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Utilization of Mobile Cell Phone as an Effective Agricultural Extension Contact Method among Extension Agents, Khartoum State, Sudan.

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ABSTRACT

Extension workers use an individual and group contact methods in addition to mass media to contact farmers in order to do better job farming. Each of these contact methods has its advantages and disadvantages. It is high time to find out a contact method that has the advantages of all these methods and rid of their disadvantages. In the rhetoric, mobile cell phone has the advantages of all these methods and free from all their disadvantages. The objective of this paper is to investigate the possibility of using mobile phone as an effective extension contact method among Khartoum state extension agents. A questionnaire is designed to collect the needed data. All the extension workers (40) in the study area were interviewed. The collected data were analyzed using Statistical Package for Social Sciences (SPSS), frequencies, percentages, weighted mean and Chi² are calculated. The

results revealed that: all extension workers (100%) have mobile phone and (87.5%) of them have smart phone. Extension workers have a positive attitude towards using mobile phone as extension contact method at a weighted mean of (4.07) according to Likert scale results. 10% of the extension workers used video and short written message to contact farmers, while 40% of them used telephone call and 25% of them used both mentioned ways. Chi² test results shows that there was a high association between the extension workers personal characteristics and suitability of using mobile phone at a level of significance of 0.00. It is recommended that extension and technology transfer directorate should regard mobile phone as genuine extension contact method and provide extension workers with more advanced smart phones and train them on how to use it as a contact and teaching method effectively, the extension workers should use all individual and group contact methods to inform and teach farmers the importance of using mobile and urge them to act upon, and take advantages of social media and establish whatsApp groups contacts involve all the farmers and the extension workers in Khartoum state to hang together and stick together so as to exchange ideas, skills and discuss problems that farmers face.

Key words: *Utilization; Agricultural extension; Mobile cell phone; Contact method; Extension agents.*

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1. INTRODUCTION

Agricultural Extension (AE) in Sudan is well known as a link between agricultural research institutions and farmers. However, in recent years this role is not activated due to budget shortages. The overall agricultural sector is receiving only 1-3% of the country's GDP (Gross Domestic

Product). Hence, looking for cost cutting means of information dissemination is crucial to preserve the agricultural extension role in Agriculture (Khalifa, 2014).

The information communication technologies are increasing in developing countries for the development of different people such as educated persons, doctors, and agricultural specialists etc... The farmers are one of the big communities in developing countries where they have no facilities in their areas to increase their product and income. Mobile phone is increasing among farmers but still there is a gap available among business, customers and farmers. There is need of enhancement different projects about mobile phone technologies where farmers could get easy access to communicate with people to sell their goods in markets. The government and other related departments should also plan to reach these farmers and provide latest information about seed, weather and market on the time and provide good price of their product (El-Adly, 2000).

Dudley (2008) reported that extension contact methods are usually classified into three types as follows:

- 1- Individual contact methods.
- 2- Group contact methods.
- 3- Mass media methods.

Extension contact methods are the ways of communicating between the farmers and the extension agents. Through extension methods, knowledge and skills are disseminated to the farmers. It is vital for the extension agents to completely be familiar with these methods since it is important for the agent to pick a certain method according to the situation. Group and individual contact methods are some of the extension methods through which messages regarding latest agricultural technologies can be communicated to the farming community.

Irfan *et al.* (2006) stated that individual and group contacts like personal, face-to-face extension methods, which come under categories, have their own strengths and weaknesses. One of their limitations is that they cover limited number of farmers in the community. It has been seen that individual extension methods can be costly in both terms of time and scarce extension resources, and that they reach only a limited number of people.

Mgbada (2006) found that women farmers rated individual method contact and the use of radio as the most important and most effective sources of agricultural information to them while the extension agents rated individual, group and mass media contact method as being important and effective.

Similarly, Arshed *et al.* (2012) concluded that individual contact methods were ranked highest in the effectiveness of dissemination of agricultural information to maize growers in India.

The information given by Extension Field Staff (EFS) through different extension methods is also not considered very effective (Bajwa *et al.*, 2008). While disseminating new technologies among farmers, different extension methods are employed by extension field staffs which play an important role (Muhammad, 1994).

Ponniah *et al.* (2008) stated that approach of individual contact method is most effective for activities undertaken by or within the full control of the individual farmer or household.

There are many methods available to any communicator or extension agent to reach an audience with a message. It is important to select and use the proper channels of communication in order to be effective in the communication process. Furthermore, extension education is more effective when combinations of two or more forms are used because it provides an opportunity to impart knowledge, make it more appealing and increase motivation.

Telephone communications is one of the common and successful ways to use in many developed countries. The effectiveness of this method assumes suitable that connect large number of farmers, indispensable part of life. It was the invention of telephone which really opened the way for communication revolution. Nowadays it has become an indispensable part of commercial, industrial and domestic life.

Telephone call is an old communication method used by extension workers to contact farmers in remote areas, where the extension worker has no accessibility to visit them in their homes or at fields. Also it is appropriate teaching method for farmers nearby who want to contact extension worker when they have some urgent problems need immediate solution, but they have no time or transportation means to visit the extension worker at office (Kelsey & Hearn, 1955). Rural telephone networks in Sudan are part of the process through which rural people are becoming more linked together and with most parts of the country and the rest of the world. Telephones are means of exchanging social information, particularly to maintain contact with scattered family members and keep them in touch. Experience with telephone services has shown the potential for rural people benefits from various development services such as agriculture, health and education services.

2. METHODOLOGY

Area of the Study

The study is conducted in Khartoum state. Khartoum is one of the eighteen states of Sudan. Although it is the smallest state by area (22,142 km), it is the most populous (5,274,321 in 2008 census). It comprises the city of Khartoum, which is the capital of Sudan.

The state lies between longitudes 31.5 to 34 °E and latitudes 15 to 16 °N. It is surrounded by River Nile State in the north-east, in the north-

west by the Northern State, in the east and southeast by the states of Kassala, Gedaref and Gezira, and in the west by North Kordofan state.

The weather is warm in the summer, and cold and dry in the winter. Average rainfall reaches 100–200 mm in the northeastern areas and 200–300 mm in the northwestern areas. The temperature in summer ranges from 25 to 40 °C from April to June, and from 20 to 35 °C in the months of July to October. In winter, the temperature declines gradually from 25 to 15 °C between November and March.

The state is geographically divided into localities. There are seven localities namely al-Khartoum Locality, Jabal Awliya', al-Khartoum Bahri, - East Nile, Omdurman, Ombadda and Karari Locality.

The Sample

The population of the study consists of all extension workers in Khartoum state. The total number of extension workers is 40 members. All the extension workers (40) were representing the sample for this study.

Data Collection

For collecting primary data for this paper a questionnaire was distributed to the extension workers (40) in the study area. The extension workers were interviewed directly by the researchers.

Data Analysis

The collected data was coded and fed to computer, Statistical Package for Social Sciences program (SPSS) were used to analyze the data. Frequencies and percentage were calculated for descriptive analysis, weighted mean to show the respondents attitude towards using mobile phone as an extension contact method according to Likert scale results, while χ^2 were used to illustrate the association between the respondents personal characteristics and suitability of using mobile cell phone as an extension contact method.

3. RESULTS AND DISCUSSION

This part of the paper is devoted to the results obtained from the field survey. It illustrated the personal characteristics of the respondents in Khartoum State, the respondents' acceptance and readiness to use mobile cell phone (MCP), and the relationship between the respondent's personal characteristics and the suitability of using mobile cell phone as an extension contact method at a level of significance of (0.05).

Table 1 shows that the majority (80%) of extension workers are in age group ranging from 21 to 40 years, and few (7.5%) of them are in age group (51-60) years. It is clear that the majority of them is young and have an opportunity to work for long time with farmers and have the opportunity to improve their work with training sessions conducted in the future.

Table 1. Distribution of the extension workers by age

Age group	Frequency	Percent (%)
21-30	13	32.5
31-40	19	47.5
41-50	05	12.5
51-60	03	07.5
Total	40	100.0

Vast majority (95%) of extension workers are graduated and some of them are post graduated. This indicates that extension workers in the study area are qualified and well competent to cope with new technologies to perform their work better, and to do efficiently in their jobs (Table 2).

Table 2. Distribution of the extension workers by educational level

Academic qualification	Frequency	Percent (%)
Sudanese certificate	01	02.5
Agricultural Technical Diploma	01	02.5
Bachelor of Agriculture	24	60.0
Master degree	14	35.0
Total	40	100.0

Most (62.5%) extension workers have bachelor degree in agricultural extension, while the others have different specializations such as: crop production, crop protection, horticulture, agric. engineering, agric. economics, animal production and veterinarian. Those who are not specialized in agricultural extension may serve as a subject matter specialist to support the extension workers to get the essential issues necessary to make their job more efficient (Table 3).

Table 3. Distribution of the Extension Workers by Academic Specialization

Agricultural specialization	Frequency	Percent (%)
Agricultural extension	25	62.5
Crop production	03	07.5
Crop protection	01	02.5
Horticulture	01	02.5
Agric. Engineering	03	07.5
Animal production	03	07.5
Agric. Economics	02	05.0
Veterinary	01	02.5
Forestry and pastures	01	02.5
Total	40	100.0

The majority (85%) of the extension workers have experience in work range from 1-10 years, This result is in the line with the results obtained in Table 1 as 80% of the respondents are young in age (less than 40 years), this time of work experience is considerable enough for them to act effectively in their work (Table 4).

Table 4. Distribution of the extension workers by work experiences

Experience (in years)	Frequency	Percent (%)
1- 5	20	50.0
6 -10	14	35.0
11 -15	02	05.0
21-25	01	02.5
more than 31	03	07.5
Total	40	100

Only 10% of the extension workers are skilled at dealing with mobile cell phone as an extension contact method. This means that mobile phone is not efficiently used in the study area as the vast majority of them lack skills to deal with it properly.

It is clear that all the extension workers (100%) have a mobile cell phone (MCP). This means that gaining a mobile set is not at all a problem and more effort should be exerted to make the respondents get benefit from their mobile cell phone to facilitate communication process with farmers. Katengeza (2011) found that more recent studies still identify early adopters and more intensive users in India as better off with a high correlation between mobile ownership, use of a bank account and greater asset endowment. Also Martin and Abbott (2011) found that mobile phones are having a democratizing (leveling) effect with no significant difference in ownership between leaders and non-leaders identified in rural communities in India.

Table 5. Distribution of the extension workers by efficiency in using mobile phone as extension contact method

Efficiency	Frequency	Percent (%)
Skilled	04	10
Not skilled	36	90
Total	40	100

The majority (87.5%) of the extension workers have smart phone, although only 10% are well skilled in using mobile in extension use as shown in table (5). Extension directorate should take this advantage and train extension workers on how to use smart mobile phones as an extension contact method, taking into account the miracle merit of (MCP) which allows high interaction among extension workers and between extension workers and farmers (Table 6).

Table 6. Distribution of the extension workers by mobile version

Mobile version	Frequency	Percent (%)
Simple mobile phone	05	12.5
Smart mobile phone	35	87.5
Total	40	100.0

The vast majority (95%) of the extension workers used mobile cell phone (MCP) to contact farmers (Table7), despite their lack of skills in dealing with mobile phone as shown in table (5) which results in poor performance, (they know how to use mobile phone, but were not expert in the technology). As they cannot benefit from the high technology that smart phone can offer. Aker (2011) identified mobile phones as the predominant communication technology amongst farmers in Ghana.

Table7. Distribution of the extension workers by using mobile cell phone as contact method

Using mobile as contact method with farmers	Frequency	Percent (%)
Using	38	95.0
Not use	02	05.0
Total	40	100.0

The vast majority of extension workers contact farmers to aware them about the technical package including sowing date, certified seeds, land preparation, space between holes, depth of holes, pesticides and irrigation at percentage ranging from (80-97.5%), while about half of them (55%) used mobile phone to contact farmers for financing problems, and 66.5% of them contact farmers to inform them about storage and marketing matters (Table 8). It is clear that extension workers used mobile phone with regard to simple messages, they do not contact farmers with videos message about results of demonstrations or methods of demonstrations or short films to learn new advanced skills, or to show the advances in agriculture that made anywhere in the world.

This may be due to the lack in training on using mobile phone as mentioned earlier. Katengeza (2011) explained that the introduction of mobile telephony or mobile-enabled agriculture information services have a higher impact in regions which are poorer and are remote from markets. This is so because the initial returns to the introduction of mobile based information services are larger in the regions which have higher information gaps. Aker (2010) illustrates that the primary mechanism through which mobile phones improve market efficiency is a change in traders (middlemen) marketing behavior, grain traders operating in mobile phone markets search over a greater number of markets, sell in more markets and have more market contacts as compared with their non-mobile phone counterparts in South Africa.

Table 8. Distribution of the extension workers by dissemination of technical packages through mobile cell phone (MCP)

Technical packages	Always		Some times		Not a tall	
	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Sowing date	32	80.0	7	17.5	2	02.5
Improved seeds	26	65.0	12	30.0	2	05.0
Land preparation	30	75.0	6	15.0	4	10.0
Space between holes	13	32.5	22	55.0	5	12.5
Depth of holes	13	32.5	19	47.5	8	20.0
Pesticides	17	42.5	20	45.0	3	07.50
Fertilization	23	57.5	14	35.0	3	07.50
Irrigation	25	62.5	13	32.5	2	05.00
Harvesting	16	40.0	23	57.5	2	02.50
Storage issues	08	20.0	19	47.5	13	32.50
Marketing	11	27.5	16	40.0	13	32.50
Financing	07	17.5	11	27.5	22	55.00

Table 9 illustrates that large percentage of the extension workers ranging from 77.5%- 97.5% inform famers about the urgent information like meetings, demonstrations, crop rotations, recent publication, field days,

training courses and group discussions. Aker (2011) elicits the role of mobile phones in supporting access to information about agricultural technologies and extension services in Niger. She identifies several potential mechanisms in this context, including improving access to information from private sources or through agricultural extension services; improving the management of input and output supply chains, facilitating the delivery of other services, increasing the accountability of extension services, and increasing linkages with research systems. She also notes a number of challenges associated with the use of mobiles in agricultural extension, such as the need for literacy skills and technological knowledge, the limits of mobiles to display complex information, and technical difficulties in developing voice-based systems.

Table 9. Distribution of the extension workers by using mobile cell phones to contact farmers to diffuse the urgent information

Urgent information	Always		Some times		Not at all	
	Frequency	Percent (%)	Frequency	Percent (%)	Frequency	Percent (%)
Crop rotation	21	52.5	14	35.0	5	12.5
Watch TV program	17	42.5	19	47.5	4	10.0
Radio	19	47.5	15	37.5	6	15.0
Publication	25	62.5	12	30.0	3	7.5
Meeting	26	65.0	13	32.5	1	2.5
Demonstration	20	50.0	17	42.5	3	7.5
Field day	20	50.0	16	40.0	4	10.0
Participation	13	32.5	18	45.0	9	22.5
Training courses	11	27.5	22	55.0	7	17.5
Group discussion	12	30.0	20	50.0	8	20.0

The most common way to contact farmers is telephone voice call as it has been used by 40% of the extension workers, followed by short text message (SMS) as it has been used by 20% of them, and only 10% of

them used video messages (Table 10). As it is mentioned earlier this last category includes the only ones who are trained on using mobile phone as an extension contact method. This result is in accordance with results obtained in before as most farmers used telephone call followed by those who used short text message (SMS). Klonner and Nolen (2009) explained that mobile phone coverage has been successful in generating employment opportunities in Niger, to date, there have not been studies examining impact of mobile phones on both formal and informal job creation. Thus mobile phones have the potential to not only reduce costs, but also allow for more regular and timely access to information. Several mobile services have already been developed that deliver information to farmers either on demand or by sending updates via SMS or audio recordings. Mobile services may also serve to facilitate farmer-to-farmer or farmer-to-buyer relations, such as sharing of experiences on farming practices and market information related to prices, supply and demand.

Table 10. Distribution of the extension workers by ways of contacting farmers using mobile cell phone (MCP)

Way of contact	Frequency	Percent (%)
Telephone voice call	16	40.0
Short text messages (SMS)	08	20.0
Video messages	04	10.0
Telephone call + SMS	10	25.0
Not use	02	05.0
Total	40	100.0

About one third (37.5%) of the extension workers contact farmers via (MCP) before season, while only 17.5% of them contact farmers at the end of the season. This results is in accordance with the results obtained before as nearly the same percentage that contact extension workers before the season ask about information about the land preparation, and improved seed to be used, while those who contact during the season ask about practices done during the season such as fertilizers application and

using pesticides, while those who contact at the end of the season ask about storage and marketing matters.

Table 11. Distribution of the extension workers by time of contacting farmers via (MCP)

Contact time	Frequency	Percent (%)
Pre-season	15	37.5
During season	16	40.0
At the end of the season	07	17.5
Not contact at all	02	5.00
Total	40	100.0

Half of the extension workers (55%) contact farmers weekly via mobile cell phone (MCP), 12.5% of them contact farmers every two weeks, while 27.5% of them contact farmers monthly. It is clear that the frequency of contact to some extent was suitable.

Table 12. Distribution of the Extension Workers by Mobile Cell Phone Contact Frequencies

Contact frequency	Frequency	Percent (%)
Weekly	22	55.0
2 weeks	05	12.5
Monthly	11	27.5
Not contact at all	02	5.00
Total	40	100.0

According to Likert scale measurement reveals that the suitability of using mobile phone to deliver needed information among farmers in the study area, regarding exchange of ideas and information, convey skills, awaking about places to sell their products, inform them about market prices, alert them about new innovations and offer guides and advice about where to find the desired inputs at a weighted mean ranging from 3.3 to 4.2, which means that all types of agricultural information can be diffused through mobile cell phone (MCP) with great degree of accuracy

(Table 13). It is obvious that mobile phone can substitute all extension contact methods; individual contact method, group contact method, and mass media to communicate with farmers to make them aware about the new advanced technology in agriculture and what is going around them with reference to their farming work at a minimum cost, in time to overcome the problem of limited number of extension workers versus the large number of farmers in the study area.

Aker (2011) investigated the impact of cell phones on grain markets in Niger identifying positive arbitrage (reduced grain price dispersion and variations across markets) resulting from a reduction in search costs and hence transaction costs, as well as lower grain prices (3.5% reduction in prices from 2001 to 2006).

Table 13. The Extension workers opinion towards communicating farmer via mobile

Purpose of contact	Quite suitable		Suitable		Moderate		Not suitable		Not suitable at all		Weighted mean *
	F	%	F	%	F	%	F	%	F	%	
Exchange ideas and information	14	35.0	10	25	16	40.0	0	0	0	0	3.95
Convey skills	20	50.0	9	22.5	11	27.0	0	0	0	0	4.22
Sell places	18	45.0	5	12.5	13	32.5	4	10	0	0	3.92
Market prices	22	55.0	8	20.0	10	25.0	0	0	0	0	4.50
Agricultural innovation	19	47.5	5	12.5	15	37.5	1	2.5	0	0	3.30
Agricultural inputs	20	50.0	7	17.5	11	27.5	2	5.0	0	0	3.32

*According to Likert scale: (Likert, 1932).-weighted mean >3 means positive attitude.
-weighted mean =3 means neutral attitude.-weighted mean <3 means negative attitude.

Agricultural extension workers have a positive attitude towards using mobile phone as an extension contact method at weighted mean of 4.07 according to Likert scale results. This means that mobile cell phone is regarded as an acceptable and desirable contact method to be used by extension workers to contact farmers. As all the extension workers have

a mobile phone, and 87.5% of them have smart phone, and only 10% of them have the skill to use it properly as an extension contact method, mobile cell phone can play a great role in dissemination of information and improved practices if extension workers receive the appropriate training to use it as a contact method, and hence improve extension workers daily performance (Table 14), Nigel (2004) reported that mobile phone provided farmers with information and has opened opportunities for new services through short text message (SMS).

Table 14. The extension workers attitude towards using mobile cell phone as an extension contact method

Quite suitable	Suitable	Moderate	Not suitable	Not suitable at all	Weighted mean*
17	10	12	1	0	4.07

* According to Likert scale: -weighted mean >3 means positive attitude. -weighted mean = 3 means neutral attitude. -weighted mean < 3 means negative attitude.

Chi² test results in Table 15 shows that there is a significant relationship between the extension workers personal characteristics namely age, experience and educational level and the suitability of mobile cell phone to disseminate skills and knowledge at a level of significance ranging from 0.01 to 0.00.

Table 15. Chi² test for association between the extension workers personal characteristics and suitability of using mobile cell phone as an extension contact method

Personal characteristics	Disseminating skills			Disseminating knowledge		
	Chi ²	d.f	Sig.	Chi ²	d.f	Sig.
Age	16.4	3	.001	16.4	3	0.01
Experience	36	4	.00	36.2	4	.00
Educational level	37.4	3	.00	37.4	3	.00

4. CONCLUSION

It can be concluded that all the extension workers have a mobile phone and the vast majority of them have smart ones. Extension workers have a positive attitude towards using mobile phone as a communication method to contact farmers. Most extension workers contact farmers through mobile phone to make them aware about different matters regarding their farming work.

It is clear that mobile phone is a suitable communicative method to be used by the extension workers in the study area if a good and appropriate plan is conducted to pave the way for both farmers and the extension workers to communicate with each others.

Based on the findings of this paper, it is recommended the followings for the general extension directorate:

- Advised regard mobile phone as one of the essential extension contact methods and urge extension workers to incorporate it into ongoing communication process among farmers in the study area.
- Provide extension workers with more advanced smart mobile phones to use for sending and receiving messages to and from farmers in the study area.
- Train extension workers on how to use mobile phone effectively as a contact and teaching method.
- To establish on the website an open-source platform that utilizes mobile phone networks to allow information to be delivered to and shared by both farmers and extension workers in Khartoum state.
- Take advantages of social media and establish whatsApp groups contacts involve all the farmers and extension workers in Khartoum state to hang together and stick together so as to exchange ideas, skills and discuss problems that farmers face.

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المستخلص

يستخدم الهاتف المحمول على نطاق واسع كوسيلة اتصال إرشادية في البلدان المتقدمة وبعض الدول النامية. وله مزايا الاتصال الجماهيري في نشر الأفكار الجديدة، ويقوم بدور وسائل الاتصال الجماعي في تعليم المزارعين المهارات الجديدة، بالإضافة إلى أنه وسيلة اتصال بالافراد. تهدف هذه الورقة إلى بحث إمكانية استخدام الهاتف المحمول كوسيلة إرشادية فعالة بين مزارعي ولاية الخرطوم. وللقيام بذلك فقد تم تصميم استبانة لجمع البيانات المطلوبة. تم اختيار عينة حجمها (400) مزارعاً من جملة عدد مزارعي ولاية الخرطوم البالغ عددهم (200) ألف مزارعاً وفقاً للمعادلة الإحصائية $(Z^2 \times p \times q) / e^2$. بعد جمع البيانات تم تحليلها عن طريق جهاز الكمبيوتر باستخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (SPSS) ومن ثم حساب التكرارات والنسب المئوية والوسط الحسابي المرجح و مربع كاي (Chi^2). أظهرت النتائج أن 92% من المزارعين لديهم هواتف محمولة و 37.2% منهم لديهم هواتف ذكية. وأن للمزارعين موقفاً إيجابياً تجاه استخدام

الهاتف المحمول للاتصال بالمرشدين بمتوسط مرجح قدره 3.8 وفقاً لنتائج مقياس ليكرت. يستخدم 31% من المزارعين الهاتف المحمول بشكل منتظم للاتصال بالمرشدين، بينما 50% منهم يستخدمونه للتواصل مع أقرانهم لتبادل الأفكار ومشاركة حل المشاكل. تجدر الإشارة إلى أن 3.5% من المزارعين يتواصلون مع المرشدين عن طريق الواتساب والفيديوهات والرسائل. توصى الورقة بأن يتخذ جهاز الإرشاد ونقل التقانة الهاتف المحمول كوسيلة اتصال أساسية وتزويد المرشدين بهواتف ذكية متقدمة وتدريبهم على كيفية استخدامها كوسيلة تعليم فعالة. كذلك يجب تدريب القادة المحليين على استخدام الهاتف المحمول ليلعب دور نموذجي بين المزارعين. وأخيراً أن يزود اتحاد المزارعين بالولاية المزارعين بالهواتف النقالة الذكية بتكلفة مدعومة لجعل الحصول على الهاتف المحمول في متناول يد جميع المزارعين.

كلمات مفتاحية: ولاية الخرطوم؛ الإرشاد؛ الهاتف المحمول؛ السودان.

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