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Effectiveness of agricultural extension services to crop farmers of Khartoum State, Sudan

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Abstract: This study was carried to investigate the role of extension service in raising crops total product in Ombadda locality of Khartoum State, Sudan. Simple random sampling procedure was used to select 80 respondents from the four villages purposively selected. A structured interview schedule and observation were used to collect the primary data needed to meet the objectives of this study. Frequency distribution and T-test procedures were used for data analysis and interpretation. Results obtained revealed the extension package and inputs production provided there contributed positively in adopting new technologies and increasing crops production and farm income. T-test analysis showed significant difference between beneficiary and non-beneficiary groups with respect to crop production. A further research is recommended to identify the farmers' needs and suggest relevant agricultural extension intervention strategies to be adopted in the study area.

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1. Introduction

The Concept of Agricultural Extension has a wide range of definitions; it is defined by many scholars in different parts of the world (Bello, 2014). As indicate by Swanson (1984),it is an on-going process of getting useful information to people (the communication dimension) and then in assisting those people to acquire the necessary knowledge, skills and attitudes to utilize effectively this information or technology (education dimension). According to Roling (1982) extension means different things to different people, but most people regard it as a government instrument to promote technologies for improving agricultural production and farmer's income. Agricultural extension as stated by Anderson (2007) plays essential role as communication channel to transfer new ideas and innovations to the farmers where they are. It encourages them to use and adopt the innovations to increase agriculture product and hence improve their standard of living. That is mainly, because the Agricultural extension contributes directly to promoting agricultural development and rising of food production and income so as to improve living conditions of the farmer because the farmer faces problems and barriers to reach that goal. The conventional definition of agricultural research includes both applied research and extension (Anderson 2007). Essentially extension services act as a bridge between scientists who strive to resolve problems in the practice of agriculture through research and the farmers who need the solutions. Innovative technologies and good practices can be translated to increased yields and improved food security only when it is properly communicated to farmers (Annie and Merle 2012). An analysis of national extension systems in Asia and the Pacific Region (Qamar, 2006) shows that agricultural extension today is passing through a major transformation as a result of dissatisfaction with the public systems perceived to be outdated to respond to changes like globalization, decentralization and information technology revolution. In some countries agricultural extension uses a common pattern where technical prescriptions derived from controlled conditions are disseminated using top-down extension approaches with little attention to local conditions, often making the content unworkable. In other countries, despite relatively well organized network of extension systems, success is hampered by inappropriate material, declining budgets for field activities, and inadequately skilled and poorly motivated staff (Friederichsen, 2008). Extension systems in many countries are struggling to shift to more integrated, farmer-oriented approaches to rural innovation that emphasize the importance of interactive, mutual learning between formal and

informal knowledge systems which are integrated and multi-disciplinary (Annie and Merle 2012).

The history of agriculture extension and agricultural technology transfer started in Sudan in 1902. In 1956, USAID assisted the government in establishing agricultural extension division to provide the extension services (Altayeb, 2005). This division was developed later to the Agricultural Extension Administration at the Ministry of Agriculture and Animal Resources(now Ministry of Agriculture and Forests) , the main Governmental body responsible for providing a widely diffused extension service in the country (Ministry of Agriculture and Forestry,2009). As indicate by Bello (2014) in the 1994, the country adopted the federal government system and was divided to 26 states. Accordingly the agricultural extension was decentralized and each state had its own extension administration, while keeping the Agricultural Extension Administration at the federal level at the Ministry of Agriculture and Forests under the name of Technology Transfer and Extension, with primary responsibility of program planning an execution at national level. Increasing productivity through improving farmers knowledge by different kinds of media are basic goals of agriculture extension in Sudan (Ministry of Agriculture and Forestry (2009). To meet these goals the country has tried a number of extension approaches including commodity approach, Training & Visit system, community development, and Farmer Field School (FFS). A number of transitional structures between each of the three types can also be noticed. That is mainly because there is no “best practice” available to modify the extension programs and formulate a magic model that could be launched as a standardized or ideal model for the development of the farming in a particular country. Moreover, several institutions and organizations in public and private sectors, NGOs and farmers based organizations are providing different agricultural and veterinary extension services in the country (Bello, 2014).

Effectiveness has been defined as success in realizing goals or in executing the missions delegated (Mirsepassi, 1998), as the degree of achieving shot-term and long-term goals in relation to the expectations of stakeholders and evaluators, or as organizational life. Therefore, the educational programs section is expected to see if the education offered can achieve the designed goals and whether this education is capable of bringing about the intended changes. Serious discussions are taking place, especially in developed countries, about the necessity of having extension services; therefore, education offered through extension services must prove its effectiveness in order to survive (Abed, 2014).

1.1 Purpose and Objectives of the Study

The main objective of this study is to investigate the impact of extension packages on small famers in Ombadda locality of rural western parts of Khartoum State, Sudan. It aims precisely to assess the contribution of the extension packages of extension packages of the FAO West Omdurman Special Program for Food Security (2004-2010) to improve crops production the beneficiaries in the study area.

2. Methodology

Study Area

The study was conducted in the West Omdurman area of Ombadda locality in rural western parts of Khartoum State, Sudan. The population of the study area is basically nomads and rational subsistent farmers whose life was greatly affected by the 1980s drought and decreasing rainfall resulted in lesser flow of the major seasonal valleys such as Wadi El Mugadam, running throughout the area (Bello and Fadul, 2015). The Western part of the locality is a desert area with herding as the major economic activity, while the Southern area is characterized by being a livestock and agricultural area. The nearest urban community is 86 kms and the more distant one is about 150 km from the outskirt of Omdurman town, boarding the Northern and North Kordofan States, White Nile State, and Karari locality in Khartoum State (Turkawi and Bello, 2009).

According to the FAO final Special Program for Food Security document (2001) the West Omdurman, Khartoum State project was designed and implemented by the FAO in 2004 to improve food security and nutrition on a sustainable basis, reverse the declining trend of agricultural productivity and bridge the food gap for targeted vulnerable areas. It was established as a part of the Special Program for Food Security (SPFS) in Sudan. The project components are:1.Water control and management to increase the water efficiency of the existing or proposed new irrigation schemes by: i-Increasing the water uses at the pumping, distribution at plot levels, and ii-Improving the water management in order to maximize the water productivity and enhance food security, for the targeted beneficiaries, 2. Intensification of plant production systems through : i-Development of participatory process among the beneficiaries and their organizations for the identification, evaluation and monitoring of technological options. Identification of constraints and appropriate solutions to resolve them would ensure widespread adoption of high yielding varieties, integrated plant nutrition system, integrated pest management sound post-harvest techniques and efficient input delivery system, ii-Demonstration of

available new technologies for boosting food production of the major staple food crops (dura, sorghum, millet, etc.) in a sustainable way in farmers' fields (FAO,2001).

Data collection and analysis

The simple random sampling method was used to select 80 respondents from four villages (20 from each).The villages were selected purposively from sites covered by the West Omdurman, Khartoum State project services. Table of random numbers was used to select 10 respondents from each sampled village who represent direct project participant/beneficiaries. Another group of 40 respondents as non-registered to the project were selected (10 from each village) using accidental non-random sample method. Primary data were collected through field survey by using structured interview and observation. Frequency distribution and T.test procedures were used to determine whether the observed difference between the project beneficiary (B) and non-beneficiaries (NB) in terms of the study variable were significant.

3. Results and Discussion

3.1 Socioeconomic characteristics of respondents

Table 1 shows that 94.7% of the respondents fall within the age group of 20 – 59 years old, 68.9% are under 49 years old and represent 72.5 and 65% as participants and non-participants respectively. This result indicates that both groups have a high percentage of economically active population, which facilitates the success and sustainability of the actives introduced by the project. The table also shows that 48.8% of the respondents were illiterate, 32.5% attended Khalwa (Qoranic School), 17.5% and 1.3% of the respondents received primary and secondary education respectively. This indicates the widespread of illiteracy in the project area. This is a negative indication in developmental process which undermines their desire to adopt new technologies and innovations. Data in table 1 also indicates that most of the respondents were married (78.8%) representing 85% and 72.5% as P and NP respectively. The table also shows that 8.8 , 3.8% and 12.5% of the respondents are widowed ,divorced and single respectively. Data in the table also It reveals that 26.3% of the respondents have family size less than 6 members and 76.3% have family size range between 6 – 10 members. This is mainly because it is observed that most of the respondents have relatives sharing with them food and accommodation. The table also shows no difference in family size between the participants and non-participants, as 47.5 of the project participants have family size of 6 – 10 members compared to 52.5% of non-participants. Those who have family size of more than 10 members amount to 22.5% as B and 25% as NB respectively.

3.2 SPFS Impact:

3.2.1 Respondents farm income

Table 1 also shows that 5% of participants and 15% of non-participants have an income level of less than 1000 Sudanese pounds (SG) per month; there are 62.5 % and 37.5% as B and NB have the income level of more than SG 3000 per month. This indicates that the B have achieved higher income levels compared to NB. This result reflects the positive impact of the project interventions in raising household income. Respondents representing project B confirmed that activities provided by the project have enabled them to increase their income level and improve their living standards. Moreover it is observed that the participants have achieved higher income levels and better food intake both in terms of quantity(number of meals per-day) and quality(diet composition), while the non-project participants reported to have achieved less income and low food quantity and quality which consider as the main factor effecting nutritional status. This result indicates positive effect of the project on the food availability in terms of quantity and quality which is essential to household food security. From the interview and group discussion it is appear that the participants have used the higher income level to cover their immediate food needs, as first priority of income expenditure followed by household furniture and clothes.

Table1. Frequency distribution of respondents according to their socioeconomic characteristics

Characteristics	B		NB		Total	
	F	%	F	%	F	%
Age group (years)						
20 – 29	3	7.5	2	5.0	5	6.3
30 – 39	3	7.5	4	10.0	7	8.8
40 – 49	23	57.5	20	50.0	43	53.8
50 – 59	10	25.0	11	57.5	21	26.3
60 – above	1	2.5	3	7.5	4	5.0
Total	40	100	40	100	80	100
Education						
Illiterate	10	25	29	72.5	39	48.8
Khalwa	16	40	120	25.0	26	32.5
Primary School	23	14	35	-	-	14.0
Secondary School	-	-	1	2.5	1	1.3
Total	40	100	40	100	80	100
Marital status						
Married	34	85	29	72.5	63	78.8

Widowed	1	2.5	6	15.0	7	8.8
Divorced	-	-	3	7.5	3	3.8
Single	5	12.5	2	5.0	7	8.8
Total	40	100	40	100	80	100
Family size						
Less than 6 members	12	30.0	9	22.5	21	26.3
6 – 10 members	19	47.5	21	52.5	40	76.3
More than 10 members	9	22.5	10	25.0	19	23.8
Total	40	100	40	100	80	100
income levels						
Less than 10,00	2	5.0	6	15.0	8	10.0
10,00-19,99	3	3.8	4	10.0	7	8.8
20,00-29.99	10	25.0	15	37.5	25	31.1
3000 and over	25	62.5	15	37.5	40	50
Total	40	100	40	100	80	100

Table 2 indicates that before the project 25%, 50%, 10% and 15% were farmers, pastoralist, traders and others (e.g. well digging) respectively. This situation has changed after project intervention as the percentage of pastoralist has dropped from 50% to 7.5%. On the other hand the number of those who the agriculture have increased from 25 to 85%. This change in occupation indicates that the project has changed the participants from pastoralist to farmers and or agro-pastoralists and promoted them to get involved in better income generating opportunities. It is observed that the project succeeded in the transformation of nomads and pastoralist into settled agriculturalists. It is observed that considerable number of inhabitants B and NB practices animal production as main economic activity is replaced by greater dependence on field crop production and a set of non- farm jobs created the project. Several individual projects' beneficiaries have many successful stories which indicate the project impact in transformation of nomads into agriculturalists or agro-pastoralists. Mohammed Ahmed (one of the project beneficiaries) had commented that: "in the past my occupation is looking for pasture and water for our livestock especially during the rainy season. Now I acquired knowledge and skills which enabled me to have other job to gain money to meet my family basic needs".

Table 2. Frequency distribution and percentages of beneficiaries respondents by main occupation.

Occupation	Before the project		After the project		Total	
	F	%	F	%	F	%
Agriculture	10	25	34	85.0	44	55.0
Pastoralism	20	50	3	7.5	23	28.8
Trade	4	10	3	7.5	7	8.8
Others	6	15	-	-	6	7.5
Total	40	100	40	100	80	100

3.2.2 Access to extension service

Table 3 indicates that all the respondents (as B and NB) comment that they have access to agricultural services. Such services include preparing of land, improved seeds, and cultivation and irrigation methods as indicated in table 2.

Table 3. Frequency distribution and percentages of respondents by access to extension service.

Access to extension service	B		NB		Total	
	F	%	F	%	F	%
Yes	40	100	40	100	80	100
No	-	-	-	-	-	-
Total	40	100	40	100	80	100

Table 4.Frequency distribution and percentages of respondents by type of services received.

Type of services received	B		NB		Total	
	F	%	F	%	F	%
Preparing land	40	100	-	-	-	-
Improved seeds	40	100	40	100	80	100
Irrigation method	40	100	-	-	-	-
Total	40	100	40	100	80	100

Table 5 shows that most of participants and non-participants as 92.5% and 100% respectively are used to take crops inputs from the project. This reflects the wide contact of respondents with SPFS team and their access to project services which provided equally to both subsectors.

Table 5.Frequency distribution and percentages of respondents by sources of production inputs.

Sources of inputs	B		NB		Total	
	F	%	F	%	F	%
SPFS	40	100	37	92.5	77	96.3
Local market	-	-	3	7.5	3	3.8
Other	-	-	-	-	-	-
Total	40	100	40	100	80	100

3.2.3 The benefit from the different SPFS extension packages

Table 6 shows the frequency distribution of respondents by the benefit from the different SPFS extension packages. It indicates that many extension packages were extended by the SPFS. The most popular extension packages are watermelon and cucumber extension to the participants group (for cultivation and irrigation methods) as 92.5% .and 85 respectively.

Table 6. Frequency distribution and percentages of beneficiary respondents by extent of perception of benefit received from SPFS extension packages.

Extension packages	Benefit		No benefit	
	N	%	N	%
Abu Sabaeen extension package for improved seed	32	80.0	8	20.0
Abu Sabaeen extension package for use cultivation method	32	80.0	8	20.0
Abu Sabaeen extension package for use of irrigation method	32	80.0	8	2.0
Watermelon extension package for improved seed	30	75	10	25
Watermelon extension package for use cultivation method	37	92.5	3	7.5
Watermelon extension package for use irrigation method	37	92.5	3	7.5
Okra extension package for improved seed	34	85.0	6	15.0
Okra extension package for use cultivation method	33	82.5	7	17.5
Okra extension package for use irrigation method	33	82.5	7	17.5
Cucumber extension package for improve seed	35	87.5	5	12.5
Cucumber extension package for cultivation methods	34	85	6	15
Cucumber extension package for irrigation method	35	87.5	5	12.5

3.2.4 The benefit from the adoption of different extension packages

Data in table 7 reveals that low adoption rates were achieved for Okra extension packages (improved seed, cultivation and irrigation methods). Adoption rates of the recommended production packages of the other three crops (watermelon, Abu Sabaeen and cucumber) are very high as 82.5%, 92.5%, 85.0% and 87.5 respectively.

Table 7.Frequency distribution of beneficiary respondents by extent of perception adoption of different components extension packages.

Extension packages	Adoption		No adoption	
	N	%	N	%
Adoption of improved seed of Abu Sabaeen	34	85.0	6	15.0
Adoption of Abu Sabaeen cultivation method	34	85.0	6	15.0
Adoption of Abu Sabaeen irrigation method	34	85.0	6	15.0
Adoption of watermelon improved seed	37	92.5	3	7.5
Adoption of watermelon cultivation method	37	92.5	3	7.5
Adoption of watermelon irrigation method	37	92.5	3	7.5
Adoption of okra improved seed	33	82.5	7	17.5
Adoption of okra cultivation method	33	82.5	7	17.5
Adoption of okra irrigation method	36	90.0	4	10.0
Adoption of cucumber improved seed	35	87.5	5	12.5
Adoption of cucumber cultivation method	34	85.0	6	15.0
Adoption of cucumber irrigation method	36	90.0	4	10.0

3.2.5 Result of T-test analysis of total production

Data of T-test of significance of the observed different between B and NB in term of total

production of selected crops (table 9); show there was a significant difference between B and NB in term of total production of Abusabeen. The mean scores are 175.18 and 58.43 for B the NB respectively, with t-value. 3.85. The results also revealed that there was a significant difference between B and NB in term of total production of watermelon. The mean scores are 152.03 and 43.70 for B the NB group respectively, with a t- value 3.39. The table also reflected that there was a significant difference between B and NB in term of total production of okra. The mean scores for two groups are 25131.20 and 26.95 for B and NB respectively with a t- value 1.004. Data in the table showed that there was significant difference between B and NB in term of total production of cucumber. The mean scores are 165.68 and 28.00 for B and NB group respectively with a t- value 6.068.

Table 9 Results of t-test for beneficiaries and non-beneficiaries in SPFS in term of selected variables

Variables	Group	Mean Score	Std dev	t	Sig
Total Production of Abu Sabaeen	1* 0**	175.18 58.43	185.283 47.886	3.858 3.858	,000
Total Production of Watermelon	1 0	152.03 43.70	189.282 69.636	3.397 3.397	,000
Total Production of Okra	1 0	25131.20 26.95	158125.140 30.771	1.004 1.004	,000
Total Production of cucumber	1 0	165.68 28.00	141.355 24.732	6.068 6.068	,000

*1: B, and ** 0: NB

4. Conclusion and Recommendations

The study concluded that the extension packages and inputs production introduced in the study area contributed positively to adopting new technologies resulted in increasing crops production and farm income. T-test analysis showed significant difference between beneficiary and non-beneficiary groups with respect to crop production. The study recommended the need for further research and studies to propose relevant long term agricultural extension intervention strategies addressing the farmers' needs and environment awareness in the project area.

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