Impact of Farmers' Field Schools Approach on Crop Productivity in Khartoum State, Sudan

Mohamed Zakaria Yahia

Department of Agricultural Extension and Rural Development, Faculty of Agriculture, University of Khartoum, Sudan. E-mail: dr-raouf12@hotmail.com

Abstract: This article investigates the impact of farmers' field schools approach to increase the agricultural productivity in the study area of Khartoum state, Sudan. The random sample method was used to select 320 respondents' from four localities of the State. Primary data was obtained through interview schedule and observation. Descriptive analysis was carried out to display frequencies and percentages for the socioeconomic characteristics or respondents. Multiple regression and T-test were used for data analysis and discussion. The study findings of multiple regressions revealed that the level of participation in farmers' field schools (FFSs) was significantly associated with the education, farm ownership, farm size, and the period of residency. It is also indicated that the level of application of received agricultural innovations was significantly associated with the education level, farm ownership, farm size, total income, and participation level in FFSs. T-test results revealed a statistically significant difference between participants and non- participants in term of the total production of three crops (onions, tomatoes, and potatoes). The study recommended some interventions to improve and develop the application of the FFSs approach.

[Yahia, MZ. **Impact of Farmers' Field Schools Approach on Crop Productivity in Khartoum State, Sudan.** *N Y Sci J* 2017;10(12):104-109]. ISSN 1554-0200 (print); ISSN 2375-723X (online). http://www.sciencepub.net/newyork. 12. doi:10.7537/marsnys101217.12.

Key words: Farmers' Field Schools; crop productivity; Khartoum State; Sudan.

1. Introduction

Most African countries depend on agriculture for their economic growth. About asserted that about 80 percent of the populations who live in rural areas of developing nations depend directly on agriculture for their livelihood (Sheingate, 2008). In the recent years, a number of Sub-Sahara African countries experienced slow agricultural development (Olaniyi et al., 2013. In spite of these great importance of agriculture to most African countries, the output of the agricultural sector is still relatively low for many reasons, with the most prominent being the traditional practice of agriculture (Yahia, 2014).

Agricultural Extension is the system of introducing new agricultural techniques and idea to the farmers for incorporating them into their farming practices. The extension workers, therefore, not only informs farmers to improve their lands and prepare a cropping pattern but also motivate them to use improved agricultural implements and adopt the modern agricultural practices according to their socio-economic status (Ahmad et al., 2007). As indicated by (Ahmad et al., 2007) agricultural extension interventions illustrate the difficulties in reaching these farmers, gents travel to villages to increase the productivity of farmers (Schmidt et al., 2012).

Agricultural extension approaches are the quick systems and methods which used in agricultural extension work to increase agricultural productivity. There are many agricultural extension approaches commonly used in Sudan: traditional approach, training and visit system, integrated rural development approach, integrated agricultural development approach, commodity approach, the approach of agricultural extension through universities, and the approach of farmers' field schools. (El-Hassan, 2011). Farmers Field Schools approach is another, more recent, tool developed to improve farmers' livelihoods. It involves season-long, field-based groups of 25 to 30 farmers, who meet regularly to learn through discovery and experience, Farmer Field Schools FFS is often described as a school without walls for improving farmers' decision-making capacity and stimulating local innovations for sustainable agriculture or forestry, it is a participatory approach, which gives farmers an opportunity to make a choice in methods of production through discovery-based learning tools (Alsadding, 2010).

Farmer Field Schools is one of the group contact methods, and the term "Farmer's Field School" refers to Indonesian expression "Sekolah Lapangane" it is meant field school. The first Field Farmer School was established in 1989 in the center of Java Island, Indonesia, during a pilot season by 50 plant protection workers to test and develop new field training methods as part of their IPM training course (Elfadual, 2012). According to IIIE (2014), Farmer Field Schools is a participatory method of education and enables small farmers to explore and learn the skills by themselves and determine the benefits of the adoption of practices in their fields. This approach was implemented by a United Nations Food and

Agriculture Organization of the United Nations (FAO) project in Southeast Asia in 1998 in the adoption of Integrated Pest Management (IPM) practices, and then applied for other agricultural purposes. The application was soon extended to many countries in Africa and Latin America (IIIE, 2014).

Moreover, as commented by IIIE (2014), FFSs team building and composition of an effective group requires that training involves communication skills, problem solving and discussion management techniques to create an educational environment for the farmer to learn effective leadership skills, implement decisions in the field, and be able to deliver information to others. El-Hassan (2011) revealed that the characteristics of the farmers' field schools approach are as follows: 1-Farmers are experts and they learn through practices and activities, 2-The field is the first place of education, where farmers work in groups to collect and analyze data, and then present and discuss the results to reach decisions, 3-The workers in the agricultural extension are facilitators, they are assistants/coordinators and participates in the discussion session, and 4-The experts and the extensionist are work with farmers rather than lecturing (as consultants rather than lecturers).

In Sudan, the approach was prepared in its initial form by the Directorate of Agricultural Extension of the Gezira scheme in 1997 to cover all aspects of production and protection of different crops. The application of the experiment has been widespread in many states of Sudan, including state of Khartoum, which represents the country's capital, the first state in term of population, and one of the most important states in agricultural production to meet the food needs for its large population, especially in production of vegetables and fruits, as well as to contribute to agricultural exports (Alsadding, 2010). Recently FFSs approach has been implemented intensively in Khartoum state as result of the establishment of Farmer's Field Schools center as a partnership between Faculty of Agriculture, University of Khartoum, and the Ministry of Agriculture, Animal Wealth and Irrigation of the Khartoum State in 2007, in collaboration with the Arab Organization for Agriculture and Development. In 2009 the Centre received financial support from…. to implement the program in the approach at different localities of the state (Agricultural Planning Administration, Ministry of Agriculture, 2015).

There are significant challenges facing the agricultural extension workers in Khartoum state, which are reducing their efficiency and effectiveness to provide agricultural extension services and transfer farmers' transformation from traditional to the modern agricultural system (ATTE, 2013). Hence, to improve their agricultural productivity and production. According to Yahia (2014), the difficulty of delivering agricultural information to all farmers by individual contact methods is caused by the large number of farmers spread out over large agricultural areas (in scattered villages), which are covered only by a small number of extension workers (The ratio of supervision is1: 1081, this means one extension agent needed to serve more than 1081 farmers) with very poor means of transportation. Therefore, he commented that implementing the FFSs approach in Khartoum state was expected to bridge the knowledge gap of information and diffusion of innovations to farmers to improve their agricultural production.

1.1 Objectives of the Study

The main objective of this study was to assess the impact of farmers' field schools approach to improve the crop productivity in some areas of t Khartoum State. The specific objectives are to:

1. Identify respondents' level of participation in the FFSs in the study area.
2. Assess the respondents' level of application of agricultural innovations diffused by the FFSs in the study area.
3. Investigate the factors affecting respondents' participation in FFS activities and programs.
4. Assess the impact of diffused agricultural innovations by the FFSs on crop productivity in the study area.

2. Material and Methods

The study area

Khartoum State is located in the north-eastern part of the central part of the country in the heart of Sudan at the confluence of the Nile, the White Nile, and the Blue Nile, to be the Nile River. The state lies between longitude 13.5 and 34 east and latitude 15-16 north. The state has about 8 million inhabitants. One-third of the population has been displaced from the other states of Sudan and the state now has a high population density of almost a quarter of the country's population. The state is located at an altitude of 1352 feet above sea level, with an area of 22,736 square kilometers. The state's arable land is about 1.8 million feddans, of which only 350,000 feddans are cultivated. The area used for natural pastures reached 2.2 million feddans. Sources of water exploited in the agriculture operations of the Niles, Blue Nile, White Nile and groundwater (Khartoum State, 2017). Administratively, the State is divided into seven localities: Khartoum, Omdurman / Bahri, East Nile, Um Bidda, Jabal Oliya, and Locality. Agriculture and grazing are is the main economic activity of the rural population (Agricultural Planning Administration 2013).

Sample selection and dada analysis

Non-random purposive sample was used to select four localities (East Nile, Bahri, Karri, and Jabal Oliya).. The random sample method was used to select 320 respondent farmers (80 farmers from each locality). Interview schedule and observation were used for primary data collection. Descriptive statistics, Multiple regression and T-test techniques were adopted for data analysis and discussion, using the Statistical Package for the Social Sciences (SPSS).

3. Results and Discussion

Farmers' Level of Participation in FFSs

Table 1: Frequency distribution and percentages of respondents According to their participation in FFSs

Classification	Frequency	Percent
The extent of participation		
Yes	197	61.6
No	123	38.4
Total	320	100
Level of participation		
Rarely	18	9.1
Sometime	37	18.8
Continuously	142	72.1
Total	197	100
Reasons of not participating		
No agricultural extension office	22	17.9
Don't know the program	61	49.6
No time to participate	29	23.6
Lack of interest	11	8.9
Total	123	100

Table 1 shows that 61.6% of respondents participate in FFSs activities at different three levels. About 72% commented that they participate continuously. This finding is consist with the saying stated by FAO and JICA (2011) who indicated that attendance of FFSs is also an indicator of how the members perceive the quality of the FFS and facilitators.

Farmers' Level of Application of received Agricultural Innovations FFSs

Date in table 2 indicated that FFSs participants in the study area received agricultural package containing 10 agricultural innovations (Land preparation, seed verities, sowing method, irrigation methods, fertilizer use, weeding, pests and diseases control, harvest, post-harvest activities, and marketing) diffused at different levels. All respondents (100%) commented that they applied the seed verities. About 64%, 84.3%, and 87.8% of respondent indicated that they have adopted land preparation, sowing method, and weeding respectively. All respondents commented that they adopted irrigation methods and fertilizer use at medium level, while their application to control of pests and diseases, and harvest at two levels: medium level (56.3%, and 80.2%respectively) and low level (43.7%, and 19.8% respectively). Most of the e respondents' reported that the innovations which they applied at a high level due to good training and/or ease of application, while the innovations which they applied at the medium or weak level due to lack of training and/or difficulty of application. These results is consistent with Khatam *et al* (2010) who stated that it is concluded from the results that FFS approach brings about a positive change in farmers' behavior towards adopting improved skills and knowledge and exposes them to the technique of learning by doing which is innovative as well more practical. Also FAO and JICA (2011) commented that FFS provides a structured extension platform, which makes implementation hence the farmers gained knowledge and skills, and they be able to apply the new technologies in their farm, because the regular group meeting days make FFS easier to monitor and learn by doing.

Table 2: Frequency distribution and percentages of respondents according to their application of the agricultural innovations diffused by FFSs

Innovation	Application level									
	High		Medium		Low		Not apply		Total	
	F	P	F	P	F	P	F	P	F	P
Land preparation	126	64	71	36	-	-	-	-	197	100
Seed verities	197	100			-	-	-	-	197	100
Sowing method	166	84.3	31	15.7	-	-	-	-	197	100
Irrigation methods	-	-	197	100	-	-	-	-	197	100
Fertilizer use	-	-	197	100	-	-	-	-	197	100
Weeding	173	87.8	24	12.2	-	-	-	-	197	100
Pest and diseases control	-	-	111	56.3	86	43.7	-	-	197	100
Harvest	-	-	158	80.2	39	19.8	-	-	197	100
Post-harvest activities	-	-	-	-	197	100	-	-	197	100
Marketing	-	-	-	-	197	100	-	-	197	100

Farmers' Field Schools (FFSs) on Agricultural Productivity

Table 3: Frequency distribution and percentages of respondents according to their opinion on the impact of the diffused Innovations on Productivity

Classification	Frequency	Percent
Impact of Applying on Agricultural Productivity		
Yes	173	87.8
No	24	12.2
Total	197	100
The level of impact of Applying on Agricultural Productivity		
High	113	65
Medium	48	28.8
Low	12	6.9
Total	173	100

Table 3 indicates that 87.8 cmmented that the application of the agricultural innovations diffused by the FFSs had direct contribution to improve their farm productivity This results reflects the positive role of FFS in farmers transformation. In other words to have positive change on farmers' knowledge, attitudes, and behavior towards the new agricultural innovations. Thus to improve crop' productivity. This result is compatible with Rola et al. (2002) who concluded that Farmer Field School (FFS) required significant investment in time, training and other facilities, the approach could be an expensive way of diffusing new science-based knowledge and other information to farmers, and changed their attitudes towards this knowledge and assist them to apply in the field.

Determinants of Farmers' Participation in FFSs

Multiple regression analysis in Table4 reveals that education level, farm ownership, farm size, and the period of residency scales had significant positive regression weights, indicating that farmers with a high level of education, farm ownership, farm size, and the period of residency are expected to have more desire to participate in FFSs to know more about new information about agricultural innovations to develop their agricultural activities and increase their productivity. Age and agricultural experience had a significant negative regression weight, indicating that farmers older farmers with a more agricultural experience scores, are expected to participate in FFSs at less frequently, this mean that young farmers are more willing to participate in FFSs than older farmers, because the young farmers are more risk takers and expected t search for agricultural information and innovations to improve their agricultural experience This findings also indicates that participants with more agricultural experience had less participation rate in FFSs, as they were expected to be have high confidence in their agricultural information and skills, so they may not have interest to seek further information and skills.

Table 4: Multiple Regression analysis of the socioeconomic characteristics of respondents

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	9,101	4,387		2,226	,018
Respondents' age	-,152	,089	-,147	-2,155	,039
Education level	1,431	,512	,187	2,416	,003
Farm ownership	,030	,011	,122	2,272	,014
Farm size	,000	,000	,028	2,736	,001
Agric. experience	-,103	,076	-,163	-2,213	,005
Period of residency	,000	,000	,039	2,487	,012

Table 5 Results of T-test for the difference between the productivity of three crops (Onions, tomatoes, and potatoes)

Variables	Group	Mean Score	Std. dev	Mean dif	Std error dif	t	Sig.
Total production of onions	1 0	57.89 13.41	67.741 9.315	43.501 43.501	10.869 1.462	4.138 4.138	0.030
Total production of tomatoes	1 0	165.16 58.43	184.278 46.876	114.690 114.690	28.276 7.569	3.853 3.853	0.000
Total production of potatoes	1 0	55.43 15.65	60.593 22.876	39.700 39.700	9.579 3.611	3.879 3.879	0.000

Examine the Difference between the Productivity of three crops (Onions, tomatoes, and potatoes)

Table 5 shows that there is a significant difference between participants and non- participants in term of total production of three crops (onions, tomatoes, and potatoes). Date in the table reveals that the mean score of the total production of onions are57.89 and 13.41 for the participants non-participants respectively, with t-value 4.138 and significance of 0.030. The mean scores of the total production of tomatoes are 165.16 and 58.43 for the participants non- participants respectively with t-value 3.853 and significance of 0.000. Results in the table also show that the mean scores of the total production of potatoes are 55.43 and 15.65 for, for the participants and non- participants respectively with t-value 3.879 and significance of 0.000. These findings revealed that FFSs participants secured better agricultural productivity than the non- participants farmers. These results are consistent with Abu Baker (2000) concluded that to cope with these challenges of low agricultural productivity, many extension approaches have so far been used to increase productivity in general and profitability in particular. He also commented that FFSs was recommended to improve farmers' livelihoods.

4. Conclusion and Recommendations

There are significant challenges facing the agricultural development and transformation in Khartoum state. Recently the FFSs approach has been implemented intensively in different localities of the state to contribute in solving the problem to bridge the knowledge gap by delivering agricultural information and innovations to farmers and helping them to improve their production. This study was conducted to assess role FFSs to meet its prescribed objectives in the study area. The findings of multiple regressions revealed that the level of participation in the FFSs was significantly associated with the education level, farm ownership, farm size, and the period of residency. However, the level of application of received agricultural innovations was significantly associated with the education level, farm ownership, farm size, total income, and the level of participation in FFSs. Analysis of T-test indicated that there was a significant difference between in terms of the total production of three crops (onions, tomatoes, and potatoes). The study proposed the following recommendations and measures to be considered by the concerned authorities of Khartoum State. These include:

1- Expansion of FFSs to cover all localities of the State.

2- More efforts are badly needed to encourage farmers to participate in FFSs activities.

3- The FFSs should provide more emphasis on activities related to harvesting operations and post-harvest technology to reduce production losses.

3-The need for extension education marketing should be considered in FFSs activities.

References:

1. Abu Baker, N (2000). The Sudanese Countryside and the Pioneers of Agricultural Extension. General Organization for Printing and Publishing, Khartoum, Sudan: 82.
2. Ahmad, M (2007) Interaction of Extension Worker with Farmers and Role of Radio and Television as Sources of Information in Technology Transfer: A Case Study of Four villages of District Peshawar and Charade, Sarhad J. Agric., 23(2): 64-73.
3. Agricultural Planning Administration, Ministry of Agriculture, Khartoum State (2015). Annual report: 61.
4. Agricultural Planning Administration, Ministry of Agriculture, Khartoum state (2016) Annual Report: 53.
5. Alsadding, A. N. (2010) evaluation of agricultural extension services in some states in Sudan through the period: 1958-2008, university of Khartoum (PhD thesis): 321. .
6. Elfadual, I. Y. M. (2012) the role of farmers' field schools centre in agricultural development, university of Khartoum: 29.
7. Elhassan, A. A., Sadding, Kh. R., Oshiekh, M. A., (2011) agricultural extension guide, administrative of Technology Transfer and Extension, Kassala state: 120.
8. FAO, and JICA (, 2011) Farmer Field School Implementation Guide, Kenya Forest Service: 553.
9. Farmers' unions in Khartoum state (2013). General records: 33.
10. Haj-khalifa, A. K. (2000) the role of the mass media in activating the process of adoption and modernization amongst the farmers of province east of Nile- Khartoum State,, Sudan University of Science and Technology (M.Sc. Thesis): 208.
11. International Initiative for Impact Evaluation (IIIE) (2014) farmers' field school form agricultural extension ton adult education, Hugh Waddington Howard White: 52.
12. Khatam A; uhammad, S; and Chaudhryk, M (2010) Strength and Weaknesses of farmers' Field Schools Approach as Perceived by Farmers, *Sarhad J. Agric*, Vol. 26, No.4,: 686-688.

13. Khartoum State, (2017). About the state website: http://www.khartoum.gov.sd/index.php?pag=1, date: 11 December 2017:5.
14. Olaniyi, A. S. & Gbemiga, A. J. (2013) Assessment of Use of Selected Information Communication Technologies (ICTs) for Extension Service Delivery: Implication for Agricultural Development in Nigeria, International Journal of Agricultural Management & Development (IJAMAD) ISSN: 2159-5852 (Print) ISSN: 2159-5860 (Online): 131-139.
15. Rola, A.C., S.B. Jamias and Quizon. J (2002). Do Farmer Field School graduates retain and share what they learn? An investigation in Iloilo, Philippines. *J. of Int'l Agric. Extension Educ.* 9(01):69-78.
16. Gary, M S, and Bayor A., A (2012). Impact of Low-Cost, On-Demand Information Access in a Remote Ghanaian Village, USCA Annenberg School for Communication & Communication & Journalism, 8(2):85–100.
17. Sheingate, A (2008). Agrarian Social Pacts and Poverty Reduction, UNRISD Flagship Report: Combating Poverty and Inequality: 59.
18. The General Administrations for Technology Transfer and Extension (ATTE) in the study area- general official archives, 2000-2013.
19. The General Administrations for Technology Transfer and Extension of Khartoum state (2013). General Official Archives 2013: 157.
20. Yahia, M. Z. (2014) Effectiveness of Radio and Television Extension Programmes in the Dissemination of Recommended Agricultural Technologies in Sudan, University of Khartoum (PhD thesis): 257.

12/20/2017