ASSESSMENT OF THE EFFECTIVENESS OF INSTITUTIONAL LINKAGES BETWEEN AGRICULTURAL RESEARCH AND EXTENSION CENTERES IN KHARTOUM STATE

By

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Dedication

To my father and mother- the best parents I know - for their continued help and encouragement
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Abbreviations

**ISNAR**: International Service for National Agricultural Research

**KARI**: Kenya Agricultural Research Institute

**MOST**: Ministry of Science and Technology

**CORAF**: Formally known as the Conference des responsables de la recherché agricale Afrique de l’Ouest due center.

**ATS**: Agricultural Research Technology System

**REE**: Research Education Extension

**ARC**: Agricultural Research Corporation

**NPR**: Non-Program Research

**ATS**: Agricultural Technology System

**AKIS**: Agricultural Knowledge Information System

**INTA**: An Institution Integrating on-station and on-farm research.

**IARCs**: International Agricultural Research Centers

**OFCOR**: On-Farm Client Oriented Research

**IDB**: Inter-American Development Bank

**ARPT**: Adaptive Research Planning Team
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Abstract

This study was conducted to assess the effectiveness of institutional linkages between agricultural research stations and the agricultural extension centers.

A questionnaire was distributed among nineteen researchers and twenty-two Extensionists. The Extensionists comprised eight Federal Extensionists and fourteen State Extensionists.

The study showed that:

- All researchers interviewed are MSc and PhD holders while only few Extensionists had MSc degree.
- Researchers had little involvement in various extension tasks and Extensionists had little involvement in various research tasks.
- The majority of researchers described research-extension relationship as medium while all Federal Extensionists described research-extension relationship as non-existing and the majority of State Extensionists describe research –extension linkage as medium.
- Extensionists depend much on the Ministry of Agriculture in directing their work while researchers depend much on the Federal Ministry of Science and Technology in directing their work.
- The majority of researchers didn’t depend on suggestions from extension in directing their work.

The major conclusion reached in this study is that the institutional linkages between research and extension were weak and the relation-ship between
them depend on informal relationship between researchers and Extensionists.

It is therefore highly recommended that:

- Extensionists should have more funds for education opportunities.
- Permanent availability of extension worker at research station.
- Formalizing the relationship between research and extension through establishment of formal research-extension channels.
- Revise the managerial hierarchy of all parties concerned with a view of enhancing cooperation between them.
- Mutual respect and understanding to the role of each other through sensitivity training.
خلاصة الأطروحة

تم إجراء هذه الدراسة لتقييم فعالية الربط المؤسسي بين محطات الأبحاث الزراعية ومراكز الإرشاد الزراعي وقد تم توزيع استبيان على تسعة عشر باحثًا، اثنان وعشرين مرشداً بينهم ثمانية مرشدين اتحاديين وأربعة عشر وولي. أثبتت الدراسة ما يلي:

أًتضح أن كل الباحثين الذين تم استطلاع رأيهم من الخاصين على درجة الماجستير والدكتوراه في حين أن عددًا قليلاً من المرشدين كانوا من الخاصين على درجة الماجستير.

أًتضح أن مشاركة الباحثين في مهام الإرشاد المختلفة قليلة ومشاركة المرشدين في مهام البحوث المختلفة قليلة.

يُعتقد أن الغالبية من الباحثين أن العلاقة في الأبحاث والإرشاد متوسطة، بينما يرى كل المرشدين الاحتفالين أن العلاقة بين البحث والإرشاد غير موجودة، وكان رأي غالبية المرشدين الواليين أن العلاقة بين الأبحاث والإرشاد متوسطة.

يُعتقد أن الغالبية من الباحثين كثيرًا على وزارة الزراعة بشأن توجيههم في حين يعتقد الباحثون كثيرًا على وزارة العلوم والتقنية في توجيه عملهم.

لا يُعتقد أن الغالبية من الباحثين على مقتراحات الإرشاد في توجيههم.

الاستنتاج الرئيسي من هذه الدراسة يؤكد أن نمط الربط المؤسسي بين الأبحاث والإرشاد ضعيف، وأن العلاقة بينهما تعتمد على العلاقات غير الرسمية بين الباحثين والمرشدين. لهذا توصى هذه الدراسة بأن يتم عمل ما يلي:

- تخصيص المزيد من الاعتمادات المالية من أجل زيادة فرص التعليم المرشدين.
- ضرورة وجود الدائم للمرشدين في محطات البحوث.
- إضفاء الصفة الرسمية على العلاقة بين الأبحاث والإرشاد عن طريق إنشاء فروع رسمية للربط بينهما.
- مراجعة التسلسل الهرمي الإداري الخاص بكل الجهات المعنية بهدف تطوير التعاون بينها.
Chapter One

INTRODUCTION

Food production all around the world is now based on application of modern science and technology to maximize the yields from crops and species. This scientific research has led to expansion in agricultural activities. Crops quantities and qualities have increased. It has also enabled most countries to be self sufficient in its needs of many agricultural products. Farmers are benefiting greatly from agricultural research, which is advancing rapidly taking place of traditional methods.

A report on the growth and sustainability of agriculture in Asia (Non-Program Research - NPR) indicates that performance of Asian agriculture during the past two decades was a miracle. Although population has increased by a billion, earlier predictions expected major shortages and starvation did not come true. The increased demand of food was met with investments in technology infrastructure-especially roads and irrigation systems and institutional reforms that revitalized market in incentives. Thus achievement was a result of technology comprising high yielding varieties, fertilizers, and chemically oriented crop protection and good water control.

Agricultural research in Sudan started at the beginning of the 20\textsuperscript{th} century. Since then technologies have gradually transformed subsistence farming in Sudan to major agricultural schemes serving domestic and export markets. The private sector has recently introduces modem methods of packing, storage, processing and transportation process. The
vast fertile land and plenty of water resources helped the government to encourage the farmers to increase cultivation of a variety of crops. Problems that affect farmers were given a high priority. Researchers selected and propagated the desirable strains of the most yielding varieties of crops such as cotton, dura, legumes and horticultural products. Strains from out of the country were imported to add to the variety of agricultural products in the country. Agricultural research in Sudan has brought about a surge in crop production and a wide variety of crops have enriched the export potential of the country. (FAO, Rome, 1996) Lack of close working relationship between national agricultural research and extension organizations, and with different categories of farmers and farm organizations, is one of the most difficult institutional problems confronting ministries of agriculture in most developing nations. Research and extension organizations usually compete over the same scarce government resources, frequently; leaders of these institutions do not see themselves as part of a broader system The Agricultural Technology System (ATS) (E. Swanson, FAO, 1990).

Statement of the problem:

Research and Extension are mutually dependent on one another for their successful operation. Extension should serve as a main source of information to maintain an awareness of the actual farm problems that need to be solved.

The link between agricultural research and extension is weak and depends on informal relationship between extensionist and researcher.

Lack of close working relationship between national agricultural research and extension organization, and with different categories of farmers and farmer organizations, is one of the most institutional problems confronting ministries of agriculture in most developing nation, research and extension organizations usually compete over the same scarce government resources; frequently leaders of these institutions do not see themselves as part of a broader system The Agricultural Technology System (ATS).

Weak linkages among research, education and extension (REE) institutions result in systematic "bottlenecks" in national agricultural technology systems and can limit their effectiveness to contribute to development.
While close linkage between research and extension are a necessity, they are rather difficult to achieve in a most satisfactory manner for a number of reasons.

Strong links between research and extension is essential for both to operate effectively. It is difficult to attain in most cases because research and extension in most countries are under the responsibility of different organizations, their head quarters may be in different locations. Some times research and extension operate under locations. Some times research and extension operate under different purpose.

This study is intended to assess the effectiveness of institutional linkages between research and extension in Khartoum State.

Objectives:
1- Study the historical reasons for the lack of coordination between research and extension.
2- Measure the impact of the existing linkages between research and extension on agricultural productivity.
3- Measure the impact of the existing linkages on farmers.
4- Examine the existing linkage mechanisms and their characteristics.
5- Verify the cause of any weak linkage.
6- Find ways and means to improve the existing linkages between research and extension.

Organization of the study:

This study consists of six chapters as follows:

Chapter One: includes introduction, background about the area of the study, statement of the problem and objectives of the study.

Chapter Two: includes the literature review about the organizational structure of research and extension, examples of some countries experience with the interaction between research and extension, history of research and extension linkages, lessons & strategies for strengthening research and extension linkages.

Chapter Three: deals with the methodology used in data collection. Questionnaires used with researchers, Extension agents and farmers who are covered by extension services.

Chapter Four: includes records for results in form of tables and graphics.

Chapter Five: includes the discussion of the results and findings of the study.
Chapter six: This chapter is a summary of the work carried out in this study. It also includes conclusions and recommendations.

Chapter Two

LITERATURE REVIEW

This literature was based on the book "Making the link, Agricultural Research and Technology Transfer in Developing Countries" edited by David Kaimowitz and on other ISNAR Briefing papers. The book contains papers commissioned as a part of study conducted by the International Service for National Agricultural Research (ISNAR).

Niels Roling in his paper (The Agricultural Research-Technology Transfer Interface A Knowledge System Perspective) stated "the links between agricultural research and technology transfer in developing countries are generally recognized as a major bottleneck in agricultural technology systems and have received inadequate attention in the past" (Sands, 1998).

A basic concept of this paper is that research and extension should not be seen as separate institutions, which must somehow be linked. Instead, scientists involved in basic, strategic, applied and adaptive research, together with subject-matter specialists, village-level extension workers and farmers, should be seen as participants in a single Agricultural Knowledge and Information System (AKIS).

Improving linkage mechanisms:
In some countries, the annual reports of the research are not published in time or not published at all although it remains the only
An official linkage mechanism between research and technology transfer. The greater the number of linkage mechanisms, the greater range they span within the administrative hierarchy, the better the chances that effective links will develop. A typical example of multiple linkage mechanisms is the Ghana Grains Development Project. "Body swapping" is effective linkage mechanisms which create communication bridges that allow informal contact between different subsystems.

An analogue mechanism used in the agricultural sector- of some developing countries is the post of Research Extension liaison officer. They work on-farm adaptive research teams; they play important role in enlisting the support of extension services once technology is ready for more widespread testing and dissemination.

Mc Dermott claims that the responsibilities conventionally assigned to existing research and extension organizations may leave a "fatal gap" in the performance of these functions (steps or stages). Various types of institutional go between, such as subject- matter specialists, or technical liaison officers and supporting staff are currently developing to bridge the gap, but it is still too early to measure their success. One of the major problems in bridging the gap between research and extension is that the categories according to which work is organized differ.

The state agricultural policy comprises the immediate policy context in which research and extension operate. The objectives of Latin America and the sequence in which policies have been introduced over time are:

a. "Development in line with a new perception of agriculture's contribution to national to develop infrastructure needed to facilitate the production of a few commodities for export".
b. "To protect the producers of these commodities against production risks and market fluctuations in price and demand by imposing regulatory controls"
c. "To increase production and productivity, through the application of new technologies, to reduce domestic food prices and increase export surplus".
d. "To reduce possibility of social conflict by satisfying the demand for equity through the introduction of land reform and rural development policies".
Historical review of the Organization of Research and Extension in Latin America Role of the state: the first stage lasted from the mid 19th century until about the 1930. At this period the state policies were oriented towards the expansion of the usable land pushing human resources and attraction of investment and resources from abroad. In order to achieve economic growth of agricultural production of export market, there was focus on educational sphere, meeting farmer's association needs and focusing in new technologies. Extension originated in universities, departments within the Ministry of Agriculture and institutions responsible to those ministries. With the help of European technicians, by the end of this period many countries had linkage mechanisms that will develop in subsequent stages.

The second stage lasted from 1930 to 1950s and characterized by proliferation of government institutions and the emergence of much more complex state apparatus. In response to the new conditions of the International market, creation of new institutions, there was certain degree in the privatization in the public sphere. Agricultural ministries continued to be weak in situation in which sectoral interests were increasing their capacity to exert pressure on the state.

However the lack of effective links between research and extension Institutions hindered the development and transfer of the technology appropriate for small scale, resource - poor farmers, especially those in low - potential, heterogeneous, agroe-cological areas. If research or extension institutions have poor leadership, inadequate funding or poor staff morale, linking them will not solve the problem.

This paper focused on two studies carried out by (ISNAR). The study of the linkages between research and extension, and research project on the organization and management of On Farm
Client Oriented Research (OFCOR) in national agricultural research systems. (OFCOR) is designed to establish closer links between research and resource poor farm households. The analysis is based on national agricultural systems, which have formally included OFCOR as major activities and have at least 5 years experience with research approach. In the first section of this paper, the relationship between on-farm research and extension is contrasted in three countries: Guatemala - Nepal and Zambia. The second section draws evidence from all nine countries to analyze the experience with six mechanisms for linking on-farm research and extension. The final section point out the lessons that emerge from the case studies for research managers using on-farm research as a means of strengthening the links between research and extension.

In studied countries extension institutions were responsible for adopting and transferring new technologies to farmer. With the development of on-farm research programs the research institutions has replaced the role of extension institutions by having a direct contact with farmers. The case studies report several examples of links between research and extension that have not lasted.

(Peter Ewell, Links between On-Farm Research and Extension in Nine Countries)

Guatemala:

Large scale farmers produce high value export crops while small-scale farmers produce food crops for local consumptions. Since 1940s research and extension services within the ministry of Agriculture had followed procedures based on models from the USA (Mosher, 1957).

ICTA: An institution integrating on-station and on-farm research.

Weak links with extension have been a major constraint on the adoption of ICTA's technology. In most areas, extension worked independently of ICTA. The informal contact between ICTA's technology testing teams and local extension agent in some areas, particularly where technology in high demand from farmers was becoming available (Whyte, 1983).

(PROGETTAP) a new joint program established in 1986. Based on the close link between research and extension (Ortiz, 1987). Financed from IFAD and IDB (Inter American Development Bank). Selected farmers known as "rural leaders" are trained in the management of new technologies and hired on a half-time basis. Each of these promoters is expected to work with 15 to 20 rural leaders.

Nepal

The institutional structure: Agricultural development in Nepal faces sever constrains. Extension and most Research follow the ministry of agriculture but links at the national level are weak. On - Farm client
oriented research is organized under different research departments and organizations. All students of agriculture used to serve as extension agents for two years one year as an assistant and the other year as a technician before being admitted to the university. Due to manpower shortages, permanent extension positions were created. Salaries and benefits for these extension low and staff turnover is high. During 1980s professional subject matter specialist were appointed as a part of T and V system in some district.

The case study highlights the on-farm programs of National Rice Improvement Program. There is informal coordination between research and extension at the regional and national level, but there were no formal mechanisms for joint planning and evaluation at the time of the study.

**Zambia:**

In Zambia research and extension are located in the Ministry of Agriculture. Fieldwork is organized through semi-autonomous provincial operational units known Adaptive Research Planning Teams (ARPTs). Of the nine countries studied, Zambia has developed elaborate set of mechanisms to link research and extension.

The ARPT programs was intended to support extension workers in various ways, by focusing on the conditions of small-scale farmers. Senior staff, including the Assistant Director of Agriculture for Extension, were directly involved in setting up the ARPT program. Provincial ARPT committees were set as a forum of joint planning and review of on-farm research and extension at the operational level. Although formal linkage mechanisms have been put in place at national Level - Provincial Coordinating Committees, Research - extension Liaison officers, their effectiveness has varied among teams. A strong commitment to research -extension links by senior administers will be required if these are to be sustained once donor support ends.

Another example of the studies conducted as part of an ISNAR project on the linkages between research and farmers organizations is: Linkages between research, farmers, and farmers' organizations in Kenya: A summary of findings By Anna Wauyts - Fivawo. This paper summarizes the findings of a study that assessed existing and potential linkages between agricultural research and farmers' organizations in Kenya.

**Lessons for strengthening linkages:**

a. Awareness of the potential benefits of linkages has to be raised to the various actors.

b. Policies had to be developed giving the priority to linking Farmers' organizations and agricultural research institutions.

c. Resources are needed if linkages are to take place. The allocation of resources has to be flexible and decentralized.
d. Incentives are needed. Researchers should be rewarded for pursuing the link with farmers' organizations. Likewise official farmers' organizations need to be rewarded for bringing research to their members.

e. To achieve maximum benefits from linkage, contacts need to be sustained over time.

f. Institutional changes are necessary: research needs to create space for others, knowledge gaps need to be reduced, and farmers' organizations need to encourage participation.

g. Institutionalization of farmers' participation through their organizations is necessary if farmers are to have an effective voice in linking with researchers. (A-Wuyts-Fivawo, 1996)

Ineffective linkages between research and extension were considered among the key problems faced technology system in the region. (Eponou, November1996)

Studies carried by ISNAR and Research system reviews have highlighted the following characteristics of many agricultural research systems in Africa:

a. **Missing functions**: Some systems don't have formal processes for formulating research program or setting priorities as consequence, researches do not interact with extension agencies and farmers and cannot incorporate inputs from them into research agenda.

b. **Missing linkages**: Usually due to bureaucratic or institutional barriers, especially were extension and research are based in different ministries, or located in organizations with different legal bylaws. In such case effective continues cooperation between research and extension becomes difficult.

c. **Idle and ineffective mechanisms**: formal mechanisms may exist but they are not used or used poorly, Research and extension and extension are supposed to meet and formulate the research program together, but what happened during these meetings is that researchers represent their current results and their plan for the future. Most systems cut financing for linkages, and many linkage mechanisms, but they no longer function.

d. **Duplication of effort**: Despite the financial problems facing research and extension there is duplication of activities mainly in diagnosing farmers' problems. Because donors make linkages with partners all actors involved in technology generation and transfer undertake a condition of their research and extension projects, diagnosing farmers’ problems.

e. **Fluctuation and the use and the performance of the linkage mechanisms**: Donor resources are often given to
only one actor in the system, due to this link mechanisms may achieve a high degree of effectiveness but for only short period of time during the project. As soon as the project is over the performance drops. When donors' resources become available again it improves. Thus, fluctuations in linkages are due to the fact that most linkage mechanisms are related to donor projects.

f. **Limited input from farmers in formulating the research agenda:** Only few systems have formal mechanisms that enables farmers have influence on the research agenda. Due to the poor linkages between station and on-farm research, research managers often blame poor farmer linkages on lack of farmers involvement in decision making in public institutions, ineffective organization of farmers, and their inability to participate effectively.

g. **Poor coordination** between nongovernmental organizations (NGOs) and national research organizations. The relationships of the NGOs with public institutions, especially research organizations have not been cooperative. At best; NGOs maintain informal contacts with research.

(Eponou, November 1996, linkages between researches and technology users: Some issue from Africa)

As a consequence of the characteristics outlined above, the general results of the agricultural research can be summarized as follows:

a. Lack of relevant technologies produced by research. Farmers reject many of the technologies produced by research because they are not responsive to farmers' needs.

b. Technologies remain on the "research shelf" simply because extension and farmers are not aware of their existence, or can not use them. Research mechanisms may not allow the extension to disseminate the technologies effectively.

c. Absence of significant technological improvements in the subsistence sector. Most have occurred in the commercial sector.

d. Degradation of natural resource in areas of high population density) with fragile land.

(Eponou, November 1996)

In their book on Improving Agricultural Extension Gwyn E. Jones is Senior Lecturer, Agricultural Extension and Rural Development Department, and Chris Garforth is Senior Lecturer and Head of the Agricultural Extension and Rural Development Department, both at The University of Reading, United Kingdom, they stated:
“Agricultural extension work has a venerable, albeit largely unrecorded, history. It is a significant social innovation, an important force in agricultural change, which has been created and recreated, adapted and developed over the centuries. Its evolution extends over nearly four thousand years, although its modern forms are largely a product of the past two centuries. Today, the organizations and personnel engaged in agricultural extension encompass a diverse range of socially sanctioned and legitimate activities which seek to enlarge and improve the abilities of farm people to adopt more appropriate and often new practices and to adjust to changing conditions and societal needs”.

“The term "extension" The use of the word "extension" derives from an educational development in England during the second half of the nineteenth century. Around 1850, discussions began in the two ancient universities of Oxford and Cambridge about how they could serve the educational needs, near to their homes, of the rapidly growing populations in the industrial, urban area. It was not until 1867 that a first practical attempt was made in what was designated "university extension," but the activity developed quickly to become a well-established movement before the end of the century. Initially, most of the lectures given were on literary and social topics, but by the 1890s agricultural subjects were being covered by peripatetic lecturers in rural areas (Jones, 1994). The growth and success of this work in Britain influenced the initiation of similar activity elsewhere, especially in the United States. There, in many states, comparable out-of-college lectures were becoming established by the 1890s (True, 1900, 1928). During the first two decades of this century, the extramural work of the land-grant colleges, concerned with serving the needs of farm families, was to expand dramatically and become formally organized; but the use of the term "extension" continued and has persisted as the designation for the work”.

One of the good references that tackled the issue of agricultural extension is agricultural-extension reference manual edited by E. Swanson, published by FAO.

According to Swanson it is difficult to define the term "agricultural extension" because it is designed by different organizations to be used by different people to achieve a variety of objectives. The goal of extension is
to give useful knowledge, skills and information in an on-going process to people to enable them to improve their quality of life. Extension or non-formal education can be used—agricultural programs such as rural health, family planning or community development. The terms agricultural extension and technology transfer are not synonymous. The term technology transfer includes beside agricultural extension the supply of input and agricultural services.

(B.E. Swanson, 1981)

**Development of Agricultural extension in the Third World.**
The development of agricultural extension in the third world countries has occurred after the Second World War as a post independence phenomenon. In Latin America and Caribbean, the national agricultural extension organizations were started in 1960s and 1970s.

(Swanson and Rassi, 1981)

The colonial governments in the third world countries sponsored research—extension activities for export of cash crops such as sugar, groundnuts, etc. As they were interested in increasing export crops. In some countries these trends are still taking place. Research—Extension activities for traditional food crops were almost neglected until independence. There were shortage in trained agricultural personnel in the third world countries. Today most third world countries have extension organizations although many donors have shown their frustration in their attempts to improve these systems.

(E. Swanson, 1981)

Figure 1.1 Extension linkage with research and farmers’.
Extension work as a link between research and farmers. It carries out information about new technology from research to farmers and feedback farmers’ problems and needs to research stations.

Figure 1.2 Primary Research Linkages.

IARC = International Agricultural Research Center
MOA = Ministry of Agriculture
Figure 1.2 Shows the linkages between International Research Institutions and National Research Institutions and their relation with extension. National Research Centres should carry the primary linkage responsibility (ISNAR Teams concerned with upgrading and further development of the relationship between research and extension organizations …ISNAR teams have found in many developing countries that workers with out close link to research is carried out in isolation, building up technical solutions ….some of which are unusable or unused. Research systems that cannot transmit findings to the extension service and to farmers make little practical contribution. Extension work that is not sustained by results obtained through research has little value and may even be detrimental.)

(L.H. Watts)

Linkage between research-extension- farmers and farmers’ organization
The lack of linkage between research-extension and farmers leads to isolation of farmers and consequently to poor production. Linkage has therefore become a must for increased agricultural productivity.

The need for effective linkages is becoming highly important for the development and spreading of farm technologies at farmers’ level. Research and extension will enhance farm production and increase the farmers’
income. This will in tern encourage farmers to adopt research recommendations. Linkage will also allow researchers and Extensionists to benefit from the indigenous technologies adopted by farmers.

“All is not well about linkage between research and extension,” says Sabarathnam, Principal Scientist (Agricultural Extension) Ragendranagar, and Hyderabad. He says this is due to:

- In 16 out of 20 research projects evaluated by USAID and in 12 projects evaluated by the F.A.O. (1984), communication between research and extension was weak.
- The World Bank (1985) has pointed out that bridging the gap between research and extension is the most serious institutional problem in developing an effective research and extension system.
- Many scholars have reported that extension workers see researchers as working in ‘ivory towers’ and producing technologies that are not applicable to the farmers with whom they work (FAO1984, Samy, 1986).
- Researchers look down on extension workers and question extension agents’ capacity to perform their job (Quimsum, 1984).
- Both researchers and extensionists avoid the task that bridge the two activities such as adaptive field trials and treatment of technological findings for extension agents (Mc Dermot, 1987).
- Communication between the two groups is limited. These problems are caused by difference in background, training, experience, responsibility, status, institutional setting and physical location, which promote competition between the two groups and hinder their ability to understand each other (Bennel, 1989).
- Many studies have indicated that that the source of idea for the research in agriculture, in majority of the cases is neither the extension worker nor the farmer, but something else (Lion Berger and Chang 1970).
- Linkage between agricultural research and extension is often weak or non-existents. Rather than operating as a continuum, these services often act in ways that reinforce their separation rather their mutual support. (Cernea et, al 1985).
- Researchers are often out of touch with farmers’ problems. Research Programs tend to be in isolation of farmers’ problems. (Cernea, Coulter and Russell, 1985) (Sabartnam, V.E. Private Extension: Indian Experience. Chapter7 Linkages for mutual survival Stability and Development).

In Briefing paper No: 30 published by the International Service for National Agricultural Research (ISNAR) in November 1996 by Thomas Eponou, says “the reasons for poor status of linkages may vary from one
country to another, but several factors contributing to the situation are shared by most countries:

- Absence of systems perspective and an effective system of leadership.
- Lack of transparent, agreed upon research policy.
- Inappropriate linkage strategies and management.
- Donor-driven development strategy.

(Thomas Eponou, 1996. Linkages between Researches and Technology Users: Some Issues from Africa)

The ISNAR Briefing Paper No 45 briefing paper suggested the following planning cycle and its steps:

- Step 1: Define research technology user linkage strategies at different levels;
  a) Identifying the potential linkage partners;
  b) Defining the linkage objectives and/or functions for the most important partners at each level;
  c) Identifying an array of potential linkage mechanisms by type of partner and linkage functions/objectives;
  d) Preparing linkage strategies that specify the partners, the linkage functions/objectives, and the linkage mechanisms

- Step 2: Diagnose and analyze the existing linkage situation.
  a) Using the linkage strategy developed in step 1 to identify the linkage gaps/problems at nationals and regional levels;
  b) Develop affordable solutions (linkages) at each level;
  c) Defining structural and staffing responsibilities for the identified linkages and mechanisms, including any necessary changes.
Step 3: Develop action plans to solve linkage problems.
   a) Identifying the necessary linkage mechanisms required for each linkage channel at national, regional, and district levels;
   b) Identifying the resource costs (funds, staff, equipment) and estimating budgets for plans at each level;
   c) Identifying contributions to be made by each partner organization for the action plans;
   d) Assigning responsibilities and a time frame, and implanting the content of the plans.

Step 4: Periodically monitor and assess the linkage strategy and action plans.
   a) Assigning monitoring and assessment responsibilities;
   b) Monitoring action plan implementation;
   c) Periodically reviewing and adjusting strategies and action plans.

Prospects and problems of establishing linkages between agricultural research and farmers’ organizations to enhance research and development. The following conclusions and lessons were learned from this study:

- “Linkages are beneficial but the benefits are not efficiently apparent to the various actors for any one of them to take the initiative. Awareness of potential benefits needs to be raised.
- Policies need to be developed giving priorities to linkages between farmers’ organizations and agricultural research institutions if they are to link with each other.
- Resources are needed if linkages are to take place. The allocation of resources also needs to be flexible and decentralization to the level where they are needed.
- Incentives are needed. Researchers should be rewarded for pursuing links with farmers’ organizations. Likewise, officials of farmers’
organizations need to be rewarded for bringing research to their members.

- To achieve maximum benefits from linkages, contacts need to sustain over time.
- Institutional changes are necessary: research need to create space for others, knowledge gaps need to be reduced; farmers’ organizations need to encourage participation.
- Institutionalization of farmer’s participation through their organizations is necessary if farmers are to have an efficient voice in linking with researchers.” (Wauyts-Fivawo, 1996.ISNAR, Briefing paper32. Linkages between Research, Farmers, and Farmers’ Organizations in Kenya: Summary of Findings)

Studies on strategies and plans to strengthen research extension linkages

1. Briefing paper No: 30 (LINKAGES BETWEEN RESEARCH AND TECHNOLOGY USERS: SOME ISSUES FROM AFRICA), published by INSAR on November 1996. By Thomas Eponou, recommended the following actions in order to promote improved linkages between research, framers’ organizations and extension in CORAF member countries:

- Support the emergence and the strengthening of farmers’ organizations, with particular emphasis on supporting the development of their technical and economic objectives.
- Assist extension services and research organizations to take into account the requests, or “demand”, of farmers’ organizations.
- Assist farmers’ organizations and civil society actors in formulating request to research and participating in research processes, especially through the creation of catalytic funds that can be used on the demand of farmers’ organizations.
- Strengthen the capacities of the three actors to work together.
2.1 Briefing paper No: 45 (Methods for Planning Effective linkages) published by INSAR on January 2001. Stated the following:

**Methods for improving linkages:**

- **Role of farm-research-extension actor’s responsibilities and objectives** can be coordinated to avoid overlap and achieve complementary in terms of shared goals.

- **Farmers** are the ultimate users of technology and information, and contribute to its flow by:
  - Providing indigenous knowledge and information;
  - Determining which technology is useful and relevant;
  - Identifying production problems and defining what is needed from research;
  - Representing farmer interests, in the case of farmers’ organizations.

- **Role of research and extension.** Public-sector research and extension organizations have traditionally played a central role in providing improved technology and information for farmers. Government research organizations can and should play a guiding role in linkage planning by initiating such efforts. In general, government research and extension are central to:
  - Policy formulation and planning for country-wide research and extension services;
  - Carrying out research and services that result in improvements for agricultural production and natural resource management;
  - Ensuring broad coverage of farmers’ technology and information needs;
  - Promoting the use of shared methods and processes for linkage planning.

- **Implications and importance for farmers.** Farmers need to participate in establishing research-extension agendas in order to communicate their production and management problems to research, and to help determine the effective means of accessing improved technology and information. Substantial changes are needed to improve the participation of farmers in decision-making related to research and extension.

- **Adaptation to AKIS conditions.** Linkages require substantial and sustained attention to
establish strong farmer voice in decision-making and to build cooperation and collaboration among the principal actors. Together with Senegal, Tanzania, Zimbabwe, and Mali, INSAR has developed and tested linking planning methods and procedures that have been proven effective. These methods are available for use in other countries and are useful in resolving linkage problems.

- **Conceptual Approach.** The linkage planning approach developed by ISAR emphasizes national participation in the process, provides step-by-step guidelines, and promotes leadership and decision making by representatives of the major actors.

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**Chapter Three**

**Organization of Agricultural Research and Extension in Sudan**

**Organization of Agricultural Research and Extension Institutions in Sudan.**

**3.1 The Agricultural Research and Technical Corporation**

The Sudanese Agricultural Research Corporation is considered as one of the oldest institutions in agricultural research and education in Africa and the Middle East.

The history of agricultural research in Sudan dates back to 1903. In 1904, the department of agriculture establishes Shumbat Research Farm where some botanic and agronomic work was carried out. When the growing of cotton was proved successful in Gazira Research area, a research farm was established near Wad Madani and called the Gazira Research Farm.
1918. Shumbat and Gazira research farm were then transferred to the department of agriculture in 1919.

The Gazira Research Farm has ever since acted as headquarters for organizations of agricultural research which assumed different names throughout its history. It was called the Gazira Agriculture Research services in 1930-31, changed to agricultural research institute in 1938, to research division in 1957.

3.1.1 The Corporation employs about 246 researchers, 99 of them are PH holders, and 147 hold MSc degrees and 82 are BSc holders. Technical staff is formed of about 67 employers’. The labours working in different fields are estimated to be about 3000.

3.1.2 Ninety five percent of the fund is available by the government, and the rest comes from different donors inside and outside Sudan.

**Working locations:** The Agricultural Research Corporation consists of four canters and 17 stations:

Can ters are:
1. Shumbat Food Research Centre. Khartoum.
2. Madani-Crop Protection Research Centre. (Gazira)
3. Madani Water and land Research. (Gazira)
4. Suba-forestry Research Centre. (Khartoum)

Figure (1) shows the managerial hierarchy of Agricultural Research Corporation.
Figure (1) the managerial hierarchy of the Agricultural Research Corporation:

Minster of science & technology

Administration of agricultural research

General Manager of Agricultural Research and Technology

Vice General Manager for station affairs & technology transfer

Manager of external stations

Human Resources Administration

Information & Documentation Administration

Finance Administration

Vice general manager for programs & communications

Coordinator of research programs

Program researchers

Public relations

Internal monitoring
**Agricultural Extension in Sudan:**

Agriculture extension division in the Ministry of Agriculture was established in 1958 since then the program has reached most of the regions in Sudan. These regions have established sub units at the district level. These units are:

<table>
<thead>
<tr>
<th>Region</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>6</td>
</tr>
<tr>
<td>Northern</td>
<td>3</td>
</tr>
<tr>
<td>Kordfan</td>
<td>3</td>
</tr>
<tr>
<td>Darfor</td>
<td>3</td>
</tr>
<tr>
<td>Eastern</td>
<td>1</td>
</tr>
<tr>
<td>Khartoum</td>
<td>2</td>
</tr>
</tbody>
</table>
Agricultural Extension Personnel:

The Agricultural Extension Department has about 240 employees of most of whom are university graduates. It is estimated that an average one extension worker for every 18,000 rural families in the country. On the other hand, the Sudan Gezira Board, which established in Agricultural Department in 1968 employs a relatively large number of extension workers. These are agriculture extension graduate and post-secondary graduate.

Beside extension agents there are about 400 agricultural inspectors. Only 17 have received substantial training in agricultural extension while 112 have received little training and the rest have no agricultural training at all. These inspectors are responsible for providing selected services to farmers, seeds, fertilizers…etc.

Each inspector serves about 5,000 feddans, 130-150 families. Village heads usually assign to work with the agricultural inspectors, because of their long allocation with the communities in which they serve. Such as middle aged teachers, employers and other civil.

(Hassan M. Said, 1986)
Figure (2) shows the managerial hierarchy of Agricultural Extension and Technology Transfer.

Figure (2) the managerial hierarchy of Agricultural Extension and Technology Transfer:
Local centers of extension agents’ circles.

Targets at the local level
Chapter Four

RESEARCH METHODOLOGY

This chapter deals with methods used to collect data, sample selection, sample size, and conceptual model of the study, the hypothesis and analytical techniques of the collected data.

4.1 Background information on research site study area:

As mentioned earlier in chapter one, this study is designed to assess the effectiveness of institutional linkages between agricultural research stations and agricultural extension centres in Khartoum State. The study covers Shumbat Food Research Centre and Shumbat Agricultural Research Station that are both headed by the Agricultural Research and Technical Corporation and the administration of technology transfer and extension at the federal state level.

4.2 Hypothesis:

There is no effective formal linkage mechanism between research and extension institutions in Khartoum State. Linkage depends on informal relations between extension agents and research workers. Coordination is hindered by institutional factors and differences in qualifications between researchers and extension workers.

4.3 Sample selection procedure and sample size:

a. This research covers Agricultural Research Corporation (ARC) resembled in agricultural research station, agricultural food centre, the administration of technology transfer and extension at the state level.

b. The sample size is a group of 41 that comprise: 19 researchers, 8 federal extension agents and 14 extension agents in Khartoum State. The respondents were selected randomly.

4.4 Data collection procedure:

Data for this study were collected through a variety of means. This included questionnaires, research and extension report, papers on the subject and reference books.

Fieldwork was conducted mainly in extension centres and took about four months.

Primary collection focused on the information needed to assess the effectiveness of institutional linkages between agricultural research
stations and agriculture extension centres. It was collected through direct observations, interviews and discussion with the respondents. It was also collected from reference books.

4.5 **The questionnaire:**
   a. The questionnaire was designed to allow for the gathering of the required data for the study, a copy of the questionnaire is placed in the appendix
   b. The questions were carefully reviewed to ensure that it will be easily understood and that it was fairly relevant to the aim of the questionnaire.
   c. A pre test was conducted to estimate the time needed by the respondent to fill the answers.

4.6 **Data analytical techniques:**
   Data obtained were analyzed by computer using the Statistical Package for the Social Science (SPSS) program for computation of frequency distributions. The results were presented in percentage.

4.7 **Problems and Limitations:**
   a. The main problem was that respondents were reluctant and some of them refused to fill the questionnaire, either because it was too long, or because it contains some personal information regarding their qualifications.
   b. The other problem was the absence of respondents for days, weeks and some times for a month from the field. This has resulted greatly in delaying the collection of the questionnaire. It took more than the scheduled time.
Chapter Five

RESULTS AND DISCUSSION

Gender of respondents:
Table 1 shows that the majority of both researchers and extension agents (federal and state) are males. There was a wide gap between the numbers of female researchers compared to male while the number of female extension agents is almost the same compared to male number.

Length of employment:
Table 2 shows that researchers' length of employment varied from 1-40 years and the majority had an experience of 20-40 years while extension agents’ length of employment varied from 1-25 years. This shows that researchers had a longer work experience compared to extension agents.

Length of employment in other positions:
Table 3 shows that only few researchers had an experience in other positions and this number increases in case of extension agents especially state extension agents. The length of employment in other positions varies from 1-15 years for both.

Number of years of education:
Table 4 shows that the majority of interviewed researchers received more 21-25 years of education while the majority of extension agents received less 16-20 years of education. This proves that education of researchers was better than that of extension agents.

Secondary certificate and diploma holders:
Table 5 all interviewed researchers and extension agents are holders of secondary certificate. Only few extension agents hold sub university diploma 12.5% of federal extension agents and 21.4% of state extension agents.

BSc degrees held by researchers and extension agents:
Table 6 shows that all interviewed researchers are BSc degree holders and all interviewed federal extension agents are BSc degree holders while 92.9% of state extension agents are BSc degree holders. The majority of researchers are Khartoum University graduate while the majority of extension agents graduated from other universities. The majority of researchers are holders of class two division one and class two division two degrees, while the majority of federal extension agents are holders of class two division two degrees and the majority of state extension agents are holders of class three degrees.
Table 1 Gender of the respondent:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>68.4</td>
<td>6</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>31.6</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2 length of employment:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of employment</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>1-5</td>
<td>2</td>
<td>10.5</td>
<td>6</td>
</tr>
<tr>
<td>6-10</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>11-15</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td>21-25</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>26-30</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>31-35</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>36-40</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 3 length of employment in other positions:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of employment in other positions</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>1-5</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td>6-10</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>11-15</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>26.3</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4 Number of years of education completed by researchers and extension agents:
<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td><strong>Number of years of education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-15</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>16-20</td>
<td>7</td>
<td>36.8</td>
<td>7</td>
</tr>
<tr>
<td>21-25</td>
<td>12</td>
<td>63.2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 5 Distribution of researchers and extension agents by level of education:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td><strong>Holder of Intermediate certificate</strong></td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Holder of Secondary certificate</strong></td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td><strong>Holder of sub-university diploma</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO</td>
<td>19</td>
<td>100.0</td>
<td>7</td>
</tr>
<tr>
<td>YES</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 6 BSc degrees held by researchers and extension agents:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Holder of BSc degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>YES</td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td>The university which BSc degree was obtained</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khartoum</td>
<td>13</td>
<td>68.4</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>31.6</td>
<td>7</td>
</tr>
<tr>
<td>Class of BSc degree held</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class one</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Class two division one</td>
<td>6</td>
<td>31.6</td>
<td>3</td>
</tr>
<tr>
<td>Class two division two</td>
<td>8</td>
<td>42.1</td>
<td>2</td>
</tr>
<tr>
<td>Class three</td>
<td>3</td>
<td>15.8</td>
<td>1</td>
</tr>
</tbody>
</table>

MSc and PhD degree held by the respondent:

Table 7 shows that all researchers hold MSc degree while only less than half of federal extension agents hold MSc degree and few state
extension agents holds MSc. The majority of researchers have obtained their MSc from Khartoum University and the rest from universities outside Sudan while the majority of extension agents have obtained their MSc from Khartoum University and the rest from other universities inside Sudan and only 7.1% have obtained their MSc from universities outside Sudan. This shows that researchers have better quality of education and access to studies outside Sudan.

The majority of researchers hold PhD degrees while none of extension agents interviewed had PhD degree. The majority of researchers have obtained their PhD from universities outside Sudan. This shows that researchers have been encouraged by their administration to continue their education and had access to scholarship.

**Respondents' involvement in research tasks:**

Table 8 shows that researchers are much involved in basic research activities while only 7.1% of extension agents have little involvement in basic research activities. The majority of researchers are too much involved in applied research activities while the majority of extension agents are not involved and only few have little involvement in applied research activities. The majority of researchers have much involvement in adaptive research activities while the majority of extension agents have no involvement in adaptive research activities and only few 28.6% have much involvement in adaptive research activities. The majority of researchers have no involvement as a subject matter specialist and only 26.3% have little involvement while the majority of extension agents have no involvement as subject matter specialist and 21.4% have much involvement.

**Respondent involvement in administrative and training tasks:**

Table 9 shows that the majority of researchers have much involvement in the supply of information requested informally by extension agents while the majority of federal extension agents have too much involvement and the majority of state extension agents have no involvement in the supply of information requested informally by extension agents. The majority of researchers have much involvement in training of extension agents while the majority of extension agents have no involvement in training of extension agents. The majority of researchers have no or little involvement in farmers training while the majority of extension agents have much involvement in farmers training. The majority of researchers have no or little involvement in administrative work while the majority of federal extension agents have little involvement and state extension agents have much involvement in administrative work.
Table 7 MSc & PhD degrees held by researchers and extension agents:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holder of MSc degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>5 62.5</td>
<td>12 85.7</td>
</tr>
<tr>
<td>YES</td>
<td>19 100.0</td>
<td>3 37.5</td>
<td>2 14.3</td>
</tr>
<tr>
<td>Total</td>
<td>19 100.0</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
<tr>
<td>The University from which he obtained MSc degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khartoum</td>
<td>11 57.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other in Sudan</td>
<td>-</td>
<td>2 25.0</td>
<td>1 7.1</td>
</tr>
<tr>
<td>Outside Sudan</td>
<td>8 42.1</td>
<td>1 12.5</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>19 100.0</td>
<td>3 -</td>
<td>1 7.1</td>
</tr>
<tr>
<td>Holder of PhD degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>6 31.6</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
<tr>
<td>YES</td>
<td>13 68.4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>19 100.0</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
<tr>
<td>The University from which he obtained PhD degree</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khartoum</td>
<td>3 15.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other outside Sudan</td>
<td>10 52.6</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
<td>-</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
<tr>
<td>Total</td>
<td>13 68.4</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
</tbody>
</table>
Table 8 Extent of the respondents' involvement in research tasks:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of involvement in basic research activities</td>
<td>Freq %</td>
<td>Freq %</td>
<td>Freq %</td>
</tr>
<tr>
<td>no</td>
<td>5 26.3</td>
<td>8 100.0</td>
<td>13 92.9</td>
</tr>
<tr>
<td>little</td>
<td>5 26.3</td>
<td>- -</td>
<td>1 7.1</td>
</tr>
<tr>
<td>much</td>
<td>4 21.1</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>Too much</td>
<td>5 26.3</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>Level of involvement in applied research activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>- -</td>
<td>8 100.0</td>
<td>8 57.1</td>
</tr>
<tr>
<td>little</td>
<td>1 5.3</td>
<td>- -</td>
<td>5 35.7</td>
</tr>
<tr>
<td>much</td>
<td>8 42.1</td>
<td>- -</td>
<td>1 7.1</td>
</tr>
<tr>
<td>Too much</td>
<td>10 52.6</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>Level of involvement in adaptive research activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>5 26.3</td>
<td>7 87.5</td>
<td>8 57.1</td>
</tr>
<tr>
<td>little</td>
<td>1 5.3</td>
<td>1 12.5</td>
<td>2 14.3</td>
</tr>
<tr>
<td>much</td>
<td>11 57.9</td>
<td>- -</td>
<td>4 28.6</td>
</tr>
<tr>
<td>Too much</td>
<td>2 10.5</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>Involvement as subject matter specialist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>11 57.9</td>
<td>6 75.0</td>
<td>8 57.1</td>
</tr>
<tr>
<td>little</td>
<td>5 26.3</td>
<td>- -</td>
<td>2 14.3</td>
</tr>
<tr>
<td>much</td>
<td>2 10.5</td>
<td>1 12.5</td>
<td>3 21.4</td>
</tr>
<tr>
<td>Too much</td>
<td>1 5.3</td>
<td>1 12.5</td>
<td>1 7.1</td>
</tr>
</tbody>
</table>
Table 9 Extent of the respondents' involvement in administrative and training tasks:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>supply of information requested informally by extension agents</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>4</td>
<td>21.1</td>
<td>2</td>
</tr>
<tr>
<td>little</td>
<td>3</td>
<td>15.8</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>8</td>
<td>42.1</td>
<td>2</td>
</tr>
<tr>
<td>Too much</td>
<td>4</td>
<td>21.1</td>
<td>3</td>
</tr>
<tr>
<td>training of extension agents</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>4</td>
<td>21.1</td>
<td>4</td>
</tr>
<tr>
<td>little</td>
<td>4</td>
<td>21.1</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>8</td>
<td>42.1</td>
<td>3</td>
</tr>
<tr>
<td>Too much</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>Farmer training</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>6</td>
<td>31.6</td>
<td>3</td>
</tr>
<tr>
<td>little</td>
<td>6</td>
<td>31.6</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>5</td>
<td>26.3</td>
<td>4</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Involvement in administrative work</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>6</td>
<td>31.6</td>
<td>2</td>
</tr>
<tr>
<td>little</td>
<td>6</td>
<td>31.6</td>
<td>3</td>
</tr>
<tr>
<td>much</td>
<td>5</td>
<td>26.3</td>
<td>2</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>1</td>
</tr>
</tbody>
</table>

Respondent involvement in different extension tasks:
Table 10 shows that the majority of researchers have no involvement in farmer field school activities while the majority of federal extension agents have no involvement and the majority of state extension agents have much involvement in farmer field school activities. The
majority of researchers have no involvement in extension meetings while the majority of federal extension agents have no involvement and the majority of state extension agents have much involvement in extension meetings. The majority of researchers have much involvement in extension work with farmers while the majority of federal extension agents have no involvement and the majority of state extension agents have much involvement in extension work with farmers. The majority of researchers have little involvement in extension radio and televised programs while federal extension agents have no or little involvement and the majority of state extension agents have much involvement in extension radio programs and little or no involvement in extension televised programs.

**Respondent involvement in different extension tasks:**

Table 11 shows that the majority of researchers are not involved in extension demonstration activities while federal extension agents have no or little involvement and the majority of state extension agents have much involvement in extension demonstration activities. The majority of researchers are not involved as a member of comities for special duties and the majority of state extension agents are not involved as a member of comities for special duties. All researchers interviewed are not involved in women development programs and the majority of extension agents are not involved and only few have little or too much involvement in women development programs. All researchers interviewed are not involved in animal production related work and the majority of extension agents are not involved in animal production related work.

**Respondent involvement in different extension tasks:**

Table 12 shows that the majority of researchers have no involvement in rural youth integrated programs while the majority of extension agents have no involvement and only 14.2% have much or too much involvement in rural youth integrated programs. All researchers interviewed have no involvement in input distribution work while the majority of extension agents have no involvement in input distribution work. All researchers interviewed have no involvement in extension data collection while the majority of federal extension agents have no involvement and only 25% have much or too much involvement in extension data collection and the majority of state extension agents have no involvement in extension data collection.
Table 10 Extent of the respondent involvement in extension tasks:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training at farmer field school activities</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>8</td>
<td>42.1</td>
<td>7</td>
</tr>
<tr>
<td>little</td>
<td>10</td>
<td>52.6</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Involvement in extension meetings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>9</td>
<td>47.4</td>
<td>6</td>
</tr>
<tr>
<td>little</td>
<td>4</td>
<td>21.1</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>1</td>
</tr>
<tr>
<td>Direct extension work with farmers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>6</td>
<td>31.6</td>
<td>5</td>
</tr>
<tr>
<td>little</td>
<td>3</td>
<td>15.8</td>
<td>3</td>
</tr>
<tr>
<td>much</td>
<td>8</td>
<td>42.1</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Extension radio programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>5</td>
<td>26.3</td>
<td>4</td>
</tr>
<tr>
<td>little</td>
<td>7</td>
<td>36.8</td>
<td>4</td>
</tr>
<tr>
<td>much</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Extension televised programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>4</td>
<td>21.1</td>
<td>4</td>
</tr>
<tr>
<td>little</td>
<td>10</td>
<td>52.6</td>
<td>4</td>
</tr>
<tr>
<td>much</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 11 Extent of the respondent involvement in extension tasks:
<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>extension demonstration activities</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>8</td>
<td>42.1</td>
<td>4</td>
</tr>
<tr>
<td>little</td>
<td>5</td>
<td>26.3</td>
<td>4</td>
</tr>
<tr>
<td>much</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>as member of comities for special duties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>17</td>
<td>89.5</td>
<td>8</td>
</tr>
<tr>
<td>little</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Involvement in women development programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>19</td>
<td>100.0</td>
<td>7</td>
</tr>
<tr>
<td>little</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Involvement in animal production related work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td>little</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 12 Extent of the respondent involvement in extension tasks:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>rural youth integrated programs</td>
<td>no</td>
<td>18</td>
<td>94.7</td>
</tr>
<tr>
<td></td>
<td>little</td>
<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>much</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>input distribution work</td>
<td>no</td>
<td>19</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>much</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>extension data collection</td>
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<td>19</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>little</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>much</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Too much</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Respondent involvement in different extension tasks:

Table 13 shows that the majority of researchers don’t use workshops as a mean of information while an 50% of federal extension agents use workshops as a mean of information and the majority of state extension agents don’t use workshops as a mean of information. The majority of researchers don’t use lectures as a mean of information while the majority of federal extension agents don’t use lectures as a mean of information and 50% of state extension agents use lectures as a mean of
information. The majority of researchers don’t use discussion groups as a mean of information while the majority of federal extension agents don’t use discussion groups as a mean of information and the majority of state extension agents use discussion groups as a mean of information. The majority of researchers use farm visits as a mean of information while the majority of federal extension agents don’t use farm visits as a mean of information and the majority of state extension agents use farm visits as a mean of information. The majority of researchers don’t use farm trials as a mean of information while the majority of state extension agents use farm trials as a mean of information.

**Means of transferring Information to farmers:**

Table 14 shows that the majority of researchers don’t use direct application of recommended technology in farmers field as a mean of information while the majority of federal extension agents don’t use direct application of recommended technology in farmers field as a mean of information and the majority of state extension agents use direct application of recommended technology in farmers field as a mean of information. The majority of researchers don’t use farmers field schools as a mean of information while the majority of federal extension agents don’t use farmers field schools as a mean of information and the majority of state extension agents use farmers field schools as a mean of information.

**Means of transferring farmers’ needs to research centres:**

Table 15 shows that the majority of researchers have no involvement in transmitting farmer problems to officials verbally in the field while the majority of federal extension agents have no involvement in transmitting farmer problems to officials verbally in the field and the majority of state extension agents have much involvement in transmitting farmer problems to officials verbally in the field. The majority of researchers have no involvement in transmitting farmer problems to officials in research stations while the majority of federal extension agents have no involvement in transmitting farmer problems to officials in research stations and the majority of state extension agents have little involvement.

### Table 13 Means of transferring information to farmers:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>workshop</td>
<td>No</td>
<td>13</td>
<td>68.4</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>6</td>
<td>31.6</td>
</tr>
<tr>
<td>lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 14 Means of transferring information to farmers:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>direct application of recommended technology in farmers field</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>52.6</td>
<td>7</td>
</tr>
<tr>
<td>YES</td>
<td>9</td>
<td>47.4</td>
<td>1</td>
</tr>
<tr>
<td>Extent of use of farmers field schools as means of information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>87.9</td>
<td>6</td>
</tr>
<tr>
<td>YES</td>
<td>4</td>
<td>21.1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 15 To what extent extension agents transfer farmers’ needs and problems to research centres and by what means:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension</th>
<th>State Extension</th>
</tr>
</thead>
</table>

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involvement in transmitting farmer problems to officials in research stations. The majority of researchers have no involvement in transmitting farmer problems directly to officials in writing while the majority of federal extension agents have no involvement in transmitting farmer problems directly to officials in writing and the majority of state extension agents have little involvement in transmitting farmer problems directly to officials in writing.

**Extension agents' involvement in transferring farmers' needs:**

Table 16 shows that the majority of researchers have no involvement in reporting farmer problems to officials indirectly through
his department while the majority of federal extension agents have no involvement in reporting farmer problems to officials indirectly through his department and the majority of state extension agents have little or much involvement in reporting farmer problems to officials indirectly through his department. The majority of researchers have no involvement in reporting farmer problems to officials through phone calls while the majority of extension agents have no involvement in reporting farmer problems to officials through phone calls.

**Encouragement received by respondent admin:**

Table 17 shows that the majority of researchers receive much encouragement from their admin to participate in adaptive research while the majority of federal extension agents don’t receive encouragement and the majority of state extension agents receive little encouragement from their admin to participate in adaptive research. The majority of researchers receive much encouragement from their admin to link research and extension while the majority of federal extension agents don’t receive encouragement and the majority of state extension agents receive little encouragement from their admin to link research and extension.

**On job training received by the respondents:**

Table 18 shows that the majority of researchers received on job training while only half of the federal extension agents received on job training and the majority of state extension agents received on job training.

The Questionnaire formulated to shed light upon the training received by researchers and extension agents revealed the following results:

a. Training attended by researchers was partly conducted out of the country. The foreign countries visited by researchers for studies or training included: India, Italy, Tanzania, Kenya, the United Kingdom, Egypt, Holland and Turkey. The frequency of training varied from once to more than three times in some cases. The duration varied from six years to ten days.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>indirectly through his</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td></td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------</td>
<td>------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>participate in adaptive research</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>4</td>
<td>21.1</td>
<td>7</td>
</tr>
<tr>
<td>little</td>
<td>3</td>
<td>15.8</td>
<td>1</td>
</tr>
<tr>
<td>much</td>
<td>7</td>
<td>36.8</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td>link research and extension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>2</td>
<td>10.5</td>
<td>5</td>
</tr>
<tr>
<td>little</td>
<td>3</td>
<td>15.8</td>
<td>2</td>
</tr>
<tr>
<td>much</td>
<td>9</td>
<td>47.4</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>5</td>
<td>26.3</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 17 Extent of encouragement respondent receives from his administration to achieve the following:
Table 18 on job training received by respondent:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did respondent have on job training?</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>NO</td>
<td>7</td>
<td>36.8</td>
<td>4</td>
</tr>
<tr>
<td>YES</td>
<td>12</td>
<td>63.2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
</tbody>
</table>

b. Training attends by extension agents were mostly conducted within the country at: The University of Khartoum, Ministry of Agriculture, Agricultural Development Fund, Sudan University, Energy Research Centre, Hajj Bashir Farm in Jeraif and the International Agriculture Centre at Cairo. The frequency of training varied from once to thirteen times and the duration from two days to three months. Comparison between the training of Researchers and extension agents shows the following:
Researchers are partly trained outside the country for longer periods and some of them received postgraduate studies (MSc. & PhD.) while extension agents received their training within the country and for shorter periods.

The frequency of training is almost similar for researchers and extension agents.

Local Research Centres as a source of information about new technology:

Table 19 shows that the majority of researchers don’t depend on local research centres as a source of information about new technology while the majority of extension agents depend little on local research centres as a source of information about new technology. The majority of researchers don’t use training as means of transferring new technology while the majority of extension agents use training as means of transferring new technology. The majority of researchers don’t use leaflets as means of transferring new technology while the majority of extension agents use leaflets as means of transferring new technology. The majority of researchers don’t use informal meetings as means of transferring new technology while the majority of federal extension agents don’t use informal meetings as means of transferring new technology and the majority of state extension agents use informal meetings as means of transferring new technology. The majority of researchers don’t use formal meetings as means of transferring new technology while the majority of federal extension agents don’t use formal meetings as means of transferring new technology and the majority of state extension agents use formal meetings as means of transferring new technology. The majority of researchers don’t use workshops as means of transferring new technology while the majority of federal extension agents don’t use workshops as means of transferring new technology and the majority of state extension agents use workshops as means of transferring new technology.

Table 19 local Research Centres as a source of information about new technologies and means of transferring new technology:
<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local research centres as source of information about new technology</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>no</td>
<td>8</td>
<td>42.1</td>
<td>1</td>
</tr>
<tr>
<td>Little</td>
<td>1</td>
<td>5.3</td>
<td>4</td>
</tr>
<tr>
<td>much</td>
<td>6</td>
<td>31.6</td>
<td>3</td>
</tr>
<tr>
<td>Too much</td>
<td>4</td>
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</table>

Means of transferring new technologies from Local Research Centres:

Table 20 shows that the majority of researchers don’t use seminars or published papers or annual reports or publications or approved technology as means of transferring new technology while all extension agents interviewed don’t use seminars or published papers or annual reports or publications or approved technology as means of transferring new technology.
External Research Centres as a source of information about new technology:

Table 21 shows that the majority of researchers don’t depend on external research centres as a source of information about new technology while the majority of extension agents depend little on external research centres as a source of information about new technology. The majority of researchers and the majority of extension agents don’t use training as means of transferring new technology. The majority of researchers and the majority of extension agents don’t use leaflets as means of transferring new technology. All researchers interviewed don’t use informal meetings or formal meetings or seminars as means of transferring new technology while the majority of extension agents don’t use informal meetings or formal meeting or seminars as means of transferring new technology.

External Research Centres as a source of information about new technology:

Table 22 shows that the majority of researchers and the majority of extension agents don’t use internet or published papers as means of transferring new technology.

Internal sources as a mean of transferring new technology:

Table 23 shows that the majority of researchers don’t depend on other internal sources as means of transferring new technology while half of federal extension agents depend much on other internal sources and the majority of state extension agents don’t depend on other internal sources as means of transferring new technology. All researchers interviewed and the majority of extension agents don’t depend on the Ministry of Agriculture as a mean of transferring new technology the majority of researchers and extension agents don’t depend on internet as a mean of transferring new technology. The majority of researchers and extension agents don’t depend on universities as a mean of transferring new technology.

Table 20 local Research Centres as a source of information about new technologies and means of transferring new technology:
Table 21 External Research Centres as a source of information about new technologies and means of transferring new technology:

<table>
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<td>%</td>
<td>Freq</td>
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Table 22 External Research Centres as a source of information about new technologies and means of transferring new technology:

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<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<td>5</td>
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Table 23 Internal sources used as a mean of transferring new technology:

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<td>%</td>
<td>Freq</td>
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<tr>
<td>little</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>much</td>
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<td>15.8</td>
<td>4</td>
</tr>
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<td>too much</td>
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<td>-</td>
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<td>Ministry of agriculture</td>
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</table>

External sources as a mean of transferring new technology:

Table 24 shows that the majority of researchers don’t depend on external sources as means of transferring new technology while the majority of extension agents don’t depend on external sources and 42.9% of state extension agents depend little on external sources as means of transferring new technology. The majority of researchers and extension agents don’t use scientific magazines as a mean of transferring new technology. The majority of researchers and extension
agents don’t use books as a mean of transferring new technology. The majority of researchers don’t use Internet as a mean of transferring new technology while half of federal extension agents use Internet as a mean of transferring new technology. The majority of researchers and extension agents don’t use writing to international universities as a mean of transferring new technology.

**Respondent contact with the International Research Centres:**

Table 25 shows that the majority of researchers have little contact with International Research Centres, 36.8% has much contact while the majority of extension agents have no contact with International Research Centres. The majority of researchers don’t use obtaining information as a purpose of contact with the International Research Centres and 42.1% use it as a purpose of contact. While the majority of extension agents don’t use obtaining information as a purpose of contact with International Research Centres. The majority of researchers don’t use obtaining some problems or exchange of visits or training as a purpose of contact with International Research Centres while all extension agents don’t use obtaining some problems or exchange of visits or training as a purpose of contact with International Research Centres.

**Purpose of contact with the International Research Centres:**

Table 26 shows that the majority of researchers don’t use cooperation as a purpose of contact with International Research Centres while all extension agents don’t use cooperation as a purpose of contact with International Research Centres. The majority of researchers use obtaining information about research programs as a purpose of contact with International Research Centres while all extension agents don’t use obtaining information about research programs as a purpose of contact with International Research Centres. The majority of researchers don’t use references a purpose of contact with International Research Centres while all extension agents don’t use references a purpose of contact with International Research Centres. The majority of researchers don’t use genetic resources a purpose of contact with International Research Centres and only 31.6% use genetic resources as a purpose of contact while all

Table 24 External sources used as a mean of transferring new technology:
<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
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<th>State Extension agents</th>
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<td>Freq</td>
</tr>
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<td>5.3</td>
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Table 25 Extent of respondent contact with the International Research Centres and purposes of contact:
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<th>Freq</th>
<th>%</th>
<th>Freq</th>
<th>%</th>
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<td>7.1</td>
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Table 26 Extent of respondent contact with the International Research Centres and purposes of contact:

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<th>Federal Extension agents</th>
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<td>Freq</td>
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<td>10.5</td>
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</table>

extension agents don’t use genetic resources a purpose of contact with International Research Centres. The majority of researchers and the majority of extension agents don’t use consultation and advice as a purpose of contact with International Research Centres.

**Purpose of contact with the International Research Centres:**

Table 27 shows that the majority of researchers and all extension agents don’t use experience exchange or annual reports as a purpose of contact with International Research Centres, only 15.8% of researchers
use experience exchange and annual reports as a purpose of contact. The majority of researchers and all extension agents don’t use scientific papers as a purpose of contact with International Research Centres; only 21.1% of researchers use scientific papers as a purpose of contact. The majority of researchers and all extension agents don’t use leaflets or exchange of written scientific information or Enquiry about danger of unusual phenomena or Knowledge about new technology as a purpose of contact with International Research Centres.

**Extent of respondent contact with the Regional Research Centres:**

Table 28 shows that the majority of researchers have little contact with Regional Research Centres and 36.8% has much contact while the majority of extension agents have no contact with Regional Research Centres only 12.5% of federal extension agents and 28.6% of state extension agents has little contact. Fifty percent of researchers use obtaining information and recommendations, as a purpose of contact with Regional Research Centres while the majority of extension agents don't use obtaining information and recommendations as a purpose of contact with Regional Research Centres. The majority of researchers and all extension agents don’t use obtaining some problems or purpose of contact with Regional Research Centres.

**Purposes of respondent contact with the Regional Research Centres:**

Table 29 shows that the majority of researchers and all extension agents don’t use Coordination in conducting joint trials as a purpose of contact with Regional Research Centres. The majority of researchers and all extension agents didn’t attend RTW Workshops (Egypt, Ethiopia and Yemen) as a purpose of contact with Regional Research Centres; only 10.5% of researchers have attended these workshops. The majority of researchers and the majority of extension agents don’t use Consultation and advice or cooperation as a purpose of contact with Regional Research Centres. Fifty percent of researchers use exchange of written scientific information as a purpose of contact with Regional Research Centres while the majority of extension agents don’t use exchange of written scientific information as a purpose of contact with Regional Research Centres.

Table 27 Extent of respondent contact with the International Research Centres and purposes of contact:

<table>
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<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<td>%</td>
<td>Freq</td>
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<tr>
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<td>------</td>
<td>----</td>
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</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.5</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>Annual reports</td>
<td>No</td>
<td>16</td>
<td>84.5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Scientific papers</td>
<td>No</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Leaflets</td>
<td>No</td>
<td>19</td>
<td>94.7</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Exchange of written scientific information</td>
<td>No</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
</tr>
<tr>
<td>Enquiry about danger of up normal phenomena</td>
<td>No</td>
<td>18</td>
<td>94.7</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Knowledge about new technology</td>
<td>No</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Table 28 Extent of respondent contact with the Regional Research Centres and purposes of contact:
Table 29 Extent of respondent contact with the Regional Research Centres and purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordination in conducting joint trials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
### Extent of respondent contact with the Local Research Centres:

Table 30 shows that the majority of researchers have little contact with Local Research Centres and 21.1% has much contact while the majority of federal extension agents have little contact and 37.5% have no contact with local Research Centres and the majority of state extension agents have little contact and 28.6% have too much contact with Local Research Centres. The majority of researchers and the majority of federal extension agents don’t use Cooperation in conducting certain research as a purpose of contact with Local Research Centres. The majority of researchers and the majority of federal extension agents don’t use obtaining information about new technology and recommendations as a purpose of contact with Local Research Centres while the majority of

<table>
<thead>
<tr>
<th>Yes</th>
<th>1</th>
<th>5.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>19</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### RTW Workshops (Egypt, Ethiopia and Yemen)

| No | 16 | 84.2 | 8 | 100.0 | 13 | 92.9 |
| Yes | 2 | 10.5 |
| Missing System | 1 | 5.3 |

### Consultation and advice

| No | 16 | 84.2 | 8 | 100.0 | 11 | 78.6 |
| Yes | 2 | 10.5 |

### Exchange of written scientific information

| No | 9 | 47.4 | 8 | 100.0 | 11 | 78.6 |
| Yes | 9 | 47.4 |
| Missing System | 1 | 5.3 |

### Cooperation purposes

| No | 16 | 84.2 | 7 | 87.5 | 13 | 92.9 |
| Yes | 2 | 10.5 |
| Missing System | 1 | 5.3 |

70
state extension agents use obtaining information about new technology and recommendations as a purpose of contact with Local Research Centres

**Purposes of contact with Local Research Centres:**

Table 31 shows that the majority of researchers and all extension agents don’t use categorizing research programs as a purpose of contact with Local Research Centres.

The majority of researchers and all extension agents don’t use obtaining crop varieties as a purpose of contact with Local Research Centres and only 21.1% of researchers and 14.3% of state extension agents use it as a purpose of contact. The majority of researchers and all extension agents don’t use finding a joint work plan for extension as a purpose of contact with Local Research Centres. The majority of researchers and the majority of extension agents don’t use transferring problems and finding solutions as a purpose of contact with Local Research Centres. The number of extension agents who uses transferring problems and finding solutions as a purpose of contact with Local Research Centre is higher than the number of researchers.

**Respondent contact with Universities:**

Table 32 shows that the majority of researchers have much contact with universities while the majority of federal extension agents have little contact with universities and the majority of extension agents have much contact with universities. Fifty percent of researchers use teaching and supervision as a purpose of contact with universities while all extension agents interviewed use teaching and supervision as a purpose of contact with universities. This proves what we have stated earlier that majorities of researchers are high degree holder's. The majority of researcher and extension agents don’t use knowing the new technologies in Sudan as a purpose of contact with universities.

Table 30 Extent of respondent contact with the Local Research Centres and purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of respondent contact with local research centres.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>10.5</td>
<td>3</td>
</tr>
<tr>
<td>Little</td>
<td>10</td>
<td>52.6</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 31 Extent of respondent contact with the Local Research Centres and purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Categorizing research programs</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>73.7</td>
<td>6</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Extent of respondent</strong></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Obtaining crop varieties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>68.4</td>
<td>6</td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td>Finding a joint work plan for extension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>78.9</td>
<td>6</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td>Transferring problems and finding solutions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>78.9</td>
<td>6</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 33 shows that the majority of researcher and extension agents don’t participate in implementing some research or assist teacher in field work as a purpose of contact with universities. The number of researchers who participate in implementing research at universities is higher than number of extension agents this is due to researchers qualifications. The majority of researcher and extension agents don’t obtaining information about research as a purpose of contact with universities. The majority of researcher and all extension agents don’t coordinate in some research programs as a purpose of contact with universities.
universities. Only 10.5% of researchers coordinate in some research programs. The majority of researchers don’t use exchange of ideas and information as a purpose of contact with universities and 31.6% use it as a purpose of contact while all extension agents don’t use exchange of ideas and information as a purpose of contact with universities.

**Purpose of respondent contact with Universities:**

Table 34 shows that the majority of researcher and federal extension agents don’t use training of extension agents and farmers or transforming problems to find solutions as a purpose of contact with universities while the majority of state extension agents use training of extension agents and farmers and transforming problems to find solutions as a purpose of contact with universities. (This shows that state extension agents have strong contact with universities in the field of training and field problems). The majority of researcher and the majority of extension agents don’t use transforming new technologies as a purpose of contact with universities. Only 15.8% of researchers use transforming new technologies as a purpose of contact.

**Purpose of contact with the Federal Department of Technology Transfer and Extension:**

Table 35 shows that the majority of researchers have no or little contact with the Federal Department of Technology Transfer and Extension while the majority of federal extension agents have too much contact and the majority of state extension agents have little or much contact with the Federal Department of Technology Transfer and Extension. The majority of researchers and all extension agents don’t use cooperation in solving problems of each crop in different parts of Sudan as a purpose of contact with the Federal Department of Technology Transfer and Extension; only 21.1 of researchers use cooperation in solving problems of each crop in different parts of Sudan as a purpose of contact. The majority of researchers and all extension agents don’t use linking research and extension as a purpose of contact with the Federal Department of Technology Transfer and

Table 33 Extent of respondent contact with universities and different purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in implementing some research</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>68.4</td>
<td>6</td>
</tr>
</tbody>
</table>
Table 34 Extent of respondent contact with universities and different purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training of extension agents and farmers</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>63.2</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
<td>31.6</td>
<td>-</td>
</tr>
<tr>
<td>Assistance of teacher in field work</td>
<td>17</td>
<td>89.5</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Variable</td>
<td>Researchers</td>
<td>Federal Extension agent</td>
<td>State Extension agent</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------</td>
<td>-------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Extent of respondent contact with the Local Department of technology and extension Transfer.</td>
<td>Freq, %</td>
<td>Freq, %</td>
<td>Freq, %</td>
</tr>
</tbody>
</table>

Table 35 Extent of respondent contact with the Federal Department of Technology Transfer and Extension and different purposes of contact:
<table>
<thead>
<tr>
<th>Cooperation in implementing research programs at farmers field</th>
<th>No</th>
<th>16</th>
<th>84.2</th>
<th>8</th>
<th>100.0</th>
<th>14</th>
<th>100.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>5.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 36 shows that the majority of researchers and all extension agents don’t use providing technologies from researchers to beneficiaries as a purpose of contact with the Federal Department of Technology Transfer and Extension. The majority of researchers and the majority of extension agents don’t use coordinating programs as a purpose of contact with the Federal Department of Technology Transfer and Extension; the number of state extension agents participating in coordinating programs is more than the number of researchers participating in coordinating programs. The majority of researchers don’t use demonstration as a purpose of contact with the Federal Department of Technology Transfer and Extension; only 21.1 of researchers use linking research and extension as a purpose of contact.

**Purpose of contact with the Federal Department of Technology Transfer and Extension:**

Table 36 shows that the majority of researchers and all extension agents don’t use providing technologies from researchers to beneficiaries as a purpose of contact with the Federal Department of Technology Transfer and Extension. The majority of researchers and the majority of extension agents don’t use coordinating programs as a purpose of contact with the Federal Department of Technology Transfer and Extension; the number of state extension agents participating in coordinating programs is more than the number of researchers participating in coordinating programs. The majority of researchers don’t use demonstration as a purpose of contact with the Federal Department of Technology Transfer and Extension; only 21.1 of researchers use linking research and extension as a purpose of contact.
and Extension while fifty percent of federal extension agents use demonstration and the majority of state extension agents don’t use demonstration as a purpose of contact with the Federal Department of Technology Transfer and Extension. The majority of researchers and all federal extension agents and the majority of state extension agents don’t use reflecting existing problems as a purpose of contact with the Federal Department of Technology Transfer and Extension.

**Purpose of contact with the Federal Department of Technology Transfer and Extension:**

Table 37 shows that the majority of researchers and the majority of extension agents don’t use obtaining information as a purpose of contact with the Federal Department of Technology Transfer and Extension. The number of extension agents who use obtaining information as a purpose of contact is more than the number of researchers who use obtaining information as a purpose of contact. All researchers and all state extension agents get work plans from the Federal Department of Technology Transfer and Extension while 25.0% of federal extension agents get their work plan from the Federal Department of Technology Transfer and Extension.

**Extent of contact with the Local Department of Technology Transfer and Extension:**

Table 38 shows that the majority of researchers have no contact with the Local Department of technology and extension Transfer while the majority of federal extension agents have much contact with the Local Department of technology and extension Transfer and the majority of state extension agents have too much contact with the Local Department of technology and extension Transfer.

Table 36 Extent of respondent contact with the Federal Department of Technology Transfer and Extension and different purposes of contact:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing technologies from researcher to beneficiaries</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>8</td>
</tr>
<tr>
<td>Variable</td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Coordinating programs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>8 100.0</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
<tr>
<td>Demonstrative purpose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>100.0</td>
<td>4 50.0</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>4 50.0</td>
</tr>
<tr>
<td>Reflecting existing problems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>100.0</td>
<td>8 100.0</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 37 Extent of respondent contact with the Federal Department of Technology Transfer and Extension and different purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtaining information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>7 87.5</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>1 12.5</td>
</tr>
<tr>
<td>Work plans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>100.0</td>
<td>6 75.0</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>2 25.0</td>
</tr>
</tbody>
</table>

Table 38 Extent of respondent contact with the Local Department of Technology and Extension and different purposes of contact:
Only 10.5% of researchers cooperate in implementing research program at farmers' field while all extension agents don’t cooperate in implementing research program at farmers' field as a purpose of contact with the Local Department of technology and extension Transfer. The majority of researchers and extension agents don’t cooperate in transferring agricultural problems at different localities as a purpose of contact with the Local Department of technology and extension Transfer.

**Purposes of contact with the Local Department of Technology Transfer and Extension:**

Table 39 shows that the majority of researchers are not members in the counseling committee at the Local Department of Technology Transfer and Extension while all extension agents are not members in the counseling committee at the Local Department of Technology Transfer and Extension. Only 21.1% of researchers provide new technologies as a
purpose of contact with the Local Department of Technology Transfer and Extension while all extension agents don’t use providing new technologies as a purpose of contact with the Local Department of Technology Transfer and Extension. The majority of researchers and the majority of extension agents don’t use consultation as a purpose of contact with the Local Department of Technology Transfer and Extension. The number of researchers who use consultation as a purpose of contact is more than the number of extension agents using consultation purpose. The majority of researchers and all extension agents don’t work as a program coordinator in their contact with the Local Department of Technology Transfer and Extension.

**Purposes of contact with the Local Department of Technology Transfer and Extension:**

Table 40 shows that the majority of researchers didn’t attend training courses at the Local Department of Technology Transfer and Extension; only 10.5% of researchers have attended training courses and the majority of federal extension agents didn’t attend training courses at the Local Department of Technology Transfer and Extension; only 37.5% of federal extension agents have attended training courses while 50% of state extension agents have attended training courses at the Local Department of Technology Transfer and Extension. The number of extension agents who have attended workshops at the Local Department of Technology Transfer and Extension is higher than the number of researchers who have attended these workshops. 15.8% of researchers have participated in transferring new technology from research centre to the beneficiaries while only 7.1% of extension agents have participated in transferring new technology from research centre to the beneficiaries in their contact with the Local Department of Technology Transfer and Extension.

Table 39 Extent of respondent contact with the Local Department of Technology Transfer and Extension and different purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td><strong>Member in counselling committee</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>1</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Providing new technologies</td>
<td>No</td>
<td>14</td>
<td>73.7</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
</tr>
<tr>
<td>Consultation purpose</td>
<td>No</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Program coordinator</td>
<td>No</td>
<td>17</td>
<td>89.5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Table 40 Extent of respondent contact with the Local Department of Technology Transfer and Extension and different purposes of contact:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>5</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>3</td>
</tr>
<tr>
<td>Missing System</td>
<td>1</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Workshops</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 41 shows that the majority of researchers and extension agents don’t use obtaining information as a purpose of contact with the Local Department of Technology Transfer and Extension. All researchers and state extension agents don’t use Coordination between Federal Department and State Department as a purpose of contact with the Local Department of Technology Transfer and Extension while 37.5% of federal extension agents use Coordination between Federal Department and State Department as a purpose of contact. All researchers interviewed don’t use Technical and managerial purpose of contact with the Local Department of Technology Transfer and Extension while 50% of federal extension agents and 42.9% of state extension agents use Technical and managerial purpose of contact with the Local Department of Technology Transfer and Extension.

**Participation in research centres workshops:**
Table 42 shows that the majority of researchers participate much in workshops at research centres while the majority of extension agents participate little in workshops at research centres. This shows the weak coordination between extension agents and research centres.

**Frequencies of researchers visit to farmers:**

Table 43 shows that the majority of researchers pay little visits to farmers to follow the adoption of new innovations while (50.0%) of federal extension agents don’t visit or pay little visits and the majority of state extension agents pay much visits farmers to follow the adoption of new innovations. This shows that researchers and extension agents coordination to serve farmers is not sufficient.

**Farmer’s participation in directing research and extension programs:**

Table 44 Shows that the majority of researchers, federal extension agents and state extension agents depend little on farmers’ participation in directing their research and extension programs. The number of researchers who depend much on farmers’ participation in directing their research programs is more than the number of extension agents who depend much on farmers’ participation in directing their extension programs. The number of extension agents who depend too much on farmers’ participation in directing their extension programs is more than the number of researchers who depend too much on farmers’ participation in directing their research programs.

---

Table 41 Extent of respondent contact with the Local Department of Technology Transfer and Extension and different purposes of contact:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Obtaining information</td>
<td>No</td>
<td>15</td>
<td>78.9</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td></td>
<td>Missing System</td>
<td>1</td>
<td>5.3</td>
</tr>
<tr>
<td>Coordination between Federal Department and State Department</td>
<td>No</td>
<td>18</td>
<td>94.7</td>
</tr>
</tbody>
</table>
Table 42 Extent of respondent participation in workshops at research centres:

<table>
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<th>Variables</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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</thead>
<tbody>
<tr>
<td>Do respondents participate in workshops at research centres</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Little</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Much</td>
<td>13</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 43 Frequencies of researchers visit farmers to follow the adoption of new innovations:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
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<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do researchers visit farmers to follow the adoption of new innovations</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
</tbody>
</table>

86
Table 44 Extent of farmer’s participation in directing research and extension programs:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of farmers participation in directing research and extension programs</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>26.3</td>
<td>2</td>
</tr>
<tr>
<td>Little</td>
<td>7</td>
<td>36.8</td>
<td>4</td>
</tr>
<tr>
<td>Much</td>
<td>6</td>
<td>31.6</td>
<td>1</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>1</td>
</tr>
</tbody>
</table>

Means used to transform new technologies to farmers:

Table 45 shows that the majority of researchers and federal extension agents don’t use lectures in transforming new technologies to farmers while the majority of state extension agents use lectures in transforming new technologies to farmers. The majority of researchers don’t use discussion in transforming new technologies to farmers while the majority of federal extension agents don’t use or use little discussion in transforming new technologies to farmers and the majority of state extension agents use discussion much in transforming new technologies to farmers. The majority of researchers and federal extension agents don’t visit farmers regularly in transforming new technologies while the majority of state extension agents pay little visits to farmers in transforming new technologies.

Means used to transform new technologies to farmers:

Table 46 shows that the majority of researchers don’t pay irregular visits to farmers in transforming new technologies while the majority of
federal extension agents pay little visit to farmers in transforming new technologies and the majority of state extension agents pay much visit to farmers in transforming new technologies. The majority of researchers don’t use direct application at pilot farms in transforming new technologies to farmers while the majority of federal extension agents don’t use or use much direct application at pilot farms in transforming new technologies to farmers and the majority of state extension agents use much direct application at pilot farms in transforming new technologies to farmers. The majority of researchers don’t use direct application at farmer’s fields in transforming new technologies to farmers while the majority of federal extension agents don’t use or use much direct application at farmer’s fields in transforming new technologies to farmers and the majority of state extension agents use much or too much direct application at farmer’s fields in transforming new technologies to farmers.

**Type of support & guidance provided by the Federal Ministry of Science and Technology:**

Table 47 shows that the majority of researchers have much contact with the Federal Ministry of Science and Technology while the majority of federal extension agents have little contact with the Federal Ministry of Science and Technology and the majority of state extension agents have no or little contact with the Federal Ministry of Science and Technology. The majority of researchers receive financial support and directing programs to treat production constrains from the Federal Ministry of Science and Technology while the majority of extension agents didn’t receive financial support and directing programs to treat production constrains from the Federal Ministry of Science and Technology. All researchers and extension agents didn’t receive research Approved by the Ministry of Science and

Table 45 Different means used to transform new technologies to farmers:

<table>
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<th>State Extension agents</th>
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</thead>
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<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>15.8</td>
<td>1</td>
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<tr>
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<td>-</td>
<td>1</td>
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</tr>
<tr>
<td>Discussion</td>
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<tr>
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<td>9</td>
<td>47.4</td>
<td>3</td>
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<td>4</td>
<td>21.1</td>
<td>3</td>
</tr>
<tr>
<td>Much</td>
<td>5</td>
<td>26.3</td>
<td>2</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Variable</td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>47.4</td>
<td>4 500</td>
</tr>
<tr>
<td>Little</td>
<td>3</td>
<td>15.8</td>
<td>2 25.0</td>
</tr>
<tr>
<td>Much</td>
<td>4</td>
<td>21.1</td>
<td>2 25.0</td>
</tr>
<tr>
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<td>2</td>
<td>10.5</td>
<td>- -</td>
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Table 46 Different means used to transform new technologies to farmers:

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<th>State Extension agents</th>
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<td></td>
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<tr>
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<td>8</td>
<td>42.1</td>
<td>3 37.5</td>
</tr>
<tr>
<td>Little</td>
<td>5</td>
<td>26.3</td>
<td>2 25.0</td>
</tr>
<tr>
<td>Much</td>
<td>4</td>
<td>21.1</td>
<td>3 37.5</td>
</tr>
<tr>
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<td>1</td>
<td>5.3</td>
<td>- -</td>
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<tr>
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<td>5.3</td>
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<table>
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<th>State Extension agents</th>
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<tbody>
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<td><strong>Direct application at farmer’s fields</strong></td>
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<td>3 37.5</td>
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<tr>
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<td>5.8</td>
<td>2 25.0</td>
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<tr>
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<td>5</td>
<td>26.3</td>
<td>3 37.5</td>
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<tr>
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<td>5.3</td>
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</table>

Table 47 To what extent the Federal Ministry of Science and technology direct & support respondent’s job and type of support & guidance:
Financial support and directing programs to treat production constrains

<table>
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<tr>
<th></th>
<th>No</th>
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<th>7</th>
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<th>12</th>
<th>85.7</th>
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<td>57.9</td>
<td>8</td>
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<td>14.3</td>
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</table>

Researches approved by the Ministry of Science & Technology

<table>
<thead>
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<th>8</th>
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<th>12</th>
<th>85.7</th>
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<td>-</td>
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<td>14.3</td>
</tr>
<tr>
<td>Discussion</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
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<th></th>
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<th>8</th>
<th>100.0</th>
<th>12</th>
<th>85.7</th>
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</thead>
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<td>1</td>
<td>5.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Technology. Only 5.3% of researchers use discussion as a purpose of contact with the Federal Ministry of Science and Technology.

**Type of support & guidance provided by the Federal Ministry of Science and Technology:**

Table 48 shows that only 10.5% of researchers receive facilities provided by the Federal Ministry of Science and technology. The majority of researchers receive finance to their projects from the Federal Ministry of Science and technology while the majority of extension agents didn’t receive finance to their projects from the Federal Ministry of Science and technology. Researchers, federal extension agents percent of attendance to workshops at the Federal Ministry of Science and technology is almost the same and better than state extension agents attendance.

**Type of support & guidance provided by the Federal Ministry of Science and Technology:**
Table 49 shows that the majority of researchers and extension agents didn’t receive technical support. 15.8% of researchers received administrative support and all extension agents didn’t receive any administrative support from the Federal Ministry of Science and technology. 15.8% of researchers and 14.3% of state extension agents have received guidance from the Federal Ministry of Science and technology and 14.3% of state extension agents. The number of researchers and extension agents who have received training from the Federal Ministry of Science and technology is almost the same.

**Type of support & guidance provided by Agricultural Research Stations:**

Table 50 shows that the majority of researchers depend much on research stations in directing his work while the majority of extension agents depend little on research station in directing his work. The majority of researchers and all extension agents don’t use cooperation in research programs and exchange of information as a purpose of contact with research stations. 50% of researchers receive encouragement and approval of programs from researcher stations while all extension agents don’t receive any encouragement or approval of programs from researcher stations.

**Type of support & guidance provided by Agricultural Research Stations:**

Table 51 shows that the majority of researchers have received budget to facilitate work from Agricultural Research Stations while all extension agents didn’t receive budget to facilitate work from Agricultural Research Stations. The majority of researchers and all extension agents didn’t

Table 48 To what extent the Federal Ministry of Science and technology direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing facilities</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Financing research projects</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>31.6</td>
<td>8</td>
</tr>
<tr>
<td>Variable</td>
<td>Researchers</td>
<td></td>
<td>Federal Extension agents</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>----------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
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</tr>
<tr>
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Table 49 To what extent the Federal Ministry of Science and technology direct & support respondent’s job and type of support & guidance:
<table>
<thead>
<tr>
<th>Administrative support</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>5.3</td>
<td>3</td>
</tr>
<tr>
<td>Little</td>
<td>3</td>
<td>15.8</td>
<td>4</td>
</tr>
<tr>
<td>Much</td>
<td>11</td>
<td>57.9</td>
<td>1</td>
</tr>
<tr>
<td>Too much</td>
<td>3</td>
<td>15.8</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 50 To what extent Agricultural Research Stations direct & support respondent’s job and type of support & guidance:
Table 51 To what extent Agricultural Research Stations direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgets to facilitate work</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>42.1</td>
<td>8</td>
</tr>
<tr>
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<td>10</td>
<td>52.6</td>
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<td>5.3</td>
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</tr>
<tr>
<td>Distribution of aid provided by the Ministry of Agriculture</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>8</td>
</tr>
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</table>
Participate in the distribution of aid provided by the Ministry of Agriculture. The majority of researchers and all extension agents didn’t participate in discussion of programs with the agricultural research stations. Only 10.5% of researchers considered financing projects as a purpose of contact with the agricultural research stations.

**Type of support & guidance provided by Agricultural Research Stations:**

Table 52 shows that all researchers didn’t attend training at the agricultural research stations while 12.5% of federal extension agents and 28.6% of state extension agents attend training at the agricultural research stations. Only 5.3% of researchers have received moral guidance from the agricultural research stations while 21.4% of state extension agents have received moral guidance from the agricultural research stations. The majority of researchers and state extension agents didn’t use seminars as a purpose of contact with the agricultural research stations while the majority of federal extension agents use seminars as a purpose of contact with the agricultural research stations. All researchers didn’t consider

<table>
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<tr>
<th></th>
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<th>2</th>
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</table>
training a purpose of contact with the agricultural research stations while 12.5% of federal extension agents and 28.6% of state extension agents consider training a purpose of contact with the agricultural research stations. Only 5.3% of researchers have received moral Guidance While 21.4% of state extension agents have received moral Guidance from agricultural research stations. The majority of researchers and state extension agents didn’t use seminars as a purpose of contact with the agricultural research stations while the majority of federal extension agents use seminars as a purpose of contact with the agricultural research stations.

**Type of support & guidance provided by Agricultural Research Stations:**

Table 53 shows that only 15.8% of researchers have received technical support from Agricultural Research Stations while only 7.1% of state extension agents have received technical support from Agricultural Research Stations. The majority of researchers and state extension agents didn’t consider workshops as a purpose of contact with Agricultural Research Stations while the majority of federal extension agents consider workshops as a purpose of contact with Agricultural Research Stations.

**Type of support & guidance provided by the Federal Ministry of Forestry and Agriculture:**

Table 54 shows that the majority of researchers don’t depend or depend little on the Federal Ministry of Forestry and Agriculture in directing their work the majority of federal extension agents depend little and 50% depend much or too much on the Federal Ministry of Forestry and Agriculture in directing their work and the majority of state extension agents don’t depend Table 52 To what extent Agricultural Research Stations direct & support respondent’s job and type of support & guidance:

<table>
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<th>Variable</th>
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<td>%</td>
<td>Freq</td>
<td>%</td>
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<td>%</td>
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<td>Moral Guidance</td>
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<tr>
<td>No</td>
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<td>89.5</td>
<td>8</td>
<td>100.0</td>
<td>11</td>
<td>78.6</td>
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<td>Research and experiments</td>
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<td>18</td>
<td>94.7</td>
<td>8</td>
<td>100.0</td>
<td>12</td>
<td>85.7</td>
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</tbody>
</table>
Table 53 To what extent Agricultural Research Stations direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Technical support.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>78.9</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>15.8</td>
<td>-</td>
</tr>
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<td>1</td>
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<td>-</td>
</tr>
<tr>
<td>Workshops</td>
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</tr>
<tr>
<td>No</td>
<td>14</td>
<td>73.7</td>
<td>4</td>
</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
<td>4</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 54 To what extent the Federal Ministry of Forestry and Agriculture direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent the Federal Ministry of Forestry and Agriculture direct respondent’s job</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>36.8</td>
<td>1</td>
</tr>
<tr>
<td>Little</td>
<td>6</td>
<td>31.6</td>
<td>3</td>
</tr>
<tr>
<td>Much</td>
<td>4</td>
<td>21.1</td>
<td>2</td>
</tr>
<tr>
<td>Too much</td>
<td>1</td>
<td>5.3</td>
<td>2</td>
</tr>
</tbody>
</table>
On the Federal Ministry of Forestry and Agriculture in directing their work. The majority of researchers have attended workshops while 50% of federal extension agents have attended workshops while the majority of state extension agents didn’t attend workshops at the Federal Ministry of Forestry and Agriculture. Fifty percent of researchers and federal extension agents have attended Seminars and joint seminars while the majority of state extension agents didn’t attend Seminars and joint seminars at the Federal Ministry of Forestry and Agriculture. The majority of researchers and extension agents didn’t consider practical participation and training as a purpose of contact.

**Type of support & guidance provided by the Federal Ministry of Forestry and Agriculture:**

Table 55 shows that only 10.5% of researchers uses lectures as a purpose of contact with the Federal Ministry of Forestry and Agriculture and none of extension agents done. The number of extension agents who have used training as a purpose of contact with the Federal Ministry of Forestry and Agriculture.
Forestry and Agriculture is higher than the number of researcher who has used training as a purpose of contact. The number of federal extension agents who consider technical support a purpose of contact with the Federal Ministry of Forestry and Agriculture is higher than the number of researchers and state extension agents who consider technical support a purpose of contact. The number of extension agents who consider financial support a purpose of contact with the Federal Ministry of Forestry and Agriculture is higher than the number of researchers who consider financial support a purpose of contact.

**Type of support & guidance provided by the Federal Department of Technology and Extension Transfer:**

Table 56 shows that the majority of researchers don’t depend on the Federal Department of Technology and Extension Transfer in directing his work while the majority of Federal Extension agents depend too much on the Federal Department of Technology and Extension Transfer and the majority of State Extension agents depend little on the Federal Department of Technology and Extension Transfer. Only 10.5% of researchers consider Joint cooperation for technology transfer as a purpose of contact with the Federal Department of Technology and Extension Transfer while none of extension agents do. The majority of researchers and State Extension agents don’t consider workshops and seminars as a purpose of contact with the Federal Department of Technology and Extension Transfer while 50% of Federal extension agents do.

**Table 55 To what extent the Federal Ministry of Agriculture and Forestry direct & support respondent’s job and type of support & guidance:**

<table>
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<th>State Extension agents</th>
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</thead>
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<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
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<td>Lectures</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>8</td>
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<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
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<td>Missing System</td>
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<td>5.3</td>
<td>-</td>
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</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>7</td>
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<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>1</td>
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<tr>
<td>Missing System</td>
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<td>5.3</td>
<td>-</td>
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<td>Technical support.</td>
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<td></td>
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<tr>
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<td>89.5</td>
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Table 56 To what extent the Federal Department of Technology and extension Transfer direct & support respondent’s job and type of support & guidance:

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<th>State Extension agents</th>
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</thead>
<tbody>
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<td>Freq</td>
<td>%</td>
<td>Freq</td>
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<td>47.4</td>
<td>-</td>
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<td>36.8</td>
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<tr>
<td>Much</td>
<td>2</td>
<td>10.5</td>
<td>1</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Joint cooperation for technology transfer</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Type of support & guidance provided by the Federal Department of Technology Transfer and Extension:

Table 57 shows that the majority of researchers and extension agents didn’t use televised programs as a purpose of contact with the Federal Department of Technology Transfer and Extension. None of the researchers have used moral support as a purpose of contact with the Federal Department of Technology Transfer and Extension while 25% of federal extension agents and 21.4% of state extension agents have used moral support as a purpose of contact. None of researchers or state extension agents have received financial support from the Federal Department of Technology Transfer and Extension while the majority of federal extension agents have received financial support from the Federal Department of Technology Transfer and Extension. All researchers and the majority of state extension agents didn’t receive general plans and strategies from the Federal Department of Technology Transfer and Extension while (50%) of federal extension agents have received general plans and strategies from the Federal Department of Technology Transfer. All researchers and the majority of state extension agents didn’t receive general training from the Federal Department of Technology Transfer and Extension while the majority of federal extension agents have received training from the Federal Department of Technology Transfer and Extension.

Type of support & guidance provided by the Ministry of Agriculture:

Table 58 Shows that the majority of researchers didn’t depend on the Ministry of Agriculture in directing their work while the majority of federal extension agents depend little and much and the majority of state
extension agents depend too much on the Ministry of Agriculture in directing their work. The number of researchers who received financing for some programs from the Ministry of Agriculture is more than the number of extension agents who have received financing from the Ministry of Agriculture. The majority of researchers and federal extension agents didn’t receive financing for some extension farm from the Ministry of Agriculture while 50% of state extension agents have received financing for some extension farm from the Ministry of Agriculture.

**Type of support & guidance provided by the Ministry of Agriculture:**

Table 59 Shows that majority of researchers didn’t receive training from the Ministry of Agriculture. While the majority of federal extension agents and 50% of state extension agents have received training from the Ministry of Agriculture. None of researchers or federal extension agents has attended extension lectures at the Ministry of Agriculture while only 28.6% of state extension agents have attended these extension lectures. Only 10.5% of researchers had Joint projects with research centres and the Ministry of Agriculture. The numbers of state extension agents who have Table 57 To what extent the Federal Department of Technology Transfer and Extension direct & support respondent’s job and type of support & guidance:

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<th>State Extension agents</th>
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<td><strong>Televised programs</strong></td>
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<td></td>
<td></td>
</tr>
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<td>18 (94.7%)</td>
<td>8 (100.0%)</td>
<td>13 (92.9%)</td>
</tr>
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<td>Yes</td>
<td>-</td>
<td>-</td>
<td>1 (7.1%)</td>
</tr>
<tr>
<td>Missing System</td>
<td>1 (5.3%)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Moral support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18 (94.7%)</td>
<td>6 (75.0%)</td>
<td>11 (78.6%)</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>2 (25.0%)</td>
<td>3 (21.4%)</td>
</tr>
<tr>
<td>Financial support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18 (94.7%)</td>
<td>2 (25.0%)</td>
<td>14 (100.0%)</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>6 (75.0%)</td>
<td>-</td>
</tr>
<tr>
<td>General plans and strategies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18 (94.7%)</td>
<td>4 (50.0%)</td>
<td>12 (85.7%)</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>4 (50.0%)</td>
<td>2 (14.3%)</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18 (94.7%)</td>
<td>1 (12.5%)</td>
<td>10 (71.4%)</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>7 (87.5%)</td>
<td>4 (28.6%)</td>
</tr>
</tbody>
</table>

Table 58 To what extent the Ministry of Agriculture direct & support respondent’s job and type of support & guidance:
<table>
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<th>Variable</th>
<th>Freq</th>
<th>%</th>
<th>Freq</th>
<th>%</th>
<th>Freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>To what extent did the Ministry of Agriculture directed the respondent’s work at the state level</td>
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<td></td>
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<td></td>
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<td>47.4</td>
<td>2</td>
<td>25.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Little</td>
<td>2</td>
<td>10.5</td>
<td>3</td>
<td>37.5</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>Much</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>21.4</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>3</td>
<td>37.5</td>
<td>10</td>
<td>71.4</td>
</tr>
<tr>
<td>Financing some programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>52.6</td>
<td>6</td>
<td>75.0</td>
<td>10</td>
<td>71.4</td>
</tr>
<tr>
<td>Yes</td>
<td>8</td>
<td>42.1</td>
<td>2</td>
<td>25.0</td>
<td>4</td>
<td>28.6</td>
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<td>-</td>
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</tr>
<tr>
<td>Financing some extension farms</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>68.4</td>
<td>5</td>
<td>62.5</td>
<td>7</td>
<td>50.0</td>
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<td>5</td>
<td>26.3</td>
<td>3</td>
<td>37.5</td>
<td>7</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Table 59 To what extent the Ministry of Agriculture direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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</thead>
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<tr>
<td>Attending seminars</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>78.9</td>
<td>2</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
<td>6</td>
</tr>
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<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Attending extension lectures</td>
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<td></td>
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<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
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<tr>
<td>Joint projects with research centres</td>
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<td>84.2</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
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<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Planning and implementing programs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
received support and guidance and help in planning and implementing programs from the Ministry of Agriculture is more than the number of federal extension agents while all researchers didn’t receive any guidance.

**Type of support & guidance provided by the Ministry of Agriculture:**
Table 60 Shows that number of state extension agents who are implementing some programs from the Ministry of Agriculture is more than the number of federal extension agents or researchers. The majority of researchers didn’t receive technical support form the Ministry of Agriculture while 50% of federal extension agents have received technical support form the Ministry of Agriculture and the majority of state extension agents didn’t receive technical support form the Ministry of Agriculture although the number of state extension agents who have received technical support is more than the number of researchers. The majority of researchers didn’t participate in workshops at the form the Ministry of Agriculture while the majority of researchers have participated in workshops at the form the Ministry of Agriculture.

**Type of support & guidance provided by the Department of Technology Transfer and Extension:**
Table 61 shows that The majority of researchers and 50% of federal extension agents said that the Department of Technology Transfer and Extension has no affect on their work and 36.8% of researchers are much affected by the Department of Technology Transfer and Extension while the majority of state extension agents are too much affected by the Department of Technology Transfer & Extension. The majority of researchers don’t receive financial support from the Department of Technology Transfer & Extension while 50% of federal extension agents

<table>
<thead>
<tr>
<th>Missing System</th>
<th>1</th>
<th>5.3</th>
<th>-</th>
<th>-</th>
<th>-</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Support and guidance</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>7</td>
<td>87.5</td>
<td>9</td>
<td>64.3</td>
</tr>
<tr>
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<td>-</td>
<td>-</td>
<td>1</td>
<td>12.5</td>
<td>5</td>
<td>35.7</td>
</tr>
</tbody>
</table>
and the majority of state extension agents 71.4% have received financial support. The number of researchers who have joint programs with the Department of Technology Transfer & Extension is much more than the number of federal extension agents. The majority of researchers and federal extension agents didn’t receive support and guidance while the majority of state extension agents have received support and guidance from the Department of Technology Transfer & Extension.

**Type of support & guidance provided by the Department of Technology Transfer and Extension:**

Table 62 shows that all researchers interviewed and the majority of federal extension agents didn’t use approval of programs as a purpose of contact while 42.9% of state extension agents use approval of programs as a purpose of contact with the Department of Technology Transfer and Extension. The majority of researchers and state extension agents didn’t receive technical support while 50.0% of federal extension agents have received technical support from the

Table 60 To what extent the Ministry of Agriculture direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>Implementing some programs</td>
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<td></td>
<td></td>
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<td>6</td>
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<tr>
<td>Yes</td>
<td>-</td>
<td>25.0</td>
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<td>Technical support</td>
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</tr>
<tr>
<td>No</td>
<td>14</td>
<td>73.7</td>
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</tr>
<tr>
<td>Yes</td>
<td>4</td>
<td>21.1</td>
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</tr>
<tr>
<td>Missing System</td>
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</tr>
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<td>Attending workshops</td>
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</table>

Table 61 to what extent the Department of Technology Transfer and Extension direct & support respondent’s job and type of support & guidance:
Table 62 To what extent the Department of Technology Transfer and Extension direct & support respondent’s job and type of support & guidance:

<table>
<thead>
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<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<td>7</td>
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<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Missing System</td>
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<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Technical support</td>
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</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>4</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Moral support</td>
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<tr>
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<td>94.7</td>
<td>7</td>
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</tr>
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<td>Field visits</td>
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<tr>
<td>No</td>
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<td>5</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
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<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
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</tr>
</tbody>
</table>
Department of Technology Transfer and Extension. All researchers interviewed and the majority of federal extension agents didn’t receive moral support while 28.6% of state extension agents have received moral support from the Department of Technology Transfer and Extension. Only 37.5% of federal extension agents have used field visits as a purpose of contact. The number of federal extension agents who use attending seminars as a purpose of contact is more than the number of researchers or state extension agents. The majority of researchers and extension agents didn’t attend extension lectures at the Department of Technology Transfer and Extension.

**Type of support & guidance provided by the Department of Technology Transfer and Extension:**

Table 63 shows that the majority of researchers and federal extension agents didn’t use administrative purposes as a purpose of contact while 50% of state extension agents have used administrative purpose as a purpose of contact with the Department of Technology Transfer and Extension. Only 10.5% of researchers had cooperation and 26.3% of researchers have cooperative programs with the Department of Technology Transfer and Extension while none of extension agents had cooperation or cooperative programs with the Department of Technology Transfer and Extension.

**Type of support & guidance provided by farmers' unions:**

Table 64 shows that The majority of researchers and federal extension agents said that their work are not directed by farmers' unions while the majority of state extension agents said that farmers' unions had little effect in their work and 21.4 said that it has much effect on their work. The number of state extension agents who have used Farming trial and demonstration field at farmer’s field school as a purpose of contact with farmer unions is more than the number of researchers. The majority of

| Missing System | 1 | 5.3 | - | - | 1 | 7.1 |
researchers and federal extension agents didn’t use attending seminars as a purpose of contact with farmers' unions while the majority of state extension agents have used attending seminars as a purpose of contact with farmer unions. Almost all researchers didn’t attend workshops or training courses as a purpose of contact with farmers' unions while a considerable number of extension agents have attended workshops and training courses as a purpose of contact with farmer unions.

**Type of support & guidance provided by International Organizations:**

Table 65 shows that the majority of researchers said International Organizations doesn’t direct their work and only 31.6% said it has much effect on directing their work while the majority of federal extension agents said that International Organizations has no or little effect in directing their work and the majority of state extension agents said that

International Organizations doesn’t direct their work and only 28.6% said that

Table 63 To what extent the Department of Technology Transfer and Extension direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<tr>
<td></td>
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<td>%</td>
<td>Freq</td>
</tr>
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<tr>
<td>Cooperation</td>
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<tr>
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<td>16</td>
<td>84.2</td>
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<td>Cooperative programs</td>
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<td>13</td>
<td>68.4</td>
<td>8</td>
</tr>
<tr>
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Table 64 To what extent Farmer Unions direct & support respondent’s job and type of support & guidance:

<table>
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<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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</thead>
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<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>16</td>
<td>84.2</td>
<td>5</td>
</tr>
<tr>
<td>Little</td>
<td>2</td>
<td>10.5</td>
<td>2</td>
</tr>
<tr>
<td>Much</td>
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<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Too much</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Farming trial and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
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<td><strong>To what extent International Organizations direct respondent’s work</strong></td>
<td></td>
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<tr>
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<tr>
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<tr>
<td>Too much</td>
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<td><strong>Agricultural inputs</strong></td>
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<td>16</td>
<td>8</td>
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<tr>
<td><strong>Obtaining information</strong></td>
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<td></td>
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<td>8</td>
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<tr>
<td><strong>Exchange of visits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>-</td>
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</tr>
</tbody>
</table>
it has little effect on directing their work. The majority of researchers and the majority of state extension agents didn’t receive agricultural inputs from International Organizations. The majority of researchers and all extension agents didn’t use obtaining information or exchange of visits as a purpose of contact with International Organizations.

Type of support & guidance provided by International Organizations:
Table 66 shows that the majority of researchers and the majority of state extension agents didn’t receive training from International Organizations while 50% of state extension agents have received training from International Organizations. The number of federal extension agents who have attended seminars and workshops organized by International Organizations is more than the number of researchers and state extension agents who have attended these seminars. 26.3% of researchers have received financial support while only 7.1% of state extension agents received financial support from International Organizations. Only 15.8% of researchers have obtained crop varieties from International Organizations while all extension agents didn’t obtain any crop varieties.

Effect of suggestions from different parties on respondents' job:
Table 67 shows that the majority of researchers depend much and 36.8% depend too much on personal observations while the majority of extension agents depend much on personal observations. The majority of researchers don’t depend on suggestions from extension and 26.3% depend little or depend much on suggestions from extension while the majority of extension agents depend much on suggestions from extension. The majority of researchers depend on suggestions from research colleagues while the majority of federal extension agents don’t depend on suggestions from extension colleagues and fifty percent of state extension agents depend much on suggestions from extension colleagues in directing their work.
Table 68 shows that the majority of researchers don’t depend on farmer suggestions and 31.6% depend little on farmer suggestions while the majority of federal extension agents doesn’t depend or depend much on farmer suggestions and the majority of state extension agents depend much on farmer suggestions. The majority of researchers and extension agents don’t depend on request from companies or external sources in directing their work and some may depend little on request from companies or external sources. The majority of researchers and the majority of federal extension agents don’t depend on suggestions from workers in agricultural projects apart from extension while the majority of state

Table 66 To what extent International Organizations direct & support respondent’s job and type of support & guidance:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<tr>
<td></td>
<td>Freq %</td>
<td>Freq %</td>
<td>Freq %</td>
</tr>
<tr>
<td>Training</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>14 73.7</td>
<td>4 50.0</td>
<td>11 78.6</td>
</tr>
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<td>4 21.1</td>
<td>4 50.0</td>
<td>3 21.4</td>
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<tr>
<td>Seminars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15 78.9</td>
<td>5 62.3</td>
<td>12 85.7</td>
</tr>
<tr>
<td>Yes</td>
<td>3 15.8</td>
<td>3 37.5</td>
<td>2 14.3</td>
</tr>
<tr>
<td>Workshops</td>
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<td></td>
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<tr>
<td>No</td>
<td>17 89.5</td>
<td>5 62.5</td>
<td>13 92.9</td>
</tr>
<tr>
<td>Yes</td>
<td>1 5.3</td>
<td>3 37.5</td>
<td>1 7.1</td>
</tr>
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<td>-</td>
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<tr>
<td>Financial support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15 68.4</td>
<td>8 100.0</td>
<td>13 92.9</td>
</tr>
<tr>
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<td>3 26.3</td>
<td>-</td>
<td>1 7.1</td>
</tr>
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<td>-</td>
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<tr>
<td>Obtaining crop varieties</td>
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<tr>
<td>No</td>
<td>15 78.9</td>
<td>8 100.0</td>
<td>14 100.0</td>
</tr>
<tr>
<td>Yes</td>
<td>3 15.8</td>
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</table>
Table 67 To what extent respondent depend on suggestions from different parties in directing and achieving his work:

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<td>Freq</td>
<td>%</td>
<td>Freq</td>
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<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Much</td>
<td>9</td>
<td>47.4</td>
<td>6</td>
</tr>
<tr>
<td>Too much</td>
<td>7</td>
<td>36.8</td>
<td>1</td>
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<td>Missing System</td>
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<tr>
<td>Suggestions from extension</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>31.6</td>
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</tr>
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<td>5</td>
<td>26.3</td>
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</tr>
<tr>
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<td>26.3</td>
<td>6</td>
</tr>
<tr>
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<td>10.5</td>
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</tr>
<tr>
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<td>5.3</td>
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</tr>
<tr>
<td>Suggestions from colleagues</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>15.8</td>
<td>5</td>
</tr>
<tr>
<td>Little</td>
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<td>15.8</td>
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<tr>
<td>Much</td>
<td>10</td>
<td>52.6</td>
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<td>10.5</td>
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Table 68 To what extent respondent depend on suggestions from different parties in directing and achieving his work:

<table>
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<th>Variable</th>
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<th>State Extension agents</th>
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</thead>
<tbody>
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<td>%</td>
<td>Freq</td>
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<td>7</td>
<td>36.8</td>
<td>3</td>
</tr>
<tr>
<td>Little</td>
<td>6</td>
<td>31.6</td>
<td>2</td>
</tr>
<tr>
<td>Much</td>
<td>3</td>
<td>15.8</td>
<td>3</td>
</tr>
<tr>
<td>Too much</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
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<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Request from companies</td>
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<td></td>
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<td>No</td>
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<td>68.4</td>
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<td>21.1</td>
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<td>Workers in agricultural projects apart from extension</td>
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<td>No</td>
<td>9</td>
<td>47.4</td>
<td>5</td>
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<td>5</td>
<td>26.3</td>
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</tr>
<tr>
<td>Much</td>
<td>4</td>
<td>21.1</td>
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</tr>
<tr>
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</table>
extension agents depend little on suggestions from workers in agricultural projects apart from extension.

**Type of relationship between research and extension:**
Table 69 shows that the majority of researchers describe the relationship between research and extension as medium and 26.3% describe it as weak while all federal extension agents describe the relationship between research and extension as not existing and the majority of state extension agents describe the relationship between research and extension as medium or strong.
Type of the existing research - extension linkages and reasons:

Table 70 shows that only 5.3% of researchers said that extension used to be the link between researcher and farmers while 21.4% of state extension agents said that extension used to be the link between researcher and farmers and this require strong relation between research and extension. Only 5.3% of researchers said that the nature of work require such strong relation while 21.4% of state extension agents said that the nature of work require such strong relation. Only 14.3 of state extension agents think that there should be a strong relationship with research, because the new techniques cannot be applied without the help of extension. Only 7.1% of state extension agents said that there is outstanding relationship between the extension agents and research center.

Table 71 shows that only 7.1% of state extension agents said that the relationship between research and extension does not exist due to the weak relationship between field supervision section and research. (12.5%) of federal extension agents and 7.1% of state extension agents said that the relationship between research and extension does not exist because extension follows the Ministry of Agriculture, while research follows the Ministry of Science and Technology. 26.3% of researchers think that the weak resources causes the weak relationship between research and extension and 5.3% of researchers said that the weak relationship between research and extension is due to Lack of trial farms.

Table 72 shows that only 5.3% of researchers said that there is weakness of public relations. 5.3% of researchers said that the manager of the Administration of Technology Transfer Extension is changed several times this has caused the weak relationship between research and extension. 5.3% of researchers and 7.1% of state extension agents said that they don’t know the real reason of the weak link. 15.8% of researchers and only 7.1% of state extension agents
think that the weak link is due to Lack of coordination between the different parties.

Table 69 Type of relationship between research and extension:

<table>
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<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<tr>
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<td>%</td>
<td>Freq</td>
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<td>Weak</td>
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<tr>
<td>Medium</td>
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</table>

Table 70 Types of the existing research - extension linkages and reasons.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extension used to be the link between researcher and farmers.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
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<tr>
<td>Missing System</td>
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<tr>
<td>The nature of work require such relation</td>
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<td>94.7</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
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<tr>
<td>The new techniques cannot be applied without the help of extension.</td>
<td>No</td>
<td>19</td>
<td>100.0</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>The outstanding relationship between the extension agents and research centre</td>
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<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Variable</td>
<td>Researchers</td>
<td>Federal Extension agents</td>
<td>State Extension agents</td>
</tr>
<tr>
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<td>------------</td>
<td>--------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>The relationship between field supervision section and research</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>100.0</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Extension follows the Ministry of Agriculture, while research follows the</td>
<td></td>
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</table>

Table 71 Type of the existing research and extension linkages and the reasons:
**Ministry of Science and Technology.**

<table>
<thead>
<tr>
<th></th>
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<th>Federal Extension agents</th>
<th>State Extension agents</th>
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<tr>
<td><strong>Weak resources.</strong></td>
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<tr>
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<td>100.0</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td><strong>Lack of trial farms.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>73.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>26.3</td>
<td>-</td>
</tr>
<tr>
<td><strong>Missing System</strong></td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 72 what is the type of the existing research and extension linkages and the reasons?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weakness of public relations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Type of the existing research - extension linkages and reasons:

Table 73 shows that only 5.3% of researchers think that there is weak extension system and coordination is based on informal relations and 10.5% of researchers think that there are scarcities of resource and funds. 10.5% of researchers and 12.5% of federal extension agents and 7.1% of state extension agents said that there is weakness of coordination between research and extension because they are not under the same ministry.

Table 74 shows that only 5.3% of researchers and 7.1% of state extension agents said that there no relationship between research and extension until lately. Only 5.3% of researchers think that there is no direct and specific contact between research and extension while fifty percent of federal extension
agents think that there is no direct and specific contact between research and extension. Only 26.3% of researchers said that there is no institutional linkage between research and extension especially at the federal level where it depends on personal relations while 12.5% of federal extension agents and fifty percent of state extension agents said that there is no institutional linkage between research and extension especially at the federal level where it depends on personal relations.

Table 75 shows that Only 5.3% of researchers consider participation of researchers in extension programs, joint programs between research and extension and participation of researchers and extension agents in the counselling committee as linkage mechanisms while none of extension agents do.

A Questionnaire regarding the opinion of researchers, federal and state Extension agents on the causes of weak coordination between agricultural extension centres and agricultural research stations showed the following:

- 10.5% of researchers and 12.5% of federal Extension agents think it is due to lack of linkage mechanisms for contact other than direct contact.
- 5.3% of researchers and 12.5% of Federal Extension agents think it is due to neglecting the adoption of new technology. This is because there is no mechanism that forces farmers to adopt them.
- 15.8% of researchers, 37.5% of federal Extension agents and 28.6% Extension agents think there is informal institutional relation not supported by top administration.
Table 73 What is the type of the existing research and extension linkages and the reasons?

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak extension system.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>Coordination based on informal relations.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>1</td>
</tr>
<tr>
<td>Scarcities of resource and funds</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>-</td>
</tr>
<tr>
<td>Weakness of coordination between research and extension because they are not under the same ministry.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>17</td>
<td>89.5</td>
<td>7</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.5</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 74 Type of the existing research and extension linkages and the reasons:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>There was no relationship between research and extension until lately.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
</tr>
<tr>
<td>There is no direct Contact between research and extension</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>4</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>4</td>
</tr>
<tr>
<td>There is no institutional linkage between research and extension especially at the federal level where it depends on personal relations.</td>
<td>Freq</td>
<td>%</td>
<td>Freq</td>
</tr>
<tr>
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<td>8</td>
<td>42.1</td>
<td>4</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>26.3</td>
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</tr>
<tr>
<td>Missing System</td>
<td>6</td>
<td>31.5</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 75 Existing research and extension linkage mechanisms and its characteristic:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Researchers</th>
<th>Federal Extension agents</th>
<th>State Extension agents</th>
</tr>
</thead>
</table>
Researchers usually participate in extension programs and supervise the implementation. | Freq | %   | Freq | %   | Freq | %   |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
<td>100.0</td>
<td>13</td>
<td>92.9</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Missing System</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Joint programs between research and extension | Freq | %   | Freq | %   | Freq | %   |
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>18</td>
<td>94.3</td>
<td>8</td>
<td>100.0</td>
<td>13</td>
<td>92.9</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Participation of the station researcher's and the extension agents in the counselling committee | Freq | %   | Freq | %   | Freq | %   |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>18</td>
<td>94.7</td>
<td>8</td>
<td>100.0</td>
<td>13</td>
<td>92.9</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td>5.3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

- 5.3% of researchers and 12.5% of federal Extension agents think there is lack of continuous contact between researchers and extension workers.
- .15.8% of researchers, 12.5% of Federal Extension agents and 4% of State Extension agents think it is due to lack of horizontal and vertical coordination between the two ministries.
- 5.3% of researchers think it is due to personal reasons from the two sides.
- 26.3% of researchers think it is due to lack of resources.
- 10.5% of researchers think it is because the administration lacks efficient workers and resources.

- 5.3% of researchers think it is due to miss planning and 10.5% of them think it is due to lack of planning policies and joint plans and programs.

- 36.8% of researchers think it is due to shortage of funds.

- 5.3% of researchers think it is due to human nature (El khilaf – El tkuish).

- 5.3% of researchers think it is due to the frequent transfer of general managers of the “Technology Transfer and Extension”.

- 12.5% of federal Extension agents and 7.2% of state extension agents think it is due to institutional problems.

- 25% of federal extension agents and 7.2% of state Extension agents think it is because extension follows the ministry of agriculture, and research follows the ministry of science and technology.

- 12.5% of federal Extension agents and 14.3% of state Extension agents think it is because researchers do not admit the role of extension.

- 12.5% of federal Extension agents think it is due to the absence of extension work lately.

- 12.5% of federal researchers think it is because there are no regulations that oblige researchers to give information about new techniques directly to extension workers.

- 12.5% of federal Extension agents think there are no difficulties except lack of time.
12.5% of federal Extension agents think both sides (researchers and Extension agents) are responsible for this weakness.

Regarding the result of a questionnaire on how can the link between research and extension is strengthened, the approval of respondents to the suggested measures shown hereunder, was as follows:

a. Percentage of Researchers approving the suggested measures:

- Availability of funds for joint programs - %21.1.
- Finding means for communication and getting information from research stations and transferring it to the farmers - % 5.3.
- Providing research stations with problems that face farmers in their fields - % 5.3.
- Government should offer extension farms in every production area to convince farmers with the technological packages -% 5.3.
- Follow up of agricultural inputs and operations for each crop - seeds, pesticides, irrigation.. ect. Until it reaches the consumer - %5.3.
- Participation of extension worker with researcher at the final stages of researches that is usually applied at the farmer’s field - % 5.3.
- Coordination and establishment of special committees to detect the deficiencies and suggest solutions - % 21.1.
- Applying joint programs for transferring approved techniques -% 5.3.
- Sustain program implementation and using research in training extension workers and farmers -% 5.3.
- Understanding the role of each other -% 5.3
- Concentrate efforts to transfer technology -% 5.3.
- Permanent availability of extension workers at research stations -% 5.3.
- Revision of research and extension systems to find out new means other than the old ones, which have proved its failure -% 5.3.
- Pay more attention to training -% 5.3.
- There should be a real participation -% 5.3.
- Exchange of information through scientific seminars and workshops - %10.5.
- Reconstructing this institutions to achieve its goals -% 5.3.
- Strengthening coordination channels -% 5.3.
- Establishing formal connection channel - %5.3.
- Establishment of special annual programs -% 5.3.
- Researcher participation in program planning -% 5.3.
- Direct contact between researcher and extension worker -% 5.3.
- Finding specialized technical committees - %10.5.
- Clear policies to encourage cooperation -% 5.3.
- Lay out strategies, plans and programs -% 5.3.
- Offering budgets and rewards - %10.5.
- Selecting efficient persons who can work in spite of scarcities of resources -% 5.3.
- Revising joint committees job on regular bases to evaluate instructions and overcome obstacles %10.5.
• Encourage hard working personnel and punish lazy ones -% 5.3.

• Follow all new techniques introduced by researchers -% 5.3.

• Presence of technology approval committees for approval of harvesting process and crop varieties -% 5.3.

• Assign responsibilities of each extension administration to the field of its specialization -% 5.3.

• Transfer technologies through different multimedia means or through field visits, leaflets or farmer field school -% 5.3.

b. Percentage of Federal Extension Workers approving the suggested measures:

• Availability of funds for joint programs - %12.5.

• Establishing formal connection channel - %12.5.

• Revising joint committee’s job on regular base to evaluate instructions and overcome obstacles - %25.

• Integration of extension and researcher role to give solutions for problems - %12.5.

• Formalizing the relationship between research and extension - %25.

• Frequent visits to research centres through extension administration and selecting a special day for this visit - %12.5.

• Distributing leaflets of the approved researches monthly to the extension - %12.5.
- Participation of agricultural extension agents in research with researchers - %12.5.

- Getting more benefits by making joint committees work efficiently - %25.

- Strengthening the communication through special office or parties - %25.

- Finding an institutional link to help in dividing the role of researcher as producing technologies and extension agents role and transferring it to the beneficiaries - %12.5.

- Mutual respect between researcher and extension worker - %12.5.

- Offering resources for achieving these goals - %25.

C. Percentage of State Extension Workers approving the suggested measures:

- Strengthen linkage between research and extension through permanent joint committees at high level - %7.2.

- Enhance training - %14.3.

- Creating new means and methods to reduce administration supervision - %7.2.

- Finding specialized technical committees - %7.2.

- Revising joint committee’s job on regular bases to evaluate instructions and overcome obstacles - %14.3.

- Exchanged respect between researcher and extension worker - %14.3.

- Each one should recognize the role of the other - %21.4.
- They should all come under one administration or ministry - 14.3.

Chapter Six

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6-Summary of results:
6-1- All researchers interviewed were MSc and PhD holders while only few Extension agents had MSc degree.

6-2- The majority of researchers had received on job training abroad for long periods including (MSc and PhD) while the majority of Extension agents had on job training locally for short periods.

6-3- Researchers had little involvement in different extension tasks and Extension agents had little involvement in different research tasks.

6-4- The majority of extension agents depends on local research centres as a source of information about new technologies.

6-5- The majority of Extension agents had much contact with the Federal Department of Technology Transfer and Extension while the majority of researchers had little contact with the Federal Department of Technology Transfer and Extension.

6-6- The majority of researchers had no contact with the Local Department of Technology Transfer and Extension while the majority of Extension agents had too much contact with the Local Department of Technology Transfer and Extension.

6-7- Researchers paid little visits to farmers to follow the adoption of new innovations. While extension agents pay much visits to farmers.

6-8- The majority of researchers had much contact with the Federal Ministry of Science and Technology while the majority of Extension agents had no or little contact with the Federal Ministry of Science and Technology.

6-9- The majority of researchers depend much on Agricultural research stations in directing their work while the majority of Extension agents depend little on Agricultural Research Stations in directing their work.

6-10- The majority of researchers didn’t depend on the Ministry of Agriculture in directing their work while the majority of Extension agents depend much and too much on the Ministry of Agriculture in directing their work.

6-11- The majority of researchers didn’t depend on the Department of Technology Transfer and Extension in directing their work. While the
majority of State extension agents depend too much on the Department of Technology Transfer and Extension in directing their work.

6-12-The majority of researchers didn’t depend on farmer unions in directing their work. While the majority of State Extension agents said that farmer unions have little effect in directing their work.

6-13-The majority of researchers didn’t depend on suggestions from extension in directing their work.

6-14-The majority of researchers didn’t depend on farmer suggestions while the majority of Extension agents depend much on farmer suggestions.

6-15-The majority of researchers described research-extension relationship as medium. While federal extension agents described research-extension relationship as not existing and the majority of state extension agents describe research-extension relationship as medium or strong.

6-16-Researchers consider their participation in Extension programs, joint research-extension programs and participation of researchers and Extension agents in the counselling committees as linkage mechanisms. While none of Extension agents did so.

6-17-Federal Extension agents through those research extension linkages did not exist, because extension follows the Ministry of Agriculture while research follows the Ministry of Science and Technology

6-18-The institutional linkages between research and extension were weak and depend on informal relationship between researchers and Extension agents.
6.2. Conclusion

6.2.1. It can be concluded that the institutional linkage between research and extension is weak. Research –extension linkages are based on informal relationship between researchers and extension.

6.2.2. It was also found that there was a wide gab between researchers and Extension agents in terms of qualifications. Researchers are holders of higher degrees, MSc and PhD while few Extension agents had MSc degree.

6.2.3. Researchers have more frequent on the job training abroad for long periods compared to Extension agents who had on the job training for shorter periods and less frequent.

6.2.4 Researchers have little involvement in extension programs and Extension agents had little involvement in research programs.

6.2.5. There were no joint research-extension programs.

6.2.6. Research follows the Ministry of Science and Technology and Extension follows the Ministry of Agriculture.

6.2.7. Finally it can be said that farmers as a main target and beneficiary of research extension activities and any defect in research – extension linkage will affect farmers output. Improving the research –extension linkage mechanisms we will be able to enhance and improve farmers output.
6-3 Recommendations:

6.2.1. Extension agents should have more funds for education opportunities.

6.2.2. To enhance the awareness of all the concerned parties of the benefits of linking research and extension.

6.2.3. Establish more effective linkage mechanisms.

6.2.4. Coordination and establishment of joint committees at high level to detect the deficiencies and the solutions.

6.2.5. Laying out strategies, plans and programs to achieve research-extension linkages.

6.2.6. Review and adjust these strategies, plans and programs periodically.

6.2.7. Provide enough funds for joint programs.

6.2.8. Formalize the relationship between research and extension through establishment of formal research-extension channels.

6.2.9. Selection of efficient persons who can work with scarcities of resources.

6.2.10. To revise the managerial hierarchy of all the parties concerned with a view of enhancing the cooperation between them.

6.2.11. Revise research-extension systems to replace the old ones, which have proved its failure, with new systems.

6.2.12. Permanent availability of extension workers at research station.

6.2.13. Mutual respect and understanding of each other's role.
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11. الورقة الرابعة: (اللية نقل التقنية و الارشادلتطوير الزراعة بولاية الخرطوم) د.عوض الله محمد سعيد،بروفيسور. مأمون ضوء البيت،استاذة بنت وهب عبد
اللطيف، 18 ديسمبر 2002، المجلس الاستشاري لنقل الثقافة والارشاد
وزارة الزراعة والثروة الحيوانية والري ولاية الخرطوم.