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Assessment of Farmers' Utilization of Global System for Mobile (GSM) For Communication in the Fadama III Program in Taraba State, Nigeria

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Abstract

The study assesses the farmers' use of Global System for Mobile (GSM) for communication among farmers in agricultural extension programs in Taraba State, Nigeria. Specifically, the objectives include: identify key areas in which GSM are used for communication in agricultural extension programs activities, determine the frequency of usage of GSM for information exchange between farmers and extension personnel; and ascertain farmers' satisfaction in the use of GSM in obtaining information in the various agricultural extension programs. The population for this study included all beneficiaries/farmers under the agricultural extension programs in Taraba state, Nigeria. Purposive sampling was adopted because of the accessibility of the selected three Local Government Areas (LGAs), (Ardo-Kola, Jalingo & Lau) throughout the year. Five Fadama User Groups (FUGs) were randomly selected from each LGA to constitute fifteen FUGs for the study. From each FUG, ten respondents were drawn randomly to give a sample size for the study. In the Fadama III project, respondents' key areas of communications with personnel of the project included: group formation (88%), mobilization of members for participation in Fadama III programs and activities (87.3%), awareness creation of Fadama III intervention (82.7%), capacity building activities (81.3%), convening of Fadama User Group (FUG)/FCA meetings (81.3%), sub-project preparation and management (80.7%), advisory services and input support services (80%), environmental/social screening friendly practices (72.7%), asset acquisition activities (68%), record-keeping activities (66%), small-scale community infrastructure activities (63.3%) and financial management (61.3%). Farmers indicated their satisfaction in obtaining information o;n capacity building activities by the use of GSM with the (M = 1.21), advisory services and input support activities (M = 1.28), asset acquisition activities, (M= 1.16), mobilization of members for participation in Fadama III activities (M = 1.40), convening FUG/FCA meetings (M = 1.43), financial management (M=1.09), record-keeping activities (M = 1.17), awareness creation of Fadama III intervention (M = 1.27), group formation (M = 1.37) and environmental/social screening and environmentally friendly practices (M = 1.17). The main challenges included no GSM phones provided by Fadama III to farmers (M = 1.37), low level of education of farmers (M = 1.55), erratic power supply (M = 1.41), high call tariff (M = 1.11), poor network coverage (M = 1.24), lack of maintenance e.g recharging (M = 1.11), and fluctuating services by the service providers (M = 1.16). The study suggested that the Information and communication unit of the Fadama III project should collaborate with other media outfits and extension units to disseminate agro-information to the benefits of the Fadama III beneficiaries.

Keywords: Fadama 111; Communication; Global system for mobile (GSM).

1. Introduction

Information Communication Technologies (ICTs) refer to technologies that facilitate the creation, processing and transfer of information across space and time. At the heart of ICTs technology lie two main or branches of technology: computing and telecommunication. ICTs facilitate the flow of large volumes of information to a wide audience across numerous geographical locations. It is required for effective and successful transfer of technologies that are designed to boost agricultural extension delivery. For famers to benefit from ;;such technologies, they must first have access to them and learn how to effectively utilize them in their farming systems and practices. The extension agencies make use of different ICTs, particularly the Global System for Mobile (GSM) in transferring improved agricultural technologies and practices to the end users [1]. Torero [2], reported that information and communication technologies (ICTs) play important role in empowering farmers. In other words, these technologies, especially mobile phones (GSM), stimulate agricultural and rural development through the provision of information and capacity-building opportunities thereby making rural farmers to need information in higher magnitudes for increased productivity.

According to Shelton [3], a farmers' success depends on more than good weather, healthy soil, and proper seeds. Good farming also involves a series of decisions: how many crops to plant in each growing season, whether to invest in new crops only and which markets to sell the produce to. The right decisions can mean the difference between a profitable harvest and a net loss in farm income. Farmers make these decisions based on their knowledge of prevailing market prices, and supply and demand trends based on produce quality. When they lack access to up-to-date information about prices, farming conditions and produce quality, their productivity and profits can suffer. The key to filling the information gap could lie in something many of us take for granted - mobile phones. Mobile phones can save farmers time and money, and maximize their profits. For example, when rural farmers want to find the market that will offer the highest price for their maize, their only option may be to travel to each market in person, a costly venture. Faced with this option, a farmer will frequently decide to sell to the nearest market or at the farm gate, missing out potentially more lucrative opportunities. With a mobile phone, a farmer can find out the price for his or her crop in different regional and local markets without leaving home, saves time and expensive travel [3].

Bittner (1989) in Ogbomo and Ogbomo [4] defines mobile phones (GSM) as a telephone system that can move or be moved easily and quickly from place to place. Mobile phones were once the tool of rich and busy executives who could afford both the luxury. Mobile phones are now the ICT that is reshaping and revolutionizing communications globally. Its impact on the economic activities of nations, businesses, and small entrepreneurs is phenomenal. According to Marcelle (2000), in Ogbomo and Ogbomo [4] the availability of this new technology has been reshaping the material basis of the society as well as bringing about a profound restructuring of agriculture, economic, political, and cultural relations among states. Nigeria is not an exception.

The use of GSM in Nigeria just as in other developing countries is improving. According to the Nigerian Communication Commission (NCC) (2013), Nigeria's telecoms consumers may have expended about N107 billion on telephone calls in the year 2012; and crossed the 100 million subscribers mark and ended the year with 113 million active subscribers' base. Today, Nigeria can boast of four big GSM service providers, including Mobile Telecommunication Network (MTN) Nigeria, Globacom, Airtel and Etisalat. The Code Division Multiple Access (CDMA) subsector has three main players, namely; Visafone, Starcoms, and Multilinks.

Global System for Mobile Communications (GSM) is a digital cellular communication standard developed in Europe and now used in more than 160 countries. It employs narrowband Time Division Multiple Access (TDMA) technology which allows eight simultaneous calls on the same 200 kilohertz (KHZ) wide communication band at speeds up to 9.6 kilobits per second (Kb/s). Commercially, GSM was introduced in 1991 and provides a high degree of security by using Subscriber Identity Module (SIM) cards and an advanced encryption scheme. In addition, it offers a bi-directional Short Message Service (SMS) for up to 160 bytes (about 160 characters) long alphanumeric messages which can also be used for broadcasting news chips (GSM-Wikipedia, mhtmldocument, the free encyclopedia, 2013).

The Nigerian government over the years, in an attempt to tackle the dependence on rain- fed agriculture initiated the Fadama program in 1992. Fadama is a Hausa name for irrigable lands-usually low-lying flood plains areas underlay by shallow aquifers found along Nigeria's major river system (*Ingawa et al.* 2004 in Koyenikan1 and Ikharea [5]). The goal of National Fadama Development Project III (NFDP III) is to ensure all-year-round production of food through enhanced use of production technologies, improve agricultural productivity through Fadama irrigation farming along with the use of improved seeds, fertilizer and other relevant inputs became the best alternative option. The program has evolved in phases covering different States in the first and second while the third which is on-going, covers 36 States of the federation. According to Okunlola (2005 in Koyenikan1 and Ikharea [5]), one of the ways of achieving constant food supply in Nigeria is Fadama farming. The NFDP-III aims at sustainably increasing the income of Fadama Resource Users by directly delivering resources to the beneficiary rural communities, efficiently and effectively, and empowering them to collectively decide how resources are allocated and managed for their livelihood activities and to participate in the design and execution of their subprojects, (World Bank, 2011 in Koyenikan1 and Ikharea [5]). The project targets the rural poor [farmers, pastoralists, fisher folks, marketers, processor, hunters, gatherers and other economic interest groups (EIGs)], disadvantaged groups (widows, handicapped, the unemployed youth), service providers, public and private operators and professional associations operating in the project area. The components of Fadama III include; capacity building, communication and information support, small-scale community-owned infrastructure, advisory service and input support, support to the ADPs, sponsored research, and on- farm demonstration, assets acquisition for individual FUGs and EIGs, Project management, monitoring and evaluation.

General Packet Radio Services (GPRS) is a cellular networking service that supports WAP, SMS text messaging and other data communications. GPRS technology is integrated into so called 2.5G mobile phones designed to provide faster data transfer speeds than older 2G cellular networks. The higher data rates allow users to take part in video conferences and interact with multimedia web sites and similar applications using mobile handheld devices (GSM) as well as notebook computers. GPRS is based on Global System for Mobile (GSM) communication and complements existing services such as circuit-switched cellular phone connections and the short message service (SMS).The extension agents therefore can use GPRS and Bluetooth to communicate to farmers especially packages that contain photos and pictures.

1.1. Problem Statement

Agricultural extension programs including Fadama III project is faced with a lot of challenges because communities and subprojects are scattered, sometimes in remote locations with poor communication networks, CDD embraces a range of projects and CDD projects often have a multiplicity of actors/beneficiaries [6]. Addressing

global poverty therefore, is not possible without considering rural populations in developing countries in these rural locations especially small- holder farmers, Fadama III beneficiaries and other agricultural extension programs inclusive. In South Asia, Africa south of the Sahara, East Asia and the Pacific, the rural population represents more than half of the total population of each region [2]. What major challenges do rural populations face? High on the list is lack of access to physical products as well as to new technologies and ideas. This lack of access may limit agricultural output and impede improvements to health and education outcomes. In addition, by leading to unsustainable agricultural practices and resource use, it could arguably be related to environmental degradation. A growing body of evidence suggests that in many circumstances, ICTs, specifically mobile phones (GSM), can help address these problems. Such technologies are thought to increase access to both information and capacity-building opportunities for rural populations in developing countries [2].

Although there was remarkable improvement in the use of ICTs especially the Global System for Mobile (GSM), greater portion of the communication procedures were observed to be mainly through other methods of communication rather than utilization of GSM, but these have not sufficiently been able to meet the information needs of farmers/beneficiaries. According to Egbule [7], it is important to note that to date, the major ICTs used in agricultural extension generally in Nigeria are the radio and television. The radio and television have advantages in that a large number of persons are reached at a particular time, but these have not sufficiently been able to meet the information needs of farmers. The advantages of the mass media notwithstanding, the commercialization of radio and television channels have led to limited or non-existence of agricultural information; through these channels. Furthermore, the limited power supply across the nation has the capacity to hamper information delivery in places where agricultural information is available. These limitations can be addressed by the effective utilization of GSM as it does not require heavy electricity to function. All it requires is charging the battery, and this can be done with little electricity. GSM had great advantages for the rural population who are less educated as it does not require an individual to be literate before it can be utilized. Also, GSM can be purchased by low income earners; the prices of phones differ greatly and can be afforded by rural dwellers who have limited source of income supply. This is evidenced in the fact that the rate of GSM adoption on less than US1$ grew from 16 percent in 2000 to 87% percent in 2008 the world over (Aker, 2010 in Egbule [7]). The GSM device has the potentials in bridging the information divide that exist between the urban and rural places. In many countries across the world, the mobile phone has provided a source of employment, has connected individuals to market and prospective buyers of their commodity. It has also the ability to connect people to health, agriculture, and business information.

Access to ICT technology (GSM in particular) in developing countries, faces two major constraints, which Shelton [3] called “the two Cs.” The first is connectivity. While mobile phone penetration rates in developing countries have increased markedly during the past two decade, significant differences remain between urban and rural areas. One potential explanation for this access gap is cost. In many poor countries, even low-cost mobile phone services are prohibitively expensive for rural households. These high costs can stem from a lack of competition among service providers as well as a lack of adequate government regulation and investment in infrastructure. The second constraint is content. Simply put, the information distributed through mobile phones needs to be useful to farmers, such as offering real-time market prices on the goods they’re trying to sell, farm inputs they want to purchase, weather they need to understand, etc . In the absence of such information, farmers with cell phones may not be able to take full advantage of the technology. Conversely, the more farmers see the value in the information they can access using mobile phones, the more willing they will be to adopt the technology and fully harness its potential [3].

In Nigeria today, the GSM communication has a large market size that cut across both the urban and rural areas. At introduction of GSM into Nigeria, the targeted markets were the urban centers but with the installation of masts linking areas together; service providers (AIRTEL, ETISALAT, GLOBACOM & MTN) have successfully introduced their networks and services into the rural areas. The availability of these networks in the rural areas have enhanced the use of GSM by rural dwellers who are predominantly farmers.

In spite of these merits of GSM usage in dissemination of agricultural information in agricultural extension programs, it is necessary to; investigate and ascertain its utilization by farmers in the various program’s information delivery to the beneficiaries. Consequently, it is of essence to provide answers and proffer solutions to the following problems/questions; viz: What are the key areas in which the GSM are used for communication in Fadama III activities? Do extension personnel/workers use GSM in disseminating information to their beneficiaries? To what extent are the information needs of beneficiaries met by the extension officials in the use of GSM for information delivery in the study area? How frequent are mobile phones used in agricultural extension programs among the stakeholders? Are the farmers satisfied with the utilization of GSM in obtaining information in Fadama III project? And, what are the challenges hampering the efficient utilization of GSM in the area of study?

1.2. Objectives of the Study

The general objective of this study was to assess the farmers’ use of Global System for Mobile (GSM) for communication among farmers in agricultural extension programs in Taraba State, Nigeria. Specifically, the objectives include to:

1. Identify key areas in which GSM are used for communication in agricultural extension programs activities;
2. Determine the frequency of usage of GSM for information exchange between farmers and extension personnel;
3. Ascertain farmers’ satisfaction in the use of GSM in obtaining information in the various agricultural extension programs; and

4. Determine major challenges associated with the use of GSM in agricultural information delivery in agricultural extension programs.

2. Research Methodology

2.1. The Study Area

The study is conducted in Taraba State, Nigeria, The state has sixteen Local Government Areas, The Northern Zone has six Local Government Areas, namely; Ardo Kola, Lau, Karim Lamido ,Yorro, Zing and Jalingo. The state has an estimated population of 2 million people according to the 2006 population census, the state is located on $6^0$30' and $9^0$36' North and longitude $9^0$10' and $11^0$50' East. Taraba state shares common boundaries with six states and a country Cameroun. It is accessible from Adamawa State (North-East), Bauchi and Gombe State (North), Plateau (west) and Benue and Nassarawa States (South-West).

Tropical climate is prevalent in the State. Dry season is from November to March and raining season is from April to October. Average rainfall is 1350mm. temperature varies from place to place with an average of 35^0 depending on the season. Vegetation ranges from tall grasses and forest in the Southern parts. Agriculture is the bedrock of the economy over 80% of its population engages in Agriculture or farming related activities. The state is endowed with fertile land excellent climate conditions and immense agro-based raw materials including livestock and most parts of the state are arable. In Taraba state, there was wide spread of GSM networks in all the sixteen local government headquarters, of the four major service providers, at least two are found in each local government headquarters and some major villages. The most common services found are the MTN and Airtel (Taraba State Investors' Guide, (undated) & Oruonye [8]. Data base by Jamolay Integrated Concepts Ltd [9], shows that Taraba State has the following subscribers on each service provider network: MTN (441,408), Airtel (Zain) (372,084), GLO (265,449) and Etisalat (64,883). The state therefore has a total of: 1,143, 824 subscribers of the total population of two million, three hundred thousand, and three hundred and twenty six (2,300,326), (National Population Commission, 2006 in Bonjoru [10] on the four main service providers.

2.2. Population and Sampling Techniques

The population for this study included all beneficiaries/farmers under the agricultural extension programs in Taraba state, Nigeria. A purposive sampling was adopted because of the accessibility of the selected three Local Government Areas (LGAs), (Ardo-Kola, Jalingo & Lau) throughout the year. Five Fadama User Groups (FUGs) were randomly selected from each LGA to constitute fifteen FUGs for the study. From each FUG, ten respondents were drawn randomly to give a sample size for the study as in Table 1.

Table-1. Summary of Sampling Procedure

LGAs	Total FUGs	Randomly Selected FUGs	Respondents
Ardo-Kola	90	5	10 x 5 = 50
Jalingo	96	5	10 x 5 = 50
Lau	81	5	10 x 5 = 50
Total	**352**	**15**	**150**

Source: Field survey, (2021)

3. Results and Discussions

3.1. Availability and Utilization of GSM Phones Among the Farmers

Results in Table 2 reveal that majority (95.3%) of the Fadama III respondents owned GSM phones and only 4.7% do not have. About (90%) of the respondents reported that they utilize GSM for communicating information on Fadama III activities with the officials/personnel of the project, while 10% of the respondents did not. United Nations Educational Scientific and Cultural Organization UNESCO [11] concurred with this finding, where they stated that, the newer mobile telephones have exceeded the penetration of traditional land lines in most c;ountries. The innovation of GSM phone has steadily reduced the purchase price of phones, laptops, scientific instruments, and specialized software in recent years. The intuitive design of many technologies and their capacity to convey information visually or audibly make them useful to people with limited formal education or exposure to technology especially the GSM (ICT in Agriculture, undated).

Table-2. Distribution of respondents by ownership of GSM phone and its utilization for communication of information in Fadama III activities by the respondents

Variables	Frequency	Percentage (%)
Ownership of GSM phone by the respondents		
Yes;	143	93.3
No	7	4.7
GSM utilization for communicating information in Fadama III activities by the respondents		
Yes	135	90
No	15	10
Total	**150**	**100**

Source: Field Survey.

3.2. Key Areas in Which Respondents Used GSM Phone for Communication in Fadama III Project

In Fadama III project, respondents' key areas of communications with personnel of the project as in Table 3 included: group formation (88%), mobilization of members for participation in; Fadama III programs and activities (87.3%), awareness creation of Fadama III intervention (82.7%), capacity building activities (81.3%), convening of Fadama User Group (FUG)/FCA meetings (81.3%), sub-project preparation and management (80.7%), advisory services and input support services (80%), environmental/social screening friendly practices (72.7%), asset acquisition activities (68%), record keeping activities (66%), small scaled community infrastructure activities (63.3%) and financial management (61.3%) as indicated in Table 3.

It is important to mention that, the most needed key areas are mostly those that have to do with group formation and the mobilization of members' for meetings concerning Fadama III project. This could be because in the Fadama III project emphasized on group or cooperative association in interacting with the beneficiaries. The least percentage of the key areas was financial management which most farmers want to keep as secret in their lives.

Table-3. Key areas in which GSM are used for communication in Fadama III activities (n = 150)

Fadama 111 activities	F	%
Capacity building activities	122	81.3
Advisory services and input support activities	120	80
Asset acquisition activities	102	68
Small-scaled community owned infrastructure activities	95	63.3
Sub-project preparation and management	121	80.7
Mobilization of members for participation in Fadama III activities	131	87.3
Convening FUG/FCA meetings	122	81.3
Financial management	92	61.3
Record keeping activities	99	66
Awareness creation of Fadama III intervention	124	82.7
Group formation	132	88
Environmental/social screening and environmental friendly practices	109	72.7

Source: Field Survey.

3.3. Farmers' level of Satisfaction in the Use of GSM in Obtaining Information

In Table 4 the mean values reveal farmers' level of satisfaction in the use of GSM in obtaining information on the various Fadama III activities. Farmers indicated their satisfaction in obtaining information on capacity building activities by the use of GSM with the (M = 1.21), advisory services and input support activities (M = 1.28), asset acquisition activities, (M= 1.16), mobilization of members for participation in Fadama III activities (M = 1.40), convening FUG/FCA meetings (M = 1.43), financial management (M=1.09), record keeping activities (M = 1.17), awareness creation of Fadama III intervention (M = 1.27), group formation (M = 1.37) and environmental/social screening and environmental friendly practices (M = 1.17).

However, farmers were not satisfied with the generation of information by the use of GSM on small-scale community owned infrastructure activities (M = 0.91) and sub-project preparation and management (M; = 0.95). This could be because of poor leadership among the beneficiaries and inadequate knowledge and skills on infrastructure and management techniques.

Table-4. Farmers' level of satisfaction in the use of GSM in obtaining information in Fadama III project (n = 150)

Fadama 111 Activities	Mean(M)	Std. Deviation
Capacity building activities	1.21*	0.76
Advisory services and input support activities	1.28*	0 .64
Asset acquisition activities	1.16*	0. 61
Small-scale community owned infrastructure activities	0.91	0.66
Sub-project preparation and management	0.95	0.79
Mobilization of members for participation in Fadama III activities	1.40*	0. 65
Convening FUG/FCA meetings	1.43*	0.68
Financial management	1.09*	0.72
Record keeping activities	1.17*	0.64
Awareness creation of Fadama III intervention	1.27*	0.67
Group formation	1.37*	0.64
Environmental/social screening and environmental friendly ;practices	1.17*	0.61

Source: Field Survey, February, (2014). * Farmers' Satisfied < 1.

3.4. Major Challenges in the Use of GSM in Fadama III Project

It is a fact that ICTs have a lot of merits to the agricultural sector of the nation's economy and social development. Alhassan and Afolabi [12], indicated that sufficient research information is obtained in economic resources journals and agricultural science lecturers now experience less error in research papers due to ICTs use. ICTs provide libraries immense opportunity for accessing and retrieving information resources without restriction of time, space or format through on-line database searching, CD-ROM searching, e-mails services, telefacsimile services, internet services, document delivery services, networking, digitalization and virtual library. It was found that in spite of all these advantages high cost of using commercial cybercafé, lack of up to date and lack of time to spend in the café were constraints to ICT utilization study and research. The other challenges found were poor internet connectivity, lack of subscription to agricultural database, commercialization of agricultural databases, lack of enough relevant resources on free databases and above all irregular power supply.

Arokoyo (2003) in Hassim [13] opined that the utilization of ICTs generally in agriculture are challenged among other problems by inadequate infrastructure, limited human resources capacity, absence of national ICT literacy. The high cost of power either through the national grid Power Holding Company of Nigeria, (PHCN) or by stand by generators impede the effective use of ICTs and the high cost of telephone services either by landline (uncommon these days) or GSM especially in rural areas where the bulk of our farmers reside.

In a study by Akor, *et al.* [14] many of the extension agents did not have access to information and communication technologies (ICTs).Consequently, the extension agents did not make use of ICTs in disseminating research results and information to farmers. The extension agents still depended much in the use of individual contact method of extension delivery. They suggested that governments and NGOs should provide and stimulate the use of information and communication technologies (ICTs). Appropriate legislation should be made on the use of ICTs. Akor, *et al.* [14], further explained that when extension agents were made to respond to ten (10) item constraints facing them in; the use of ICTs, they only disagreed with only one of the constraints, namely; lack of technical know-how. The rest of the items include: lack of electricity, inadequate ICTs, lack of fund, high costs of computer and other ICTs equipment gadgets, problem of connectivity or no network or no service, lack of supportive government policies and legislation on ICTs, low level of education of farmers and transportation challenges and difficulties.

According to Final Report of the Agricultural Extension Transformation Agencies [15] agenda of the FGN (undated) ICT project fail in Nigeria because they are conceived and implemented as social services funded by government subventions and development partners. They usually fold up when charity funding stops. The issue of making projects sustainable is crucial to the success of ICT driven knowledge management. Nigeria really has no choice in overcoming ICT challenges in agriculture, but to allow the private sector to introduce commercial and cost sharing innovations into such ICT projects. In place of direct subventions, governments and development partners should create incentives for the private sector to offer discounted ICT services to the agricultural sector that Private Telecom Operators (PTOs) are willing to offer low tariffs to support agriculture but are frustrated by the non chalance even hostility by the public sector.

The report of International Fund for Agricultural Development (IFAD) (2007), in Amusa and Enete [16] confirmed that the poor state of the county's education, information and training has also had its toll on the poor people majority of who are farmers in rural areas in addition, they are faced with limited social services and infrastructure. World Bank [17] reported that about 90 percent of Nigeria's food is produced by small scale farmers who cultivate small plots of land and depend on rainfall rather than irrigation systems as a result of their low knowledge base, access to facilities and poor financing. They further lamented that, the continued reduction in government expenditure on extension and agricultural training has reduced the access of farmers to technology and market information. Unfortunately, the emerging alternative sources of agricultural information like the internet are yet to expand to the rural areas, and may in fact not be able to because of language and cost barriers. It is expected that farmer's organizations and the private sector will take the lead towards increased extension training activities, internet connectivity, technical and; market information provision [16].

Data on Table 5 show the main; challenges faced by the respondents in the utilization of GSM in the Fadama III project by the beneficiaries. The main challenges included no GSM phones provided by Fadama III to farmers (M = 1.37), low level of education of farmers (M = 1.55), erratic power supply (M = 1.41), high call tariff (M = 1.11), poor network coverage (M = 1.24), lack of supportive government policies (M = 1.62), lack of maintenance e.g recharging (M = 1.11), and fluctuating services by the service providers (M = 1.16).

This is in line with the findings Bolarinwa *et al.* (2011) in Egbule [7], which reported high call tariff, poor network coverage and erratic power supply as challenges to the utilization of GSM phones in information dissemination. With regards to low level of education of farmers, this contradicts the work of Bolarinwa et. al (2011) in [7] who stated that farmers' without regards to their educational qualification sourced for information through the use of GSM, particularly, through making calls than SMSs.

High costs of acquiring GSM and its accessories (M = 0.72), information type in Fadama III not suitable for GSM use (M = 0.73), inadequate number of GSM phones among farmers (M = 0.82) and inability to buy recharge cards regularly (M = 0.98) were not hindrances to utilization of GSM in Fadama III project. This may be due the fact that numerous brands of handsets available in the markets in affordable rates and the presence of lower denomination of recharge cards and the different promotions offered by the various service providers for as low as a hundred naira (N) per day for all calls.

Table-5. Major challenges associated with the use of GSM in agricultural information delivery in Fadama III project

Constraints	Mean	Std. Deviation
No GSM phones provided by Fadama III to farmers	1.37*	0.83
Low level of education of farmers	1.55*	0.71
High costs of acquiring GSM and its accessories	0.72	0.77
Information type in Fadama III not suitable for GSM use	0.73	0.77
Erratic power supply	1.41*	0.63
High call tariff	1.11*	0.72
Inadequate number of GSM phones among farmers	0.82	0.78
Inability to buy recharge cards regularly	0.98	0.63
Poor network coverage	1.24*	0.64
Lack of supportive government policies	1.11*	0.64
Lack of maintenance e.g recharging; Fluctuating services by the service providers	1.16*	0.65

Source: Field Survey, (* Main Challenge < 1).

5. Conclusion

From the findings of this study the following conclusions were drawn on farmers' use of Global System for Mobile (GSM) for communication in the Fadama III project in Northern zone of Taraba State, Nigeria: It is evident that farmers are utilizing GSM in communication and dissemination of information in the Fadama III project in the study area. This is true from the fact that higher percentages of ownership and utilization of mobile phone in the area with majority (93.3%) and (90%) respectively owning and utilizing GSM among the respondents. Higher averages of the use of GSM in the mobilization of members for participation in Fadama III activities (M =1.50), awareness of creation of Fadama III intervention; (M = 1.47) convening FUG/FCA meetings (M = 1.43), and group formation (M = 1.40) are enough evidences to conclude that GSM utilization is very relevant in Fadama III project among the beneficiaries in the study area. Farmers' level of satisfaction in the use of GSM in obtaining information in Fadama III project with the averages between (M = 1.09 to M = 1.43) on Fadama III activities were indications of level of respondents' acceptability and satisfaction among the beneficiaries of the project. The results of this study indicated that seven (7) variables with ranges between (M =1.11 to M = 1.55) hindered and challenged the effective use of GSM in agricultural information delivery in Fadama III project in Northern zone of Taraba state, Nigeria.

Recommendations

Based on the findings of this work, the following recommendations were made:

1. Information and communication unit of Fadama III project should collaborate with other media outfits and extension unit to disseminate agro-information to the benefits of not only Fadama III beneficiaries, but the generality of the farming families in the study LGAs and State as a whole. This can serve as a method of improving farmers' level of awareness and education.
2. Considering the low volume of agricultural credit available to Fadama III beneficiaries, it is recommended that commercial banks should offer special credit to farmers at concessional rates to increase volume of investment in the Fadama project and agricultural production in general.
3. Service providers in the communication industry should address the issue of fluctuating and poor network in some of the villages in the study area and look at possibility of concessional call rate to Fadama beneficiaries to cut- down call tariffs and provision of customized handsets for Fadama users.
4. Government should provide sufficient support services to Fadama III project by providing the necessary inputs and materials (regular power supply for recharging mobile phones, farm machines, agro- chemicals, improved seeds, fertilizers, e.t.c.) for effective project implementation and communication in the Fadama III project in the study area in particular and the state in general.
5. Subsequent agricultural development projects involving GSM technology should be customized to motivate beneficiaries of the project.

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