Assessment of the components that deliver agricultural extension services, at Gezira state-wad medani great locality, Sudan

Abstract
This study was conducted at Wad Medani Great Locality, Sudan- season 2016. The study attempts to assess the components that transferring agricultural extension services to the farmers involving services centers, also to assess the old components through the links between each other’s, type of the link, and information transferring cost. The primary data were collected from a field surveys using a well-structured questionnaire. Secondary data was collected from books and scientific journals. The quota sample technique was used and 322 farmers were selected as the study population. Statistical Package for Social Sciences was used for data analysis focusing on descriptive statistics and correlation analysis. Results indicated that 64% of the respondents have landowner, 70% of their agricultural experience less than 15 years, and 79% Invested in cotton, corn, wheat, and peanuts, and 76%, 68%, 75%, and 71% of the respondents their source of fertilizer, fertilizer information, pesticides, and pesticides information were service centers respectively. 71% of the farmers assess that their links with extension were strong- direct- official, 62% and 92% of the respondents stated the personal method was used for delivering information by extension is its and the service centers respectively. Services centers were quick response partners and extension was the less cost. Results of correlation analysis showed that the link with extension had high significant with the source of seeds (.011) (R=-.142), and highly significant with the source of fertilizer (.000) the value (R=-.317), fertilizer information, pesticides, and pesticides information (.000) the value (R=-.271). The result of the regression test of the farmers showed a high significant link with the extension (.487 beta). The research recommended information should be transferred to all agricultural partners; Training sessions have to be held to all extension officers and ASCs workers, using more than one approach for conducting the extension process.

Keywords: extension, model, farmers, transferring, Sudan

Abbreviations: TOT, transfer of technology; FFS, farmer field school; IPM, integrated pest management; GDP, gross domestic products; USAID, American agency for international development; ASCs, agricultural services centers; SPSS, statistical package for social sciences

Introduction
Improvement in the management of agricultural extension organizations has been identified as a key challenge in the delivery of extension services. Over the years, several components have been shared to enhance the effectiveness of extension services and service delivery. A component defined as anybody that works out in the agricultural sector to deliver some sort of services to the farmers that aid in the agricultural process and enhance productivity positively. In this section, we attempt to describe the various models of extension and its components, eight basic extension models in Africa, all of them imported from other continents as listed below.

Technology transfer model: the Transfer of Technology (TOT) model it based on the assumption that transfer of technology and knowledge from scientists to farmers help in developing agriculture and assumes that farmers’ problems can be solved by people and institutions that have this ‘modern’ knowledge. This model operates by the components of agricultural extension administration and some NGOs.

The public extension model: Public interest implies serving farmers and the urban population, securing subsistence production and promoting cash crops for export, reaching the masses of rural households and serving the needs of specific groups, extending assistance to high-potential and disadvantaged producers. This model operates by the component of governmental agricultural extension.

Commodity extension model: This model was pioneered among smallholders producing cotton in Mali and other Francophone countries 50 years ago. Commodity-based extension run by governments, parastatals, or private firms is the most frequent extension method. This model operates by private components that work in agricultural extension.

T&V model: Launched in Turkey in the early 1970s and then spread to India and throughout Africa under World Bank sponsorship in the late 1970s and early 1980s, this model has proven to be financially unsustainable. The system concentrates on contact farmers expected to pass the information on to fellow farmers with similar problems. To ensure regular field contacts, facilitate supervision and...
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The Private sector model: this model has been spreading in industrial countries such as the Netherlands and New Zealand and more recently in middle-income countries such as Chile and low-income countries such as Uganda. Under this model, the farmer is expected to pay some of the cost of extension with the hope that public outlays on the extension could be reduced. This model works based on the components that established with private sectors to serve extension purposes.

Farmer Field School (FFS) model: this started in the rice mono-cropping farming in the Philippines and Indonesia in the late 1980s, as a way of diffusing knowledge-intensive Integrated Pest Management (IPM) practices for rice. FFS has since been adapted to work with other crops and diseases, and has spread rapidly across Asia, Africa, and Latin America. The FFS uses participatory methods to help farmers develop their analytical skills, critical thinking, and creativity, and help them learn to make better decisions. Farmer Field School is a method to train adult farmers in an informal setting within their environment, and operates by the components of public extension. It is often described as a ‘school without walls.’ FFS is a practical approach to training, which empowers farmers to be their technical experts on major aspects of localized farming systems. FFS assumes that farmers already have a wealth of knowledge. Therefore, field schools are oriented to providing the knowledge and management skills in a participatory manner, so that the farmers’ experience is integrated into the program.

Innovative linkage model: historically, the extension has mainly involved technology transfer, with the village extension worker transferring knowledge from research stations to farmers by using individual, group, and mass media methods, this work operates by the component of public extension. Various approaches are being promoted but information on their impact and sustainability is sparse, most recently, the extension has been asked to play a ‘technology development role’ by linking research with community group needs and helping to facilitate appropriate technology development, virtue, rights, and utilitarian models have successive levels of priority as the theoretical base of sustainable agricultural development.

Farming System in Sudan: divided into three main categories these are; irrigated agriculture this covers 2 million hectares extend from the river Nile & its tributaries either by surface pump or flood irrigation system. The main crops are cotton, sugar cane, wheat, sorghum, pulses, vegetable, and fruits, green fodders. These crops contribute by 64% of the GDP (Gross Domestic Products). Rain Fed Mechanized Farming mainly in the central clay plain of Sudan; the average rainfall ranges 400-800 mm. The main crops are Sorghum, which covers 85% while the Sesame covers 10% of the cultivated area. The system is fully mechanized apart from weeding & sesame cutting. The last one is traditional rain-fed farming cover 9 million hectares mainly practiced in southern and western Sudan. The main crops are millet, Gum Arabic, sorghum, Hibiscus, watermelon & Pigeon Pea.

The extension services started in Sudan in 1958 supported by the American Agency for international development (USAID), which assisted the Ministry of Agriculture to establish an extension department, open extension units in some regions and train extension workers in America. From 1958 up to 1981, about 17 extension units were established in different parts of the country. Currently, Agricultural extension services are provided by a variety of government department and corporations. Due to lack of evidence on some of the newer models, extension reforms, and pluralistic models that involve many different extension providers and higher population, most of the populations are working directly or indirectly in agricultural sector, and available of all the agricultural components (Farmers, Agricultural Services Centers (ASCs), The public extension farmers, Imports companies, Research Institution (research centers and University of Gezira) this study was suggested and aim to construct a model for transferring agricultural extension services to the farmers involving services centers, also to assessment the old model through the links between the components, type of the link, assessment of information transferring cost.

Materials and methods

Area of the study

This study is carried out in Gezira State- Wed Medani Greater Locality, lies in the center of Sudan and represents one of the largest states with higher population density, and contributes much to the agriculture of Sudan. Gezira state is located between latitude 13°.32 South 13°.30’ North, and longitude 32°.22’ West 34°.20’ East (Annual report, 2016) Figure 1 it is neighbored by Khartoum state from the North, Sinnar State from the South, Gadarif State from the East and the White Nile State from the western side. The area of Gezira State is estimated 275.492 square kilometers, which is equivalent to less than 20% of the total area of the Sudan. The total number of the population in the Gezira State is about 4.244.000 (in the year 2009). The State comes second to Khartoum state of the population number. Wad Medani is the capital of the state, the population of Wad Medani is 386.000 (in the year 2009).

Figure 1 Map of Gezira State-Sudan.

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Wad Medani Greater Locality is one of eight Localities constituted Gezira State namely (Wad Medani Greater Locality, South of Gezira Locality, East of Gezira Locality, Um Elgura Locality, Eikamileen Locality, Alhasahisa Locality, Almanaqil Locality, and Al Qurashi Locality). It is a well-populated area suitable for agriculture and considered as a very important agricultural area in the State and most of the population are working directly or indirectly in the agricultural sector. In Wad Medani Greater locality there are four extension offices in the sub administrative units (Wad Medani East complexes, Hantoob complexes, Alshabarga complexes, and Fadasi complexes).¹¹

Population and sampling procedures

Population of the Study is farmers in Wad Medani Greater Locality; those were 2000 farmers according to Agricultural managements in the Locality in season 2015-2016.

Based on Steven Samson equation a general formula for sample size selection was used as follows:

\[
N = \frac{1000}{(N - 1) \times (d^2 + z^2)} + p(1 - p)
\]

Source: Altac.¹²

Where: N=total population n=sample size d=proportion of error (.05) p=proportion of availability of particularity and neutralization (.50) \( z \) =degree of the normative meeting to a level of mark 0.95 (1.96). So according to the previously mentioned equation samples size is 322 farmers selected through quota sample technique.

Data collection and analysis

The field survey was used to collect data by using a questionnaire constructed for this purpose through personal interview techniques. While secondary data collected from different sources as references, previous studies, reports, internet, and relevant sources.

The collected data was fed into the computer and statistically analyzed by using Statistical Package for Social Sciences (SPSS).

Results and discussions

Results of descriptive analysis

The results in Table 1 indicated that most of the respondents (85%) were males while 15% of them were females. This may be due to that the ownership of the agricultural enterprise always concerns by a man more than women, also may be due to the social traditions which high light men as the head of the household. For the more women always in traditional societies concern responsible for domestic work in their houses. 52% of the respondents fall in the age group (21–40) year, while 37% of them were a (41–60) year, which represents active age for production. Also, the result revealed that 35% of the respondents have a secondary level of education, compared to 25%, 20%, 14% and 6% there have basic, university, Khalwa and illiterate respectively. This in line with¹³ which cited farmers in rural area belonged to the relatively younger age and better-educated group with agriculture as the main source of income and livelihood. Concerning the land ownership the results showed that 64% owner, 24% were renters while only 12% were participants with others. The results extend to depicted that the majority of the respondents (51%) there land size between less than 5 and less than 10 Feddan, while 33% of their land size more than 10 Feddan and only 17% of the respondents their land size less than 5 Feddan. In regards to level of income the same table shows that the high percentage of the respondents (37%) their income level between 10.000 to 20.000 SD pounds per year, while 33% their level of income was less than 10.000 SD pounds per year and 30% of the respondents their income level more than 20.000 SD pounds, that means the responder includes all farmer sector (smallholder, medial holder, and the big size holder) with high, medial and low-income level. The business of agricultural research, development, and extension (RD&E) has undergone considerable change in developing countries moving from a domain largely dominated by government departments to a situation of multiple actors.¹⁴

Table 1 Distribution of the respondents according to socioeconomic characteristics

| Socioeconomic characteristics | Frequency | Percentages (%) |
|------------------------------|-----------|-----------------|
| Sex                          |           |                 |
| Male                         | 274       | 85              |
| Female                       | 48        | 15              |
| ≥ 20 years                   | 9         | 3               |
| 21– 40 years                 | 166       | 52              |
| 41– 60                        | 119       | 37              |
| ≤61 years                    | 28        | 8               |
| Illiterate                   | 18        | 6               |
| Khalwa                      | 85        | 14              |
| Literate                     |           |                 |
| Education                    |           |                 |
| Basic                        | 42        | 25              |
| Secondary                   | 118       | 35              |
| university and above          | 63        | 20              |
| Owner                        | 206       | 64              |
| type of land owner ship       |           |                 |
| Renter                       | 76        | 24              |
| Participate with other        | 40        | 12              |

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To induce farmers to adopt a productive new agricultural technology, we apply simple and complex contagion diffusion models. The results indicated that of the respondents 70% there agricultural experience less than 15 years, while 30% there experience more than 15 years that means the responder includes high and low agricultural experience. The receipt of extension Agricultural experience increases farm income had more effect in the agricultural investment. Results showed that 79% the respondents planted cash crops (cotton, corn, wheat, and peanuts), while 11% their cultivation vegetable and crops and 10% cultivation vegetables only, Table 2 that means the farmers interested in cultivation crops which were expensive and had high income for that they in need to more information about this crop to by succeed. Substantial investment in the training of agriculturalists and the further science development of systems simulation is required to tackle the enormous challenges facing agricultural development in the region.

Table 2 Distribution of the respondents according to their agricultural experience and type of crops cultivated

| Agricultural experience | Frequency | Percentages (%) |
|-------------------------|-----------|-----------------|
| less than 5 years       | 88        | 27              |
| 5 - 10 years            | 71        | 22              |
| 11 - 15 years           | 68        | 21              |
| 16 - 20 years           | 40        | 13              |
| More than 20 years      | 55        | 17              |
| Crops (cotton, Corn, wheat, peanuts) | 256 | 79 |

Indicating by SPSS; descriptive statistic, Source; field research 2016

Regarding source of seed, the results revealed that 50% of the respondents their main sources of seeds were the service centers, 36% of them access seeds from other farmers and 14% from the extension. While the source of fertilizers, 76% of the respondents their source was service centers, 13% accessed from farmers and only 11% from the extension. Regarding the source of pesticides, 75% of the respondents their sources of pesticides was service centers, 13% accessed from and 12% from extension, Table 3, this agrees with Which reported that from 1992 the privet sectors was the main input suppliers, also few of farmers still used traditional input suppliers like farmers to farmer exchanged and very few farmers dependence on extension as their input suppliers and that mean extension was very weak as input source.

Table 3 Distribution of the respondents by their sources of inputs

| Sources of inputs | Frequency | Percentages (%) |
|-------------------|-----------|-----------------|
| Extension         | 44        | 14              |
| Source of Seed    |           |                 |
| service centers   | 161       | 50              |
| Farmers           | 117       | 36              |
| Extension         | 35        | 11              |
| Source of Fertilizers |       |                 |
| service centers   | 246       | 76              |
| Farmers           | 41        | 13              |
| Extension         | 37        | 12              |
| Source of Pesticides |       |                 |
| service centers   | 243       | 75              |
| Farmers           | 42        | 13              |
| Total             | 322       | 100             |

Indicating by SPSS; descriptive statistic, Source; field research 2016

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The knowledge score of participants increased as the number of information sources contacted increased.\textsuperscript{19} The results in a Table 4 indicated the source of information regarding to production inputs, for improving seeds information: the high percentage of 45\% of the respondents accessed from service centres, 32\% of them from other farmers and only 23\% of the respondents received from the extension. For fertilizers information 68\% of the respondents received from service centres, 19\% of them got from others farmers, and only 13\% from the extension. Also for pesticides information, 71\% of the respondents their source of pesticides information were service centres, 17\% of the other farmers represent the source of information and 12\% of the respondent’s extension was the pesticides information source. When the source of modern equipment information results revealed that 57\% of the respondents their source of modern equipment information were service canters, 27\% of them their sources were other farmers and 16\% their source was an extension, Table 4. Competing models of innovation informing agricultural extension, such as transfer of technology, participatory extension, and technology development, and innovation systems have been proposed over the last decades.\textsuperscript{20}

Table 4 Distribution of the respondents according to the sources of information

| Sources of information about the inputs | Frequency | Percentages (%) |
|----------------------------------------|-----------|-----------------|
| Extension                              |           | 23              |
| Improving seeds information            |           |                 |
| service centers                        | 144       | 45              |
| Farmers                                | 104       | 32              |
| Extension                              | 41        | 13              |
| Fertilizer information                 |           |                 |
| service centers                        | 218       | 68              |
| Farmers                                | 63        | 19              |
| Extension                              | 38        | 12              |
| Pesticides information                 |           |                 |
| service centers                        | 228       | 71              |
| Farmers                                | 56        | 17              |
| Extension                              | 51        | 16              |
| Modern equipment information           |           |                 |
| service centers                        | 184       | 57              |
| Farmers                                | 87        | 27              |
| Total                                  | 322       | 100             |

Indicating by SPSS; descriptive statistic, Source; field research 2016

Current practices in agricultural management involve the application of rules and techniques to ensure high quality and environmentally friendly production.\textsuperscript{21} The results in Table 5 showed that 40\% of the respondents their source of ploughing information were services centres, 35\% of them got from others farmers and only 25\% from extension. For source of preparing land information 51\% of the respondents their source were other farmers, 26\% of them accessed from extension and only 23\% got information from service centres. Also results extend to revealed that 55\% of the respondents their source of time of planting information were other farmers, 26\% of them from the extension and 19\% of them were service centres. In regards to the source of seeding rate information: the high percentages of the respondents 44\% their sources were other farmers, 30\% service centres were and 26\% extension. While the source of irrigation information 44\% their source were other farmers, 34\% extension and 22\% service centres. Also results indicated the source of fertilizer information by 55\% of the respondents their source were service centres, 27\% and 18\% of them their sources other farmers and extension respectively.The above result agreed with\textsuperscript{22} who mentioned farmers that reported receipt of “very useful” agricultural advice had greater productivity and greater food security compared to those that reported receipt of advice that they considered not useful and those that did not receive any advice at all.

The results in Table 6 shows the links with the agricultural partners: All of the respondent’s replied that they had no links with research centres, university and imported companies as partners in agricultural work. But they explained that they had link with extension and ASCs as partners in agricultural work as 46\% of the respondents their link with extension and assessed as strong, 18\% assess as weak 30\% assess as none and 6\% assess as very strong. When 71\% of the respondent’s link with ASCs and assessed as strong, 16\% assess as weak 8\% assess as none and 5\% assess as very strong link.

Different tools in delivering extension messages enable more information exchange among agriculture stakeholders and this increase agricultural production and agribusiness.\textsuperscript{23} The results of the study indicate the methods used by agricultural extension and depicted that 62\% of the respondents reported that the personal explanation was common methods used by the extension agent, 30\% of them indicate that no visits, 5\% indicated both personal explanation and demonstration field, and 3\% addressed both the methods was media bulletins. On the other hand methods used by service centres 92\% of the respondents their link with ASCs and assessed as strong, 16\% assess as weak 8\% assess as none and 5\% assess as very strong link.

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Table 5 Distribution of the respondents by their sources of technical packages

| Sources of technical packages | Frequency | Percentages (%) |
|------------------------------|-----------|-----------------|
| Extension                    | 80        | 25              |
| Method of plowing            |           |                 |
| Extension service centers    | 128       | 40              |
| Farmers                      | 114       | 35              |
| Extension                    | 84        | 26              |
| Preparing land               |           |                 |
| Extension service centers    | 75        | 23              |
| Farmers                      | 163       | 51              |
| Extension                    | 84        | 26              |
| Time of planting             |           |                 |
| Extension service centers    | 62        | 19              |
| Farmers                      | 176       | 55              |
| Extension                    | 82        | 26              |
| Seeding rate                 |           |                 |
| Extension service centers    | 98        | 30              |
| Farmers                      | 142       | 44              |
| Extension                    | 108       | 34              |
| Irrigation                   |           |                 |
| Extension service centers    | 73        | 23              |
| Farmers                      | 141       | 43              |
| Extension                    | 57        | 18              |
| Fertilization                |           |                 |
| Extension service centers    | 177       | 55              |
| Farmers                      | 88        | 27              |
| Total                        | 322       | 100             |

Indicating by SPSS; descriptive statistic, Source; field research 2016

Table 6 Distribution of the respondents by their links with the agricultural partners

| The links with the agricultural partners | Frequency | Percentages (%) |
|-----------------------------------------|-----------|-----------------|
| links with research centers             | 322       | 100             |
| none (no visits in the season)          |           |                 |
| links with university                   | 322       | 100             |
| none (no visits in the season)          |           |                 |
| links with imported companies           | 322       | 100             |
| none (no visits in the season)          |           |                 |
| links with extension                    | 20        | 6               |
| very strong (more than 5 visits in the season) |       |                 |
| strong (3-5 visits in the season)       | 147       | 46              |
| weak (less than 3 visits in the season) | 58        | 18              |
| none (no visits in the season)          | 97        | 30              |
| very strong (more than 5 visits in the season) |       |                 |
| strong (3-5 visits in the season)       | 17        | 5               |
| weak (less than 3 visits in the season) | 50        | 16              |
| none (no visits in the season)          | 27        | 8               |
| links with service centers              | 322       | 100             |
| none (no visits in the season)          |           |                 |

Indicating by SPSS; descriptive statistic, Source; field research 2016

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Table 7 Distribution of the respondents by methods of delivering messages

| Methods of delivering messages          | Frequency | Percentages (%) |
|----------------------------------------|-----------|-----------------|
| Presentation in case of visits used by agricultural extension |           |                 |
| no visits                              | 93        | 30              |
| personal explanation                   | 200       | 62              |
| Media bulletins                        | 10        | 3               |
| personal explanation and demonstration field | 19        | 5               |
| Presentation in case of visits used by service centers |           |                 |
| no visits                              | 27        | 8               |
| personal explanation                   | 295       | 92              |
| Total                                  | 322       | 100             |

Indicating by SPSS; descriptive statistic, Source: field research 2016

The results of the study indicated that 43%, 34%, and 23% of the respondents reported that the most quick response to farmers needs services centers, extension and other farmers respectively. Also results extend to revealed that 46%, 43%, and only 11% of the respondents addressed the extension, service centers and other farmers were the less cost in term of services accessibility.

Regarding to the most useful information and availability 45% of the respondents convinced that extension and service centres present useful information, 52% of them reported service centres were more available partners. Also results showed that 47% and (52%) of the respondents explained that extension was the more relevant and interested partners on feedback respectively, Table 8.

Table 8 Effectiveness partners from beneficiaries point of views

| The effective partners          | Frequency | Percentages (%) |
|---------------------------------|-----------|-----------------|
| Extension                       | 110       | 34              |
| service centers                 | 139       | 43              |
| Farmers                         | 73        | 23              |
| Extension                       | 148       | 46              |
| The less cost                   |           |                 |
| service centers                 | 138       | 43              |
| Farmers                         | 36        | 11              |
| Extension                       | 145       | 45              |
| The most useful information     |           |                 |
| service centers                 | 145       | 45              |
| Farmers                         | 32        | 10              |
| Extension                       | 126       | 39              |
| The more available partners     |           |                 |
| service centers                 | 168       | 52              |
| Farmers                         | 28        | 9               |
| Extension                       | 152       | 47              |
| service centers                 | 141       | 44              |
| The more relevant partners      |           |                 |
| Farmers                         | 15        | 5               |
| no one                          | 14        | 4               |
| Extension                       | 168       | 52              |
| The interested partners on feedback |       |                 |
| service centers                 | 140       | 43              |
| no one                          | 14        | 5               |
| Total                           | 322       | 100             |

Indicating by SPSS; descriptive statistic, Source: field research 2016
Results of correlation and regression analysis

The results of correlation test showed that there was some personal characteristic that had significantly correlated with links with other agricultural partners, there are: The owner type and the link with extension (.006) the value of R=-.153, the agricultural experience and the link with the extension (.002) the value of R=.169 and the plant type had significant correlation with the relationship with extension (.000) value of R=.346, Table 9. The results extend to indicated that there was some significantly correlated between the farmers connectivity with agricultural partners and the source of inputs these are the source of seeds and the link with extension (.011) the value (R=-.142), the source of fertilizers and the link with extension (.000) the value (R=.317) while the link with service centers had low significant (.025) the value (R=.125), the source of pesticides and the link with extension (.000) the value (R=.309) while the link with service centers had low significant (.038 the value (R=.116), Table 10.

Table 9 Distribution of correlation test to measure the relationship between some personal characteristics of the respondents and links with the agricultural partners

| Personal characteristics of the respondents | Link with research centers | Link with university | Link with imported companies | Link with extension | Link with service centers |
|---------------------------------------------|----------------------------|----------------------|-----------------------------|---------------------|--------------------------|
| Owner Type                                  | Correlation                | .c                   | .c                          | -.153**             | -0.052                   |
| Sig. (2-tailed)                             |                            |                      |                             |                     |                          |
| N                                           | 322                        | 322                  | 322                         | 322                 | 322                      |
| Correlation                                 | .c                         | .c                   | .c                          | .169**              | 0.013                    |
| Sig. (2-tailed)                             |                            |                      |                             |                     |                          |
| N                                           | 322                        | 322                  | 322                         | 322                 | 322                      |
| Correlation                                 | .c                         | .c                   | .c                          | .346**              | 0.104                    |
| Sig. (2-tailed)                             |                            |                      |                             |                     |                          |
| N                                           | 322                        | 322                  | 322                         | 322                 | 322                      |

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)
c. Cannot be computed because at least one of the variables is constant

Table 10 Correlation test to measure the relationship between farmer's connectivity with the partners and their source of inputs

| Source of inputs | Link with research centers | Link with university | Link with imported companies | Link with extension | Link with service centers |
|------------------|----------------------------|----------------------|-----------------------------|---------------------|--------------------------|
| Source of Seed   | Correlation                | .a                   | .a                          | .142*               | -0.039                   |
| Sig. (2-tailed)  |                            |                      |                             |                     |                          |
| N                | 322                        | 322                  | 322                         | 322                 | 322                      |
| Correlation      | .a                         | .a                   | .a                          | .317**              | .125*                    |
| Sig. (2-tailed)  |                            |                      |                             |                     |                          |
| N                | 322                        | 322                  | 322                         | 322                 | 322                      |
| Correlation      | .a                         | .a                   | .a                          | .309**              | .116*                    |
| Source of Fertilizers |                  |                      |                             |                     |                          |
| Correlation      |                            |                      |                             |                     |                          |
| Source of Pesticides |                  |                      |                             |                     |                          |
| Source of Pesticides |                  |                      |                             |                     |                          |
| Sig. (2-tailed)  |                            |                      |                             |                     |                          |
| N                | 322                        | 322                  | 322                         | 322                 | 322                      |

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)
c. Cannot be computed because at least one of the variables is constant

The results in Table 11 revealed that link with extension had high significant correlation with all technical package; improving seeds information (.000) the value (R=.312), new fertilizer information (.000) the value (R=.349), pesticides information (.000) the value (R=.384), method of plowing information (.000) the value (R=.396), modern equipment information (.000) the value (R=.365), Time of planting information (.000) the value (R=.294), preparing land information (.000) the value (R=.399), seeding information (.000) the value (R=.396), irrigation information (.000) the value (R=.388), used of fertilization information (.000) the value (R=.348) and used

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of pesticides information (.000) the value (R=.271). While the link with service centers had a significant correlation with new fertilizer information (.014) the value (R=.137) and pesticides information (.015) the value (R=.136) while the other application information had no significant correlation with the link with service centers.

Table 11 Correlation test to measure the relationship between farmers links with the partners and the technical package

| Technical package                  | Link with research centers | Link with university | Link imported companies | Link with extension | Link service centers |
|-----------------------------------|----------------------------|----------------------|-------------------------|--------------------|---------------------|
| Improving seeds information       | Correlation .a             | .a                   | .a                      | .312**             | 0.018               |
|                                   | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.751               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .349**             | .137*               |
| New fertilizer information        | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.014               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .384**             | .136*               |
| Pesticides information            | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.015               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .396**             | 0.052               |
| Method of plowing information     | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.353               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .365**             | -0.005              |
| Modern equipment information      | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.927               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .294**             | -0.005              |
| Time of planting information      | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.935               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .399**             | 0.036               |
| Preparing land information        | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.522               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .396**             | 0.077               |
| Seeding information               | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.169               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .388**             | 0.052               |
| Irrigation information            | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.35                |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .348**             | 0.059               |
| Used of Fertilization information | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.293               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |
|                                   | Correlation .a             | .a                   | .a                      | .271**             | -0.007              |
| Used of pesticides information    | Sg. (2-tailed) .           | .                    | .                       | 0                  | 0.903               |
|                                   | N                          | 322                  | 322                     | 322                | 322                 |

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed)
c. Cannot be computed because at least one of the variables is constant

Citation: Ali AEM, Abdallh MAA, Hamad MAA. Assessment of the components that deliver agricultural extension services, at Gezira state-wad medani great locality, Sudan. MOJ Eco Environ Sci. 2020;5(2):49-60. DOI: 10.15406/mojes.2020.05.00176
Also, the results depicted that link with extension had high significant correlation with all farmers opinions (First component you go to in case of problem (.000) the value (R=.487), The first responsive of the components (.000) the value (R=.509), Components had less cost and efforts to get information (.000) the value (R=.561), The components had the required information (.000) the value (R=.494), The more relevant components (.000) the value (R=.466), The interested components in get and register the comment-feedback (.000) the value (R=.389). Opinion on add the service centers in the extension models (.000) the value (R=.506).

When the link with service centers had high significant correlation only with the first responsive of the components (.003) the value (R=.164) and components had less cost and efforts to get information (.010) the value (R=.143). Low significant with the First component you go to in case of problem (.026) the value (R=.124), the components had the required information (.000) the value (R=.028), opinion on adding the service centers in the extension models (.000) the value (R=.043), the opinion of the other had no significant correlation with the relationship with service centers, Table 12.

The results of the regression test measure the effectiveness of the link between the partners and the farmers on the information exchanging, two partners had impact in transferring information to the farmers, one the link with the extension the effective value was (.487 beta) with high significant regression and the second partners had to impact in transferring information is the link with the service centers the effective value was (.450 beta) with low significant regression, Table 13.

| Opinion of the farmers                                      | Link with research centers | Link with university | Link with imported companies | Link with extension | Link with service centers |
|--------------------------------------------------------------|----------------------------|----------------------|------------------------------|---------------------|---------------------------|
| First component you go to in case of problem                 | Correlation                | . a                  | . a                          | .487**              | .124*                     |
| Sig. (2-tailed)                                              | N                          | 322                  | 322                          | 322                 | 322                       |
| Components had less cost and efforts to get information     | Correlation                | . a                  | . a                          | .561**              | .143**                    |
| Sig. (2-tailed)                                              | N                          | 322                  | 322                          | 322                 | 322                       |
| The more relevant components                                | Correlation                | . a                  | . a                          | .466**              | .088                      |
| Sig. (2-tailed)                                              | N                          | 322                  | 322                          | 322                 | 322                       |
| The interested components in get and register the comment-fe | Correlation                | . a                  | . a                          | .389**              | -.054                     |
| Sig. (2-tailed)                                              | N                          | 322                  | 322                          | 322                 | 322                       |
| Opinion on add the service centers in the extension models  | Correlation                | . a                  | . a                          | .506**              | .113*                     |
| Sig. (2-tailed)                                              | N                          | 322                  | 322                          | 322                 | 322                       |

**Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)
c. Cannot be computed because at least one of the variables is constant

Citation: Ali, AEM, Abdallh, MAA, Hamad, MAA. Assessment of the components that deliver agricultural extension services, at Gezira state-wad medani great locality, Sudan. MOJ Eco Environ Sci. 2020;5(2):49-60. DOI: 10.15406/mojes.2020.05.00176
**Conclusion and recommendations**

The goal of agricultural extension professionals is to influence development change in the societies where they work. Any change will happen when good relationships are formed. A farmer interested in cultivation crops which were expensive and had high income for that they in need the best information from the best source to succeed in his farm management and investment to rich high income. Service centres and extension were the main source of inputs and technical packages to the farmers and had a strong links as agricultural partners. Personal explanations and visits were the frequent methods to deliver information from the services centre and extension. The extension was the less cost, more relevant partners and the interested partners on feedback, while service centres were the quick response and the more available and the explained about the most useful information had been communiqué between extension and service centres, if they put to gathers in one system for sure will be more active. The variables tested showed significantly correlated.

Based on the finding some recommendations were set such as focusing on policy and strategy that encourages the development of the extension system, training sessions have to be held to promote extension workers, extension officers, and service centers workers, using more than one approach for conducting extension process, and because they in clear and official links with each other represents as teamwork, series to give effective delivery of information to farmers i.e. (adequate, updated recommended information, in the right time, by the best methods, with less costs to increase the best profit for all), as follows in Figure 2 below:

![Figure 2: the components for the delivery of agric. services.](image)

**Acknowledgments**

None.

**Funding**

None.

**Conflicts of interest**

The author declares no conflict of interest.

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