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Mainstreaming Global System of Mobile Telecommunications for Agricultural Development in Nigeria

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Abstract: Global system of mobile telecommunication (GSM) services play significant role in many facet of human lives. Specifically, it has been demonstrated that GSM services can be used to improve practice of agriculture in society. In line with the above position, this study was designated to examine access and utilization of GSM services in selected rural communities in Ibadan and this contributed to agricultural development. The study was hinged on Merton's theory of Manifest Function to explain conceptual issues in the study. Sample of eight hundred (800) respondents was selected from designated population of male and female farmers. Purposive, quota and accidental sampling techniques were adopted for selection of study locations, sample distribution and respondents respectively. Descriptive quantitative statistics and qualitative method was used. Access to GSM services among farmers was described as low (3.0%), moderate (57.4%) and high (29.6%). Again, the utilization of GSM services among farmers was low (4.6%), moderate (28.8%) and high (66.6%). Similarly, 5.6% of the respondents had no formal education or cannot read and write which made it difficult to effectively utilize GSM services. There were 70.1% of the respondents who could adequately utilize GSM services for various activities especially browsing internet to follow updates in daily lives. Respondents however expressed deep feelings that tariffs, quality of services, fraud and arbitrary charges continued to constrain benefits that could be derived from GSM economy. Yet GSM services can serve different purposes especially where it can be used to source agricultural information, crop and animal production practices and other sundry information which can be shared instantly by farmers who are connected on mobile service. Quality of GSM service has remained major problem in rural areas. There should be intervention at the level of government and service providers to improve utilization especially in the area of farming information system.

Keywords: Farming occupation; Information System; GSM Services

1. Introduction

The advent of Global System for Mobile Telecommunications services (GSM) in Nigeria revolutionised every aspect of social and economic life in the last fifteen years. The national statistics of tele-density rose from 0.4% in 2000 to 107% in 2016 (Nigeria Communications Commission, 2016). Now there is hardly a household in Nigeria that does not connect each other on GSM communication. It is not exaggerated to state that old and young, male and female, rich and poor are now connected on mobile communication to interact, do business and fix appointments for religious, economic or political meetings. The services of GSM have created social bond among family members, friends and colleagues and the once boundary of effective communication has been broken to allow for more flexible information flow which has economic, political and social significance. Again, access to GSM is not a determinant of urbanization. Interestingly, people in the rural area attest to widespread coverage of services which ensures that rural dwellers are not cut from the grid of electronic communication. It is a known fact that GSM operators erect transmission base masts which in rural areas allow for effective operation of service and uninterrupted communication (Micah, 2014). This is a regime of telecommunication that is inclusive for all.

Yet population of rural location is significant for its agrarian and agricultural productivity. This is the location where the bulk of food production is carried out. Rural area is also known for its major population and land tillage for crop production and animal husbandry. Rural economy is a very significant type for food security and food basket of the nation. At the same time, rural economy is the largest employer of labour that include male and female, young and old who engaged actively in agriculture. Despite the importance of the rural economy, this sector of society appears sharply neglected by successive government policies which allow for rapid migration of energetic youth seeking to benefit from the urban sector where more than 75% of government investment appears concentrated (World Bank, 2013). Also, if is maintained that GSM services have wide coverage in Nigeria society, this may appear an exaggeration if the reality is compared in most rural areas where real agricultural services take place. It is not an overstatement that many villages and towns in rural area do not have coverage of GSM services. Similarly, where there are services of GSM, it is either that the service fluctuates rapidly or the willing users have to go mountains to search for services (Micah &Okafor, 2013).

Critically speaking, rural areas are naturally designed to nurture agriculture. There are fertile land cultivations that yield mass production of grains, tubers, fibers and cereals. At the same time, people that live in these areas desire to have access to services that improve quality and also utilise the services for maximum satisfaction. Studies have shown that GSM services have varieties of benefits that cut across social to political, business, religion and agriculture (World Bank, 2001; United Nations Development Programme [UNDP], 2009; Micah, 2014). Looking at the aspect of agriculture, it has been shown that GSM service provides

access to information that educates farmers on crop yields, methods and application to farming and interactive guide in modern farming. This is usually designed in the form of apps/application that can be accessed on phones that are sophisticated like android, iphones and apple phones (UNDP, 2009). However, it appears that there is little that can be achieved in the rural economy due to poor coverage of GSM services. In some rural areas, GSM subscribers most times climb mountains to search for mobile services. At the same time, the GSM masts erected in rural areas do not function maximally to accommodate stable connection. It is also difficult for rural farmers to operate sophisticated phones like android, iphone and apple phone despite the usefulness this type of phones can serve to get agricultural information. At same time, the cost of the sophisticated phones may be out of reach to farmers due to high cost. Yet agriculture is one of the mainstreams of national economy that can potentially reduce over reliance on importation of food items which can be locally produced. This is the main focus of this study.

2. Objective of the Study

The main objective of the study was to identify the level of access and utilization of GSM services in rural area and to mainstream the utilization for agricultural development. This significantly has major implication for food security and gross domestic product.

3. Literature Review

There is abundant fact to show contribution of GSM technology to social transformation especially in the 21st century global society. Spore (2008) pointed that half of the world's 6.5 billion now use a mobile phone and the Nigeria experience is significant (Nigeria Communication Commission, 2016). This is astronomical in the acceptance of the technology which has contributed immensely to social development. In Africa, mobile phone business is the most rapid growing sector of the economy with over 250 million active subscribers (Scheen, 2008; International Telecommunication Union [ITU], 2015). Yet there are now more than 500 million subscribers connected to mobile communication (NCC, 2016). Adogla (2009) argued that the annualized aggregate growth rate in handset number was pegged at a healthy 58%, a figure that clearly propelled the African cellular market to outperform all others worldwide. This estimate has improved over the years as more users now get connected due to relatively affordable prices of mobile phones (International Telecommunication Union [ITU], 2015). In Nigeria, the introduction of GSM services in 2001 marked the positive contribution of telecommunications to socio-economic activities of the people. According to Nigeria Communications Commission [NCC] (2012, 2016), the GSM industry empowered at least 84.3 million subscribers and with an impressive tele-density of 95.20**.** This estimate has gradually improved, now there is 98.7 tele-density as at first quarter of 2017 (NCC, 2017). In Ibadan for instance, more than 95% of the sampled respondents possessed GSM phones used for communication (Micah &Okafor, 2013). The breakdown of subscribers revealed that telecommunications is dominated by GSM users (89%) and distantly followed by Code Division Multiple Access system (CDMA) and fixed wired/wireless. Indeed, less than 10% of telecom subscribers in Ibadan were

connected to CDMA (Micah &Okafor, 2013). Empowerment of citizens with mobile phones has transformed businesses and way of life in urban and rural areas of the country. The benefit spread across different sectors of the economy-health, education, communication, agriculture, industry, banking, wildlife and trade.

In agriculture, the mobile phone holds the ace in the application of modern information communication technologies (ICT) to disseminate information and knowledge to farmers. ICTs have the greatest potential to act as a facilitator for specific development oriented programmes that are currently operational at grassroots in Nigeria (NCC, 2010). Access to ICTs provides information on prices, markets, technology and weather to the farmers. Community-based tele-centres have the potential to empower rural communities and facilitate socio-economic developments in agriculture using selected ICTs (e-mail, internet, phone, radio, TV, print) to accelerate the wider delivery of appropriately packaged agricultural information and other relevant information for the poor. In the fisheries sub-sector, mobile phones are used to coordinate fishing efforts (Adogla, 2009); product marketing, talk and to improve safety (Spore, 2008) as well as linking fishermen and wholesalers together for business (Scheen, 2008). In addition, mobile services can serve as sources to acquire training skills for different types of farming where it is possible for users to connect GSM phones to access such information. The mobile phone communication benefits agriculture at several levels. The pervasiveness of GSM has brought about rapid social, political and economic transformation, which has culminated in a network society organized around ICT (Yusuf, 2005). Currently e-learning is becoming one of the most means of using ICT to provide agric information to farmers. Considering the role of agriculture in national economy and the population explosion that can be fed by agricultural production, the use of ICT in the teaching-learning process among farmers and the-will-be farmers becomes imperative . This is true because its adoption by the farmers will enhance improved productivity.

Undoubtedly, ICT makes access to agric information more flexible and reduces barriers of time and place in getting quick information by farmers to improve farming system. In addition, communication technologies can also enhance the quality of agricultural production where it is possible to access information in modern farming. The internet has emerged arguably the most visible component of the information and communication technologies (NCC, 2016). The rate of adoption of the internet exceeds that of all technologies before it. Its uses comprise communication, publishing and research.

Recently, information is recognised, as a prerequisite for empowerment (World Bank, 2002, 2012) and participation by encouraging people to be active in the development process, to contribute ideas, take initiative, articulate needs and problems and assert their autonomy (Ascroft and Masilela, 1994). ICT is the latest in the series of continuing technological revolutions. A study conducted in Uganda demonstrated that farmers could use mobile phones to find out the latest crop prices and in Tanzania mobile phones helped farmers to save travel time and cost (Adel, 2005). Phones provide other uses as

recording tools, listening devices, and catalysts for dialogue which as well make relevant contribution to agricultural development. Community radio stations are incorporating mobile phone technology into programming for advisory services in agriculture (Gakuru, Winters & Stepman, 2009; Micah and Okafor, 2013).

Many African countries Kenya, Malawi and Uganda, mobile banking is another ICT-based service which has had a tremendous impact on the socio-economic status of farmers. It enables farmers to send and receive money using their mobile phones (ITU, 2010). Similarly, a study carried out in India points towards the strong position of established commission agents and traders in local supply chains who are the major price setters. Traders and input dealers also provide an important source of information particularly related to agricultural technology and techniques (Mittal, Gandhi & Tripathi, 2010). Mobile phone usage has sharply increased and is projected to continue among rural farmers. African farmers use mobile phones to obtain information about agriculture issues (Gakuruet al., 2009).

Better access to agricultural information is expected to improve farm productivity, reduce cost and also encourage market participation by farmers. Jensen (2007) and Aker (2008) both exploit the staggered introduction of mobile phone coverage to estimate the impact of mobile phones on agricultural markets in developing countries. Jensen (2007) finds that the expansion of mobile phone coverage leads to a significant reduction in the dispersion of fish prices across markets, as well as a decline in waste. This led to important welfare improvements for both fishermen and consumers; fishermen's profits increased by three percent, consumer prices declined by four percent and consumer surplus increased by six percent. Aker (2008) in Niger found that the introduction of mobile phones reduces dispersion of grain prices across markets by ten percent. The effect is stronger for those market pairs with higher transport costs, namely; those farther apart and linked by poor quality roads.

Mobile phones are being integrated into existing agricultural trading business chiefly because of the crucial role they play in improving the exchange of supply and demand of information between farmers and buyers (Verheye, 2000). In Uganda, Martin and Abbott (2011) conclude that farmers used their phones for a range of farming activities, to coordinate access to agricultural inputs (such as training, seeds or pesticides) (87% of farmers), accessing market information (70%), requesting agricultural emergency assistance (57%), monitoring financial transactions (54%) and consulting with expert advice (52%). A study in Peru observes that the introduction of mobile pay phones in selected Peruvian villages had raised agricultural profitability by 19.5% by increasing the value that farmers received for each kilogram of agricultural production by 16% and reducing agricultural costs by 23.7% (Beuermann, 2011). Therefore, the contribution of GSM mobile services cannot be undermined in agricultural sector. It is a major concern to check how this contribution can be sustained especially in the case of rural farmers in Nigeria which will ultimately improve economic status of farmers.

4. Theoretical Application

The study adopted Robert Merton's Manifest Functionalism to explain basic concepts. The central tenet of manifest functionalism is that an institution is created for intended purpose to promote unity, unify society and maintain stable order. For example the manifestation of family institution is to increase the population of society through reproduction and nurture individual in line with norms and values of the society. This is to ensure that society survives from generation to generation (Ritzer, 2011). Merton's purpose was to trace major function of each institution and the role they played to keep cohesion of the society. Therefore, it follows that GSM services not only design for telecommunication but such communication can be achieved in different form. More importantly, GSM services now make it possible to get information on modern agricultural methods. It is no gainsay that GSM phones now contain apps for agriculture method by which users have access to information that can improve farm yields in crops and animal production. Yet this can be achieved especially in rural zone of agric base where GSM services are stable and have wide coverage.

4. Methodology

This study was conducted in the rural communities in Ibadan. This location is also called Less City (LC) area because they are largely rural. Cross sectional survey was adopted. The study was descriptive and engaged detail field work. Population of the study consisted of male and female respondents who were permanent residents and registered farmers. The categories of these farmers consisted of crop production, animal production and fisheries. Sample size was 800 respondents and this was statistically determined using Cochran's formula. The sample was derived from population of farmers in the three locations of study (IDO, Akinyele and Egbeda) which were among major area of agriculture production in Ibadan. According to Oyo State Government estimate, the population of registered farmers in these areas was 2,950 (Ministry of Agriculture, 2011). Therefore, the application of statistical formula yielded the sample result. The sampling techniques combined purposive, quota and accidental sampling. Purposive sampling was used to select locations of study which were areas that originally engaged in agriculture such as Ido, Akinyele and Egbeda residents. Quota sampling was used for sample distribution where respondents selected in each community was based on the population percentage as contained in Oyo State population distribution for communities in the state. The State estimate showed that in Ido, there were 1100 people who mainly engaged in agriculture and registered farmers. There were also 868 registered farmers in Egbeda and 982 farmers in Akinyele area. Quota method using ratio of population size in each location was used for sample distribution in Ido, Egbada and Akinyele.

Accidental sampling, a non probability method was used to select respondents who were drafted to fill the questionnaire instrument. Similarly, method of data collection was quantitative and qualitative. Whereas quantitative method generated data for the study in statistics, qualitative method generated data in textual format. Questionnaire and in-depth interviews (IDIs) were used as instrument of data collection. The questionnaire was structured close ended and classified

into sections which consisted of socio-economic characteristics, access to GSM services and utilization of GSM services in rural community. In this case, 298 copies of questionnaire were distributed and retrieved in Ido community. There were 235 copies in Egbda and 268 copies distributed in Akinyele according to population ratio. In-depth interviews were conducted in each of the locations and this consisted of 5 respondents in Ido, 4 respondents in Egbeda and 4 respondents in Akinyele. A total of 13 IDIs were conducted. Method of data analysis was quantitative and qualitative. Descriptive statistics of quantitative method which consisted of tables, frequencies and percentage was sued. Qualitative method used ethnographic summaries and content analysis. Ethical consideration was upheld for this study where respondents were treated with confidentiality and anonymity, safety and security and consent sought prior to collection of data

6. Data Analysis: Access and Utilization of GSM Services

Table 1: Distribution of Respondents by Access to GSM Services

Questionnaire items	**Less City (LC)**	
	Frequency LC= 800	**100% Percentage**
Educational qualification		
No education	90	5.6
Primary school	4	0.3
Secondary education	245	15.3
OND/NCE	199	12.5
HND	93	5.8
B.Sc	116	7.3
Masters	51	3.2
PhD	2	0.3
I have ownership of GSM phone		
No	69	8.6
Yes	731	91.4
Years of connection to telecommunication e.g. GSM services	61	7.6
Not applicable	97	12.1
Less than one year	69	8.6
1-3 years	257	32.1
4-6 years	291	36.4
7-9 years	25	3.1
10 years and above		
Locations subscribers purchased SIM cards		
Not applicable	81	10.1
Telecommunications centre	161	20.1
Hawkers on the street	37	4.6
Mobile telecom bus	85	10.6
Market	144	18.0
Telecom dealers	277	34.6
Other locations	15	1.9

Numbers of GSM line(s) possessed		
Not applicable	74	9.3
One	230	28.8
Two	300	37.5
Three	177	22.1
Four	18	2.3
> four	1	0.1
Level of access to telecommunication before GSM services	227	28.4
Low	490	61.3
Moderate	83	10.4
High		
Level of access to telecommunication after GSM services	104	13.0
Low	459	57.4
Moderate	237	29.6
High		

Source: Field Survey, 2011

In the table above, educational qualification of respondents were shown. Except the 5.6% of the respondents who did not possess formal education, other respondents had primary education (0.3%), secondary education (15.3%), certificate of education/diploma (12.5%), Bachelor of Science (7.3%) or Higher Diploma certificate (5.8%) and post graduate education (3.5%) Master's and Ph.D combined. The implication is that despite the prevalence of western of education, some individuals still remain non-literate and this could affect utilization of GSM technology which provides mobile services for communication. Notwithstanding, it is expected that there will be improved utilization of GSM services when the percentage of literate respondents combined (94.4%) is considered. The finding in table 1 above showed that when respondents were asked whether they have access to GSM services or not, 91.4% indicated that they had ownership of GSM phones which enabled their access to mobile telecommunication services. Some respondents (8.6%) indicated that they did not have access to GSM phone as at the time this study was conducted. Yet most of the respondents (91.4%) had access to GSM phones which they utilized for mobile communication. This statistics above is related to subsequent report by NCC (2017) which shows continuous increase in the size of subscribers in Nigeria.

Respondents were further asked to indicate the numbers of years they have been connected to telecommunication. Specifically, only 3.1% said they had their connectivity more than 10 years prior to the emergence of GSM phone. However, 96.9% had access to telecommunication after GSM services were launched in Nigeria and this figure represented total respondents in this category except those that indicated access more than 10 years. Respondents in this study indicated that there are various locations they could purchase GSM SIM-CARD for connection and communication. This includes telecom centre (20.1%), hawkers on the street (4.6%), mobile telecom bus (10.6%), market place (18.0%) and telecom

specialised dealers (34.6%).Similarly, some respondents indicated that they had access to one sim-card (28.8%), two (37.5%), three (22.1%) or four (2.3%) sim-cards by which they accessed GSM services for communication. Again respondents were asked to indicate level of access to telecommunication prior to mobile phones. There were low (28.4%), moderate (61.3%) and high (10.4) access. The level of access to telecommunication after GSM services were launched also showed low (13.0%), moderate (57.4%) and high (29.6%). The implication of the finding is that access to telecommunication in the regime of mobile phones has soared rapidly high and doubled. This can further be understood when some views of respondents who were engaged in face to face interviews are considered.

A female respondent who was formerly connected to NITEL before the deregulation of the telecommunications sector relived her experience:

> *The access to GSM is very encouraging. Now, people have opportunities for stable communication. In the days of NITEL, we used to queue up at the phone booths in the NITEL centres or other designated areas. You have to cover long distances before you could access those call centres. It used to be very tasking and time consuming. Sometimes if you were lucky your calls may be successful. Most often there would be call disruptions despite covering long distances to access those places. And if you were to connect someone outside the country, that is another story entirely. But today people can call any part of the world from the comfort of their bedrooms. This is as a result of access people have towards GSM services (IDI/GSM Subscriber/Egbeda LG/Ibadan/2011).*

Another respondent alluded very much to this when he argued:

> *I have more than three GSM lines. This is not because I want to show off or that I am rich in my income. But I am just sick of poor network and arbitrary charges when you try to connect other GSM services from your main network. For instance, my main network is MTN. Very often I don't derive satisfaction when I call other networks. So for me to remain in constant link with my people that use other networks, I decided to acquire different GSM networks (IDI/GSM subscriber/Ido LG/Ibadan/2011).*

It is obvious from the above views and experience that GSM services are now widespread and access to this service cut across every nook and cranny of residents which enabled them to reach family and friends, read Newspapers and access other vital information.

Table 2: Distribution of Respondents by Utilisation of GSM Services

Questionnaire items	**Less City (LC)**	
	Frequency LC=800	**%**
Patterns of utilization of GSM services		
Make call only	39	4.9
Receive call only	23	2.9
Make and receive call	145	18.1
Send and receive message	26	3.3
Browse internet	4	0.5

Listen to radio and game	2	0.2
All of the above	561	70.1
Services of GSM mostly utilised		
Conduct business	90	11.3
Be in touch with families and friends	605	75.6
Make new friends	4	0.5
Browse internet	22	2.8
All of above	7	0.9
Others	72	9.0
GSM service is affordable in terms of recharge cards		
No	198	24.8
Yes	602	75.2
The frequency of recharging GSM services		
Daily	136	17.0
Weekly	523	65.4
Every two weeks	59	7.4
Monthly	77	9.6
Never	5	0.6
Numbers of phone calls received daily		
Less than five	274	34.3
Five and ten	412	51.5
Eleven and sixteen	76	9.5
Seventeen and above	38	4.8
Numbers of phone calls initiated daily		
Less than five	343	42.9
Five and ten	398	49.8
Eleven and sixteen	44	5.5
Seventeen and above	15	1.9
Level of utilization of GSM services		
Low	37	4.6
Moderate	230	28.8
High	533	66.6

Source: Field Survey, 2011

In table 2, respondents were asked to indicate the pattern of utilisation of their GSM services. Some respondents utilized their phones to make calls (4.9%), receive calls (2.9%), make and receive calls (18.1%) and to send and receive message (3.3%). Others utilized GSM services to browse internet (0.5%) and listen to radio (0.2%). Whereas 70.0% of the respondents utilized all of the above services on their mobiles phones. The services most utilized on mobile phones were to conduct business (11.3%), connect family and friends (75.6%), to make new friends (0.5%) and browse internet (2.8%). Respondents (75.2%) indicated that GSM services were affordable and 24.8% said the price of the services were not affordable. Consequently, 17.0% said they frequently recharged their GSM services, 65.4% recharged weekly, 7.4% recharged every two weeks and 9.6% recharged once in a month. Similarly, 0.6% never recharged their services. Although there is now improved rate at which subscribers recharge their services for communication as shown in the survey of NCC (2017), arbitrary charges,

activation of service subscribers do not ask for have continued to prevail in the sector. The fact that is obvious is that most respondents eager to keep their services active which enabled them to connect regularly with family and friends and access important information. Therefore, 34.3% of the respondents could make less than five calls daily, 51.5% made between five and ten calls daily, 9.5% made between eleven and sixteen calls daily and 4.8% made above seventeen calls daily. At the same time, 42.9% received below five calls daily, 49.8% received between five and ten calls daily, 5.5% received eleven and sixteen call daily and 1.9% received above seventeen calls daily. Overall, the level of utilization of GSM services was low (4.6%), moderate (28.8%) and high (66.6%).

The implication is that there is widespread utilization of GSM services among respondents and this contributed to socio-economic activities among users. The high utilization of GSM services still persist among Nigerian users in the present year (NCC, 2016). Although utilization was high, however this was constrained by some factors which included tariffs, fake GSM accessories and poor quality of network. This problem was clearly affirmed in the views of some respondents. A forty-year old male respondent said:

> *Deregulation of telecommunications sector is a good decision by government. GSM cannot be compared to NITEL of the past. When MTN and ECONET (now Airtel) came, their prices were high. Now everybody can afford to buy GSM line and phone at cheaper and affordable prices. However, GSM tariff is high across networks. The tariff should be reduced. Government should check the service providers on high tariffs (IDI/GSM subscriber/Akinyele/Ibadan/2011).*

Another respondent said:

> *I don't make calls until there is urgent need to do it. I am poor. I can't compare myself with people who earn fat salaries as government employees. The little income from the farming is just to keep my family alive. Many times, I don't even bother calling friends and families (IDI/GSM subscriber/Akinyele LG/Farmer/2011).*

Similarly, a male respondent put in his view when he said:

> *I use Globacom and MTN. The services vary. I prefer MTN because the network is relatively stable. Globacom has not been very stable for some times now. I use the two lines because the networks cannot be bad at the same time. If one is not good, you can use others. Network is very unstable especially during the period of promos and bonanzas. The case in most rural communities here is that people sometimes climb mountains and trees to search network (IDI/GSM subscriber/civil servant/Egbeda LG/2011).*

A GSM subscriber explained:

> *Though the tariff is affordable, it is outrageous. The charges are exorbitant… too much, compared to other countries in the world. Citizens in this country are being exploited by government. Though there are infrastructural challenges, yet the charges are overburdened. Another area of concern is fake accessories sold by come marketers. Now there are too many fake phones that do not last at all (IDI/GSM Subscriber/Ido/GSM hawker/2011).*

The problem stated above can have far reaching effect on stable utilization of GSM especially when it is considered in

terms of benefits to users in the rural area. It is rather unfortunate that the problems identified in the above view are yet to abate as revealed in national survey by NCC (2016)

7. Conclusion and Recommendations

It is established that GSM services were available in some of the rural communities where this study was conducted. The implication is that in most cases people who have access to the services utilized the network to connect family and friends, browse the internet, listen to radio and read Newspapers on their GSM phones which also provide access to information in the area of agriculture. Yet there were some communities in the study area that experienced incessant service failure or there was no trace of GSM coverage. The implication is that these communities are denied the benefits of GSM services, people cannot communicate family and friends in far distance and there is barrier to access to internet services where information on agricultural science abounds. Critically speaking, most respondents in the study area have access to GSM services and also utilized the service for various purposes and in some cases to access agricultural information. However, services were not stable to maximize the use. The farmers in the rural communities usually moved from one location to another to search for service and sometimes also climbed high mountains to source service. This is a major problem that impedes the benefits of GSM services in most rural communities despite the vital role the technology plays in agriculture revolution. Yet the problem of poor network connection and lack of networks in the study areas persist. Network problem is regularly reported by NCC (2016), Akindele (2016) and Ilesanmi (2016). Therefore, to maximize the benefits of GSM especially the rural context the following recommendations are suggested.

i. The finding established that access to GSM services was widespread among residents in the rural communities studied. Yet quality of services was a major problem. This study recommends that service providers should intensify coverage of GSM network in rural communities to maximize the benefits.
ii. Utilization of GSM services was widespread in the rural communities. However tariff regime was a major problem that limited frequent use of the service. Thus challenge can be overcome where cost of services is subsidized by government. The subsidy should especially benefit farmers who are connected to GSM and utilize the service to get information on agriculture technology. This can be achieved where there is reliable statistics of real farmers to ensure that government effort actually reach this population.
iii. Finding showed that significant proportion of rural population possessed post primary educational qualification and some did not even have formal education. This suggests that some rural residents who are farmers cannot read, write and communicate in Lingual Franca. Yet GSM language is programmed in English phonetics. This study recommends that government through its ministries, departments and agencies should collaborate with GSM phone manufacturers to ensure that GSM phones are compatible with the

three national languages, Yoruba, Hausa, and Igbo. This will invariably ensure that mobile phones are user friendly to maximize the use among rural residents who are majorly farmers.

8. Limitation of the Study

This study covered agricultural communities in Ibadan. Yet there are other places in the South-West where agricultural economy blossoms and the utilization of GSM services have been constrained. Further studies may expand the scope of coverage beyond rural communities in Ibadan that could reveal the importance of GSM services to agricultural development.

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