor rural farmers and has tended to marginalise their potential contribution to the innovation process.

Institutional learning concerns the method through which new ways of working occur. It concerns learning how to do things in new ways. It asks the key questions like what norms and rules have to be changed to do a new work or to do an old one better?, how has our research method changed in reaction to the need to improve the poverty relevance of our work and what else needs to change? and what can we learn from activities that

did not produce the expected outcomes? A critical solution may involve learning how to learn better, which is called double-loop learning. The learning process is context specific and therefore institutional learning lead to unlimited range of partnerships, approaches and strategies.

Institutional learning is an intuitive and inevitable process, an essential property of all social systems (Hall et al., 2001). The findings of (Klerkx L. and C. Leeuwis, 2009) agree to the work of (Hall et al., 2003) in that institutional learning and change is highly needed in innovation systems. Due focus has to be on institutional change and learning in research establishments in agricultural innovation system. These evolve from a supply-driven, linear model of innovation to a demand-driven innovation systems model. To realize these some institutional arrangements that apparently make research demand driven are granting farmers decision making authority or research funding by farmers; governing research priority setting and decision making on fund allocating by a farmers' representatives; contracting private research providers; and enhancing client-orientation.

Partnership as strategy to technology development and institutional change is gaining special focus among the international research community and the donor. The concept shows collaborative relationships including the private and public sectors and between non-research and research organizations. The rationale for the change in approach is frequently understood in terms of the complementarities of the various organizational styles, institutional synergy and pluralism in funding comparative advantage. This technique reveals the realities linked with successful technology development. The fundamental tenant is the importance of institutional factors in the success of the innovation process. Hierarchical institutional arrangements of most centralized research systems are unable to deal with the complex technology needs of farmers especially of small farmers. This implies that innovations are formed not by organized science only, but by a number of agents together with farmers, frequently in combination with other parts of the systems. It also shows the institutional arrangements embodied in the centralized science model of innovation isolate or separate farmers and scientists to a large extent that productive relationships are not formed that is crucial to the research process (Hall et al., 2001). A common vision of agricultural development among different institutions result in a coherent science based system for rural development particularly agriculture. The critical key to its systemic nature of a system of institutions is a common understanding of the system by the concerned actors who created and maintained it. This type of understanding is the symbol of a soft system: it occurs to the point that the actors understand

they are part of a system, and therefore appreciate their inter-dependence and mutuality, and organize their engagements accordingly. The necessity for a pronounced system of institutions as a circumstance for agricultural productivity growth in developing countries is of the achievement factors for Green Revolution in Asia. In Asia, the Green Revolution was made promising through state-driven formation of institutional environments in which new technologies can lead to productivity of farmers (Hounkonnou et al., 2012).

Collaboration of researchers and farmers to bring development can be affected by a number of factors. Collaboration is related to participation of farmers in research process. Farmers' participation in research process can affect collaboration of researchers and farmers positively or negatively. According to (Neef and Neubert, 2011; Neef et al., 2006), farmers' participation in agricultural research can be affected by various factors which are interrelated to each other. These include researchers' and farmers' characteristics, researchers' and farmers' interaction, type of research project and approach, and researchers' and farmers' benefit.

In general, Food insecurity in Ethiopia is caused by a number of factors. These factors include lack of strong and effective linkage between knowledge institutes and farmers; weak agricultural innovation; weak linkage between researchers among the knowledge institutes; loose linkage of knowledge institutes with sister institutions; linear model of technology development and transfer; unfavourable institutional conditions; limited impact of technologies on the lives of the beneficiaries; and irrelevance of research for farmers (the research is not based on the real problems of farmers). Therefore, this study examined institutional factors that hindered the linkage of knowledge institutes with farmers in agricultural research in Ethiopia. The research findings hope to inform recommendations to policy makers and public authorities to contribute to solve practical problems which have limited innovation in agriculture at grassroots level.

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 (Wal-laga University and Ambo Plant Protection Research Centre), Development agents and Farmers from Western Oromia through in-depth interviews.

A total sample size of 79 respondents comprising 29 farmers, 27 researchers and 23 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 and Strauss, 1967) before it was descriptively analysed. Translation followed 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-participant (Angrosino, 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 con-

sidering 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, and 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 and Discussions

The research findings revealed that institutional factors are one of the factors that critically hindered the linkage of knowledge institutes with farmers. According to the data collected from the different sources, the country does not need only strong men but also strong institutions that are basic for the development and use of technologies. Institutional factors that hindered linkage were resources limitation, inefficient extension system, poor integrity among the stakeholders engaged in development and weak government policy. These factors are listed and discussed below as follows.

Limitation of resources to conduct demand-driven research

Resources were one of the factors limiting the linkage of researchers with farmers to conduct demand-driven research. Resource scarcity includes limited number of researchers both in quality and quantity; financial limitations to purchase the necessary things for the production and use of technology; and monopolization of these scarce resources by few elite groups.

Limitation of researchers both in quality and quantity

The study revealed that the number of researchers in the study areas were limited both in quantity and quality. Since Ethiopia is one of the developing countries in the world, she has limited number of educated manpower. Moreover, there were also problems in terms of the quality of educated people who could solve the problems of the society by conducting demand-driven research for the marginalized and poor farmers. Furthermore, among these limited educated manpower that were better in their academic excellence, most of them were not working in their country for their people. Some of the experienced researchers left their country for the search of better payment and lives in either foreign countries or working for international organizations. Among many of my respondents one researcher told me about the problem of educated manpower in the country as follows:

“The country has a problem of educated manpower in different areas of specialization. The problem is not only the number and type of specialization. Most of the educated people are from big towns, cities and rich families and they do not have the interest to work in the village with poor farmers. This adds problems on getting sufficient number of researchers to work with millions of farmers. These educated people, who are adapted to easy and better lives, do not like to work even in research centres for long. Because of this mentality they do not write proposals which take long time to get results. On the top of lack of interest to work in the village with farmers, these limited numbers of researchers are joining international NGOs and/or universities to get better payment and services.”

The above quote was the commonly shared idea among researchers, farmers and extension workers engaged in agricultural development to bring innovation to assure food security. The number of researchers was not sufficient to conduct demand-driven research at different agro-ecological locations establishing many research centres and stations. Limitation of the number of researchers also limited the opportunity to engage farmers in research to bring innovation in agriculture. Moreover, the number of farmers in the country is large and hence resulted in low proportion of researchers to farmers. Furthermore, most of the farmers in the

county are not educated and needed much time to convince them to participate in agricultural research. According to this research finding, the number of researchers was limited because of a number of factors. Basically Ethiopia is one of the developing countries in the world and the educational system is not strong as the developed nations. Also, more educated and experienced people have left the country for the search of better payment and services. Even most of the experienced and educated people who are living in the country were working for international NGOs. The cause of all these problems was due to lack of incentives, good payment and unattractive working environment. Lack of sufficient number of researchers affected the linkage of researchers with farmers in the country. According to the works of (D. D. Bayissa, 2015; Aberra and Fasil, 2005; Belay, 2008) there are limitations of researchers both in quality and quantity. Highly experienced and educated researchers are not working for their country to improve the lives of millions of marginalized and poor farmers.

Financial problems to use technologies

The research findings showed that there were financial problems that limited farmers' opportunities to use agricultural technologies to improve their lives. The use of technologies like fertilizers, selected seeds, breeds, and pesticides were limited due to lack of sufficient money to purchase the technologies. Moreover, the prices of technologies were high and unaffordable to farmers'. There was no subsidy for the use of these technologies. Farmers did not have good access to credit institutions even in the study areas. Additionally, farmers that had the capacity to purchase the technologies did not have sufficient knowledge and skills to use the technologies properly to get the maximum yield. Due to these, the yield of crops and animals were not as expected. All these problems hindered the linkage of farmers with researchers and critically reduced innovation in agriculture. The works of (IFAD, 2009; Abate et al., 2011) beautifully showed that financial availability to farmers critically affects the use of technologies to increase their output. Farmers that have enough money have high chance of adopting technologies to change their lives. Resource poor farmers have little opportunity to use modern technologies and this fundamentally hinders the linkage of farmers with researchers.

Inefficient use of the limited resources

From the research it was learnt that there was inefficient use of the available resources. Resources

like cars, offices, laboratories were controlled and used by a few elite people in knowledge institutes. This problem emanated from lack of common vision to bring development among the concerned body for the poor and marginalized farmers. Inefficient use of the scarce resources limited the motivation of many researchers to conduct demand-driven research to solve farmers' problems. Moreover, lack of the necessary resources limited researchers to have strong linkage with farmers to assure food security. The finding of this research result is similar to the works of (Wigboldus, Seerp and Jan van der Lee, 2011; Woodhill et al., 2011; Hall et al., 2006; Klerkx et al., 2012) that resource availability to researchers critically affects the linkage of farmers with researchers. Knowledge institutes that have ample resources can go to the periphery to conduct demand-driven research. Moreover, efficient uses of resources is basic to establish strong linkage among the different actors working for the development of the country by conducting research that is relevant to farmers need.

Poor extension system in the country

The research revealed that the existing extension system was one of the problems affecting the linkage of knowledge institutes with farmers to bring innovation in Ethiopian agriculture. These extension related factors affecting linkage included the linear model of technology development and transfer; pluralistic activities of development agents; loose linkage among various actors like researchers, extension workers, farmers and.

Problems of the pipeline extension model

The research conducted revealed that the extension system was the linear model in which researchers were engaged in the development of technology whereas its dissemination was left to extension workers and farmers were implementers of the technology. This model separated farmers from working with researchers to bring innovation in agriculture. The model created gap between farmers and researchers and limited the opportunity of farmers to get knowledge and skills on technology development and implementations from researchers. This linear model of extension system (Research-Extension-Farmer) limited the chance of researchers to engage farmers in the research process. In this model, agricultural office or the extension office was in between both researchers and farmers. Among many researchers interviewed, one of my respondents in the study areas told me that one of the obstacles hindering the linkage of researchers with farmers was the linear model of technology development and transfer that placed extension office in between researchers and farm-

ers. He stated the problems of the existence of agricultural office (extension system) between the developers and users of the technologies as follows:

"Researchers do not have a direct structure to work with farmers. Farmers are told not to give any information and work with anyone unless they come through the government structures starting from the district agricultural office to the village level. Getting permission from this office is not simple. People who are working at different government offices are bureaucratic and they kill researchers' time. Some times when we go to the agricultural office for permission, it is difficult to get the concerned body since they have spent most of their time on meeting. Most of the time, I prefer not to go to this office for permission. Even sometimes, they do not show willingness where the researchers need to conduct the research. Agricultural officers tell us to go somewhere they need. The existences of agricultural offices (extension offices) at different levels create obstacles for the researcher to work where and when the researcher needs to work with farmers."

The above quote was mostly shared by most researchers, agricultural officers, extension workers and farmers in the study areas. Researchers were engaged mostly in technology development that had little relevance to farmers need. Dissemination of technologies was given to Ministry of Agriculture which in turn gave the mandate to the extension wing of Ministry of Agriculture. Research institutions had no direct structure to work with farmers. For researchers it was difficult to establish direct linkage with farmers because of the government policy. When it was must for researchers to work with farmers, they had to get permission from district agricultural office. This was because of the fear that the government had on opposition parties. The government thought that someone including researchers could come to farmers by the name of research and could divert the attention of farmers from the government. This model divorced researchers from farmers and hindered the linkage of researchers with farmers to bring innovation in agricultural research. Many empirical evidences (Hall et al., 2006; Klerkx et al., 2012; Klerkx L. and C. Leeuwis, 2009) indicated that the linear model of technology development and transfer separate researchers from farmers and critically hinder the linkage of these stakeholders to bring innovation in agricultural research. For the occurrence of innovation, the different stakeholders should come together to share their knowledge and to learn from each other. The pipeline technology development and transfer system places extension system in between and hinders the interaction of researchers with farmers and hence reduce social learning that is the base of innovation in agriculture.

Diverse activities of development agents

The research result showed that one of the institutional factors hindering the linkage of researchers with farmers was the activities given to extension workers to perform. Development workers were given a number of activities from the government besides technology transfer to farmers for implementation. Development agents were engaged in non-extension activities like tax collection, teaching the ruling party politics, and organizing farmers. Extension workers were busy with government assignment and they did not have sufficient time to properly identify farmers' problems. There was high attention diffusion of development workers since they were engaged in both extension and non-extension activities. Moreover, development workers got low payment and there were no incentive systems to encourage them. These all institutional problems discouraged development agents from exerting their maximum efforts to properly convince and help farmers to participate in agricultural research in order to establish strong linkage with researchers. The findings of (Belay, 2008; Wigboldus et al., 2011; Klerkx et al., 2012) showed that the engagement of development workers in non-extension activities crucially affects the linkage of the different stakeholder engaged in agricultural research. Researchers and farmers do not trust development workers as they are engaged in politics. Moreover, development workers engagement in non-extension activities make them busy and they do not have sufficient time to bring change in the lives of farmers through proper dissemination of technologies.

Weak linkage among various actors engaged in development

The study revealed that the relationship among the different actors working in agricultural development was not strong. There was rough relationship between researchers and development workers. One of the reasons for the poor relationship between them was that researchers undermine extension workers for their academic status. Furthermore, development workers did not get attractive incentives from researchers for the work that was not their obligations. This deteriorated the relationship of researchers with development workers. Due to pluralistic work of extension workers like engagement in tax collection from farmers for the government, farmers did not trust development workers. Even the relationship between extension workers and the government was not strong for productive development. Extension workers were busy with a number of activities but they did not get enough salary to support their family. Development workers were assigned to the lower admin-

istrative levels in which they did not get access to modern facilities. Most of them were living in the rural areas. However, there were no incentives which encourage development workers. All these institutional factors affecting the relationship among the different actors radically hindered their linkage to bring innovation in agriculture. Various evidences (Belay, 2008; Spielman D. and K. Davis, 2011; Wigboldus et al., 2011; Abate et al., 2011) indicated that the level of relationship among the different actors involved in development process greatly affects their linkage. Actors having positive relationship among each other in development process do create strong linkage that brings innovation in agriculture to bring food security.

Poor integrity among the stakeholders involved

From the research it was concluded that integration among the different stakeholders engaged in the development process was weak. This poor integrity emanated from weak coordination among the various stakeholders; lack of common vision among them; and weak institutionalized body that coordinate the efforts of the different organization sweat for the development of the country.

Poor coordination of research with agricultural office

The research findings revealed that coordination and communication for effective and efficient use of the scarce resource among the different stakeholders was weak. The coordination among knowledge institutes and agricultural offices were poorly coordinated. Agricultural research institutes and universities were placed under different umbrellas. This placement under different ministries created problems in designing research plans and had brought inefficient use of resources and resulted in duplication of efforts hindering effective linkage among the research institutes, agricultural offices and farmers. Among many researchers interviewed, one of the respondents told about the problems of coordination among the different actors engaged in development process as follows:

“The working relationship between research institutes and agricultural offices is not good and attractive to work together towards a common goal to bring food security. There is complexity among the two offices. People who are working in research are more educated than the people who are working in the agricultural offices. But people who are working in agricultural offices are politician and have more political power than researchers. Most of the researchers are not politicians and they do not have the interest to be accountable for these politicians. So there are complexity in terms of ac-

ademic status and political power. When researchers ask agricultural officers for support they do not give positive responses in most of the cases. When the research institutes call them for meeting they do not often come to share our vision. This lack of coordination has created a gap between research and agricultural offices.”

The above quote was the frequently raised notion among researchers, extension workers and agricultural officers. The coordination among the key actors engaged in agricultural development to bring innovation in agriculture was poor and resulted in weak linkage among those development actors. This poor coordination emanated from the difference in world views among these development actors. There was big gap in political ideology between researchers and agricultural officers.

Agricultural officers were mostly politicians and had political power. Researchers were highly educated people and less responsive to politics and politicians. These issues created gap in academic and political status between these actors that were fundamentally important to bring development. Since extension workers were accountable to agricultural offices, the chance of getting development workers to engage farmers in research critically depended on the relationship between researchers and agricultural officers. This poor coordination of the different actors and organizations working for the development of the county was due to lack of strong institutionalized body for coordinating the efforts of all these stakeholders running for the development of the society. Many research findings (Belay, 2008; IFAD, 2009; Wigboldus et al., 2011; Sumberg, 2005) showed that the linkage between researchers and farmers are affected by the poor coordination among the different actors working in agriculture. Poor coordination of the different institutes working for the betterment of the society can be affected by the difference in political ideology that the actors do have. Lack of room to accommodate the differences in world views created wide gap among the different stakeholders working in agriculture to bring innovation to enable learning to bring institutional and technological innovation.

Lack of shared revelation amongst the various actors

Lack of shared vision among the various actors engaged in development activities was one of the institutional problems identified. The way the government saw at things to bring development for the poor farmers was not as such positively accepted by other stakeholders. The government had great ambition to bring food self-sufficiency as soon as possible but researchers prioritize research of publication to get promotion which had less relevance in bringing national food security. Even university

researchers and research institute researchers did not have shared vision to bring innovation in agriculture. University researchers thought that conducting routine research was the work of research institutes. Researchers in the university thought that their work was teaching with minimum contribution in research. For research institutes, university researchers were the cause for the lack of well skilled researchers since they were teaching with little engagement in research under Ethiopian context. Moreover, for research institutes, most university researchers had little skills to conduct research and they were producing graduates who did not have enough skills, responsibilities, commitment and concern for the society. These institutional problems hindered researchers to have strong linkage with farmers to bring innovation in agriculture. This finding showed similar result with the works of (Houunkonnou et al., 2012; Hall et al., 2003; Klerkx et al., 2012) that lack of common vision among the different stakeholders engaged in the development process reduce the motivation of the people involved to exert their maximum potential to bring development. This problem results in duplication of efforts and brings wastage of resources. Lack of shared vision brings distrust among the different actors working for the development of the country and results in weak linkage among them hindering innovation.

Policy related issues affecting linkage in agriculture

The research result revealed that government policies were one of the institutional conditions that were affecting the linkage of knowledge institutes with farmers. The research findings showed that little attention was given to institutional innovation. Most of the institutions gave due focus to technical innovation undermining the importance of institutional innovation for the success of agricultural technologies. The issues related to government policies include little government attention for research; lack of culture from the government to use local research results for development policy and strategy formulation to bring development; and lack of continuity in government policy directions.

Little attention for research from the government

The research findings showed that the contribution of research in development in the eyes of the government was little. This perspective was due to little research impact on the lives of the society. From the government point of view, most of the research conducted in the country was not as such demand-driven and relevant to the need of the beneficiaries. As a result, the findings of the research were shelved. Moreover, most of the researchers

were not working in collaboration with the government to bring innovation in agriculture to assure food security. The impact of research findings on the lives of poor and marginalized farmers in the country was insignificant. Due to this the government was giving little attention to research according to the data collected from the study areas. This problem created gap between researchers and the government and affected the linkage of researchers with farmers to bring innovation in agriculture. According to the works of (Klerkx L. and C. Leeuwis, 2009; Neef et al., 2006; Neef and Neubert, 2011) the impact of research findings on the lives of the beneficiaries critically affects the mentality of both the government and donors to fund knowledge institutes to establish laboratories to the required standard and to conduct demand-driven research. If the research findings do not bring changes in the lives of end-users, both the government and donors give little attention to the research activities. This reduces the motivation of researchers to conduct demand-driven research due to lack of sufficient budget and incentives.

Little use of research results for program planning

The research revealed that the government had little culture of using the findings of research results obtained from the country for the formulation of development policies and strategies. The government had little confidence on the research results obtained from the country to tackle local problems. Policy makers and government advisors did not give due attention to the importance of research results that was developed in the country. Most of the time government advisors and policy makers used research recommendations that were obtained from other countries for the formulation of development policy. Among the respondents, one of the researchers shared his view about the use of local research results by the government in development policy formulation as follows:

"I think research agendas are located in the last priority in the government development agenda's. You do not hear from the government when they talk about research conducted in the country. If they talk it is about the research results produced somewhere in the world. Researchers are not considered as development partners. I think the government is not happy with the research in the country. Most of the time government cadres talk about the impact of research results which is not as such achieved. The government says the impact of research results in the lives of the society is insignificant. For the government researchers are working their own business. Few researchers are conducting demand-driven research relevant to farmers need. Farmers are in poverty trap. Researchers are

not often committed, concerned and responsive to alleviate farmers' problems. Most of the researchers are not self-initiated. They talk mostly about government failures and lack of incentive. I guess that little culture in the use of the research results for development policy formulation and program planning is due to lack of significant impact on the lives of the marginalized and poor farmers in the country. The culture of not using the indigenous research results to solve local problems and little attention from the government on the use of research results for the formulation of development policy and program planning is because of lack of positive research impact on the lives of the society."

The above quote was usually shared among most researchers on the use of research results in the country for solving local problems. From the research findings one could understand that there was little use of research results conducted in the country by government advisors and policy makers. They had little trust on the research results conducted in the country and as a result they gave due attention to the recommendations given by western researchers. Government advisors and policy makers did not tell the government the problems of the society based on the research findings obtained from local research works. This affected the relationship of researchers with the government and affected the linkage of researchers with farmers. Many empirical evidences (Hounkonnou et al., 2012; Sumberg, 2005; Hall et al., 2006) showed that the use of research results for development policy formulation and program planning is affected by the trust the government have on the results of the research in solving the local problems. The impact of research results on the lives of the marginalized and poor farmers do affect the trust and attention of the government to use in its development policy formulation and program planning. Many authors agree that local problems are best solved by indigenous knowledge through the use of research results conducted in the country. But if the research result is not demand-driven and problem solving it affects the mentality of policy makers to use the local research results during development policy formulation. Inefficient and ineffective use of local research results critically affects local innovation since it discourages the engagement of the different actors in research process.

Continuous change of development policy directions

The research findings showed that development policy directions were changing from time to time without evaluating the development policies developed before. This continuous change in develop-

ment policy directions greatly affected the moral and motivation of researchers to conduct demand-driven research. The government was changing development policy directions to use and create every possible opportunity to bring development. However, continuous changes in development policies and strategies were a headache to researchers since it was not easy to change the mentality of researchers with the development directions of the government continuously without evaluating the effects and impacts of the previous development policies and strategies. Research agendas changed from time to time without evaluating the progress of the previous research agendas. There was little evaluation why some research fails. Research agendas were like campaigns. Politicians brought new research agendas and stopped what was already started. If some problems happened while a given research was on progress, it brought new structure, directions and changes in topics and agendas of research in the knowledge institutes. These changes of research agendas and directions resulted in changes in the extension systems. However, the changes in development policies and strategies in research were not based on research and evaluation of the process and results. This problem affected the work motivation of researchers and affected their relationship and linkage with farmers to bring innovation in agriculture to assure food security. The confusion created among the different stakeholders on change of strategies and policies reduced the confidence of researchers and extension workers with farmers. The finding of this research shows similar results with the work of (Hounkonnou et al., 2012; Sumberg, 2005; Hall et al., 2003; Klerkx et al., 2012) that continuous change of development policy directions and strategies critically affects the morals and motivations of researchers and other development actors that are engaged in development process. Continuous change of development policies and strategic directions, without proper research and evaluation of the previous research, results in repeating the problems that is conducted somewhere under similar context and results in wastage of the scarce resources.

Weak motivation system for due researchers

The research findings revealed that the motivation system for researchers who had showed better performance in alleviating farmers' problems were not encouraging. This issues demotivated outstanding researchers who have the interest and potential to bring innovation in agriculture. The system did not bring difference in promotion and payment among the researchers who conducted research that was relevant to the need of marginalized and poor farmers and researchers who conducted research simply

for publication for his or her own advantages. One of the researchers in the study area shared his view about the motivating factors in research in the country as follows:

"The rewarding system in the country is weak. The system does not differentiate researchers who have devoted their time and energy on research that can solve farmers' problems from those researchers who are working only to get salary. To bring change in the lives of farmers the government should establish a good rewarding system which can encourage researchers who are conducting demand driven research and discourage and divorce researchers who are not conducting demand driven research to solve farmers' problems. If there is a good rewarding system, differences among researchers are created and demand driven research that is relevant to farmers need is conducted. It also creates competition among researchers and helps to develop competent and strong researchers"

The above quote indicates the generally shared views among researchers, development workers and even farmers. The rewarding system for someone who did something in a better way and something better was weak. This lack of strong motivation system hindered researchers to conduct demand-driven research. Moreover, lack of good rewarding system limited the potential of development workers to exert their maximum efforts to mobilize the resources available to bring food security. It also hindered farmers' participation in agricultural research to bring innovation in agriculture. Almost all the interviewed respondents were not happy with the rewarding system. Even researchers told that in knowledge institutes there was no merit-based appointment to encourage and motivate the people who were doing research for the betterment of the lives of the society. Furthermore, there was no competition among researchers to conduct outstanding and demand-driven research. The institutional system in knowledge institutes did not isolate committed, rational and disciplined researchers from uncommitted and unconcerned ones. Researchers who worked and contributed tangible contributions for the development of the society did not get something encouraging in the form of rewards, incentives, recognitions and other benefits. There was no strong policy which encourages strong researchers and discourages weak, uncommitted and unconcerned researchers and divorces them from the research work. Many research findings (Klerkx et al., 2012; Brooks S. and M. Loevinsohn, 2011; Hall et al., 2001; Klerkx L. and C. Leeuwis, 2009) showed that rewarding system affects the moral and motivation of various actors working in agricultural research to bring innovation in agriculture. Knowledge institutes having strong

rewarding system that differentiate committed researchers from undedicated ones create competition among researchers to conduct demand-driven research to bring significant changes in the lives of the society. Knowledge institutes having weak rewarding systems do not create competitive environment for the different actors to bring change in the lives of the society at large.

Conclusions

From the research result a number of conclusions were made. Institutional factors are the critical factors hindering the linkage of researchers with farmers limiting innovation in agriculture. Resource limitations were one of the institutional factors hindering the linkage hampering innovation in agriculture. There was limited number of researchers both in quality and quantity to conduct demand-driven research to bring innovation for assuring food security. Financial problems both for knowledge institutes and farmers were another institutional factor hindering effective collaboration of the actors to strengthen innovation through the interaction of researchers and farmers and hence limited the establishment of laboratories for researchers and the purchase of agricultural technologies for farmers. Besides the scarcity of resources to bring development in agriculture, there was also inefficient and ineffective use of the available resources both by farmers and researchers.

The research findings revealed that ineffective extension system in the country was another institutional factor hindering the linkage of knowledge institutes with farmers to bring food security for the poor farmers through the use of innovation in the agricultural system. The extension system was the pipeline model which separated researchers from farmers through extension hindering effective interaction of researchers with farmers and limited innovation. Besides their being hindrance to researchers and farmers by their being in between, extension workers had a number of activities given from the government that made them busy to bring effective link for both researchers and farmers. Extension workers were involved both in extension and non-extension activities that made them ineffective in agricultural research. Furthermore, the linkage among the stakeholders engaged in agricultural development was weak due to lack of strong coordination among them emanating from lack of strong institutionalized body for coordination.

The research result indicated that little attention was given from the government for research and this critically limited the linkage of knowledge institutes with farmers. This was because of little research impact on the lives of the marginalized and poor farmers. Moreover, the culture of using

research results obtained from the country was not as such encouraging to conduct problem solving research since most of research results were not used for development policy formulation and program planning to solve local problems. The rewarding system for researchers was not attractive to conduct demand-driven research. Furthermore, institutional innovations did not get special focus from the various stakeholders engaged in agricultural development. Most of the institutions in the country were struggling with technical innovations overlooking the importance of institutional innovations for the success of technologies to bring impact on the lives of poor farmers in the country.

Recommendations

From the research results a number of recommendations are given. To bring food security in the country, there should be sufficient resources allocation for research. The government has to give special focus for research since it is used as the fuel for knowledge and technology development to bring innovation in agriculture. There has to be change in the existing extension system in the country since the current pipeline model does not bring innovation in agriculture since it separates researchers from farmers and limited the interaction of these stakeholders to bring innovation. There should be use of strong innovation systems in agriculture to bring change in the lives of the marginalized and poor farmers to assure food security as it facilitates learning and innovation. The extension system has to be changed from the linear model (Research-Extension-Farmer) to agricultural innovation system as this approach creates room for the interaction of the different stakeholders to bring social learning. Moreover, there should be great focus on institutional innovations rather than belligerent simply with technical innovation alone as institutional innovations are the fertile grounds on which technologies grow to bring change through the use of the technology.

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