UNIVERSITI PUTRA MALAYSIA

MEDIATING ROLE OF MOTIVATION IN THE RELATIONSHIPS BETWEEN AWARENESS, ACCESSIBILTY, PERCEIVED ORGANIZATIONAL SUPPORT AND ADOPTION OF ICT AMONG EXTENSION AGENTS IN NORTH-EAST, NIGERIA

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By

SA'ADU MUSTAPHA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

August 2021

DEDICATION

This thesis is dedicated to the memory of my late father

SAADU MUHAMMAD

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Agricultural extension is described as one of the fields where ICTs can have a significant impact that is largely dependent on knowledge sharing between extension agents and a wide range of other actors. Poor infrastructure makes visiting remote areas more difficult and expensive. The number of extension agents in the study area are inadequate to meet the farmers population. This study was designed to determine the mediating role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICT among extension agents in northeast, Nigeria. Specifically, the study was conducted to: 1) determine the respondents' level of ICT adoption; 2) identify the respondents level of awareness, accessibility, perceived organizational support and motivation; 3) clarify the relationship between awareness, accessibility, perceived organizational support, motivation and adoption of ICTs among the respondents; 4) examine the most influential factors influencing the adoption of ICTs among the respondents; and 5) examine the mediation role of motivation in relationships between awareness, accessibility, perceived organizational support and adoption of ICT's among extension agents. The study used Piaget Constructivism Theory (1980), the Digital Divide Theory (Van Dijk, 2009) and Vroom's Expectancy Theory (1964). The study employed the quantitative approach and descriptive correlational research design. A sample of 254 extension agents was randomly selected. The data was obtained by using a self-administered questionnaire and analysed using descriptive statistics, Pearson product-moment correlation, multiple linear regression and structural equation modelling.

The findings from the study indicated that the level of ICT adoption was high, awareness, accessibility, and motivation were moderate, perceived organizational support was low. High and positive relationship between awareness and ICT adoption (r=.938; p=.000), accessibilityand ICT adoption (r=.731; p=0.00), motivation and ICT adoption (r=.215; p=.001). The results of the multiple regression analysis revealed that

four variables (marital status, awareness, accessibility and motivation) contributed significantly to ICT adoption in extension work. The multi-model analysis conducted in this study revealed that the mediated model is better than the direct model in explaining the inter-relationships. It had an R2 of 0.47 against 0.23 of the direct models. The final model achieved the required categories of the fit indices (Relative chi-square = 2.045; CFI = .949; IFI = .949; NFI = .906; RMSEA = .064). The study concluded that motivation exhibit a partial mediation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICTs. Hence, it is recommended that extension organizations should be mindful of the motivation levels of their employee; such could facilitate the adoption of ICT in extension work.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia bagi memenuhi keperluan untuk Ijazah Doktor Falsafah

PERANAN PERANTARA MOTIVASI DALAM HUBUNGAN ANTARA ESEDARAN, KEBOLEHCAPAIAN, TANGGAPAN SOKONGAN ORGANISASI DAN PENGGUNAAN ICT DALAMKALANGAN EJEN PENGEMBANGAN DI TIMUR LAUT, NIGERIA

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Pengembangan pertanian merupakan salah satu bidang dimana ICT dapat memberi impak yang besaryang mana kebanyakannya bergantung kepada perkongsian pengetahuan antara ejen pengembangan denganpelbagai pelaku.Infrastruktur yang lemah telah menjadikan akses ke kawasan terpencil lebih sukar dan mahal.Bilangan ejen pengembangan di kawasan kajian adalah tidak mencukupi untuk memenuhi populasi petani.Kajian ini dibentuk untuk mengetahui peranan perantara motivasi dalam hubungan antara kesedaran, kebolehcapaian, tanggapan sokongan organisasi dan penggunaan ICT dalam kalangan ejen pengembangan di Timur Laut, Nigeria. Khususnya, kajian ini bertujuan untuk: 1) mengetahui tahap penggunaan ICT responden; 2) mengenalpasti tahap kesedaran, kebolehcapaian, tanggapan sokongan organisasi dan motivasi responden; 3) menjelaskan hubungan antara kesedaran, kebolehcapaian, tanggapan sokongan organisasi, motivasi dan penggunaan ICT dalam kalangan responden; 4) mengkaji faktor yang paling berpengaruh dalam mempengaruhui penggunaan ICT dalam kalangan responden; dan 5) mengkaji peranan perantara motivasi dalam hubungan antara kesedaran, kebolehcapaian, tanggapan sokongan organisasi dan penggunaan ICT dalam kalangan ejen pengembangan. Kajian ini menggunakan Teori Konstruktivisme Piaget (1980), Teori Jurang Digital (Van Dijk. 2009) dan Teori Jangkaan Vroom (1964). Kajian ini menggunakan kaedah kuantitatif dan reka bentuk kajian kolerasi diskriptif. Sebanyak 254 ejen pengembangan telah dipilih secara rawak sebagai sampel. Data telah dikumpul dengan menggunakan soal selidik dan dianalisis dengan menggunakan statistik diskriptif, kolerasi Pearson, regresi linear berganda dan pemodelan persamaan struktur.

Dapatan kajian menunjukkan bahawa tahap penggunaan ICT adalah tinggi, kesedaran, kebolehcapaian, dan motivasi adalah sederhana dan tanggapan sokongan organisasi adalah rendah. Hubungan antara kesedaran dan penggunaan ICT (r=.938; p=.000), kebolehcapaian dan penggunaan ICT (r=.731; p=0.00) serta motivasi and penggunaan

ICT (r=.215; p=.001) adalah tinggi dan positif. Hasil kajian daripada analisis regresi berganda menunjukkan bahawa empat pemboleh ubah (status perkahwinan, kesedaran, kebolehcapaian dan motivasi) menyumbang secara signifikan kepada penggunaan ICT dalam kerja pengembangan. Analisis pelbagai model menunjukkan bahawa model perantara adalah lebih baik berbanding model langsung dalam menerangkan perhubungan yang bersaling. Ia mempunyai 0.47 bagi R2 berbanding 0.23 bagi model langsung. Model akhir mencapai kategori yang diperlukan bagi indeks penyuaian (Relatif khi kuasa dua = 2.045; CFI = .949; IFI = .949; NFI = .906; RMSEA = .064). Kesimpulannya, motivasi adalah perantara separa dalam hubungan antara kesedaran, kebolehcapaian, tanggapan sokongan organisasi dan penggunaan ICT.Oleh itu, adalah disarankan bahawa organisasi pengembangan perlu mengambil kira tahap motivasi pekerja; hal ini boleh memudahkan penggunaan ICT dalam kerja-kerja pengembangan.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013)

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LIST OF ABBREVIATIONS

ADP	Agricultural Development Programme
AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
Df	Degree of Freedom
EA	Extension Agents
GFI	Goodness-of-fit Index
ICT	Information and Communication Technology
IFA	Incremental Fit Index
ƛ	Factor Loading
LGA	Local Government Area
M	Sample Mean
N	Number of Cases
NAERLS	National Agricultural Extension and Research Liaison Services National Bureau of Statistics
NBS	Number of cases
NFI	Normed Fit Index
P	Rho (Probability)
PGFI	Parsimony Goodness-of-Fit Index
POS	Perceived Organizational Support
R	Correlation Coefficient
r2	Squared Correlation

RMSEA	Root Mean Square Error of Approximation
SE	Standard Error
SEM	Structural Equation Modelling
SPSS	Statistical Package for the Social Sciences
TLI	Tucker-Lewis Coefficient Index
B	Standardized Regression Weight
Δ	Error Variance

CHAPTER 1

INTRODUCTION

Chapter one discusses the background of Nigeria's agriculture, agriculture in the Nigerian economy, the agricultural extension organization, problem statement, research questions and objectives. Other aspects include the significance of the study, the scope of the study and definition of terms. This chapter also highlights the organization of the thesis.

1.1 Background of the Study

The world population is projected to reach the 9 billion mark by 2050, and agricultural production will need to increase by 60 per cent from its current levels to satisfy this additional food demand (FAO, 2017). This has neccessitated global attention to focus on agriculture due to emerging food security problems, resulting from age-long neglect in the dissemination of appropriate technology (UN, 2016).

Agriculture provides a livelihood in Africa for the majority of the 75% of people living in rural areas. Rural areas in Africa, unfortunately, have the greatest concentration of poverty and food insecurity. The poor productivity of agriculture is one of the causes of low income in rural Africa. Any attempt to reduce poverty should therefore pay special attention to the transformation of the agricultural sector, in particular to the sustained improvement of the land and labour productivity of the sector, facilitated by remunerative markets (FAO, 2016). The main reason for low productivity in African agriculture, including Nigeria, has been the lack of technical and market knowledge. The main drivers of social and economic transformation in the world are knowledge and information. Knowledge and information are now as importantdevelopment factors. Agricultural extension can play a critical role in the technology-transfer transformation process, foster learning, help farmers solve problems, and enable farmers to become more aware of modern farming practises, thereby boosting their production.

In developing nations, conventional extension programmes face many obstacles that limit their effectiveness. Bad infrastructure makes visiting remote areas more difficult and more expensive. Nakasone & Minten (2014) reported that by reducing the cost of extension visits, allowing two-way communication between farmers and agents to be more frequent, and improving agent transparency, ICT would increase access to timely extension information for smallholders while addressing many of these challenges. Cole & Fernando (2012) noted that ICT also improves access to personal infromation from social networks, thereby promoting learning from one's peers, which is essential for technology adoption. ICT can enhance the flow of relevant information across all of these agents by making a major contribution to meeting these potential global food needs through contact links between producers, extension agents and research centres and ICT applications. This will be done by collecting and exchanging information on

weather, inputs, markets and prices in a timely and reliable manner; by feeding information into R&D initiatives; by disseminating awareness to farmers; by linking producers and customers, and through many other avenues (Aker, 2010).

The Agricultural axtension agents have been responsible for providing an important link between agricultural research and farming communities in particular through technology transfer to support agricultural and rural development (FAO, 2015). Several authors (Anderson & Feder, 2016; Anandajayasekeram et al., 2017; Aker, 2010) indicated that over the years, the Agricultural Extension Service has worked through various approaches, methodologies and programmes to ensure that farmers have success in implementing improved technologies.

Over the years, visits or site visits, meetings, discussion sessions, seminars, and local training sessions and home have been the common practice among extension workers to reach out to farmers. Extension staff also conducts meetings, lectures, group discussions, seminars, workshops, and local training sessions using ICT resources including computers, photos, and farmers' slides (Isife & Ofuoku, 2008). However, the performance of some participants posed doubts about achieving the set goals of the different training sessions after those training sessions and field results.

ICT has many possible applications for agricultural extension, particularly for accessing the information and knowledge needed (Mcnamara, 2009; Sennuga & Fadiji, 2020). ICT would bring new information systems to rural areas by extension agents, where farmers will have greater benefit. ICT is an information transmission technology that focuses on the ability to connect and reach different ends of the information route of electronic communication instruments such as computers and telecommunication equipment (Ali et al., 2020; Aboh, 2008).

Agricultural extension is the most important public service with the widest variety of obligations for agricultural and rural development (Adeyanju et al., (2015). Proper knowledge and access to any given innovation or technology is key to the success of the acceptance and use of technology. In this regard, Ekumankma et al. (2002) noted in Agwu et al. (2009) that poor knowledge or exposure of farmers to sufficient agricultural information and communication networks of this information is one of the key reasons for the low yield reported by many Nigerian farmers as well as the success of agricultural extension agents in their responsibilities.

The role of ICTs in ensuring that resource-poor farmers are improved through a synergy between telecommunications access and socio-economic development has been emphasised (Sennuga & Fadiji 2020; Fadiji, 2007; Kiplang et al., 2003). By effectively adopting information exchange mechanisms such as ICTs, modern agricultural practises can yield significant results and achieve sustainability.

It is imperative to stress that the largely illiterate farmers need some basic education and exposure in terms of training and extension education. These are usually obtainable from the extension agents to boost their performance and improve their productivity. In light of this, extension agents, in turn, could improve on their communication methods and education through the use of ICT, so that they can become more effective in information delivery to the farmers.

The findings of Fakhar et al. (2020); Ali et al. (2018); Eisnberger (2016) and Campbel (1976) discovered that motivation mediates the relationships between ICT awareness, access and adoption of information and communication technology among the adult learners in developing countries. Similarly, Umar et al. (2017) has found that motivation mediates the relationship between ICT awareness, ICT access, perceived organizational support and adoption of information and communication technology among the extension workers in North-western Nigeria

However, dispites the contribution of motivation to adoption of information and communication technology, no study was conducted in the study area to determine the mediation role of motivation among the extension workers. Also, an earlier study in North-East, Nigeria on Awareness of Agricultural Extension Agents has recommended the need for further studies on mediating role of motivation and the various relationships between awareness, accessibility and adoption of information and communication technologies among extension agents (Dire et al., 2016).

The agricultural sector of Nigeria is a strong springboard for development if it is given adequate attention. In the context of information dissemination and education, skills acquisition of the extension agents and farmers, ICT could be a veritable channel through which development of agriculture in Nigeria could be realized. For these reasons this study delves into investigating the mediating role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICT among extension agents and inform the policy on the way forward.

1.2 Nigeria's Agriculture Sector

Originally a country dependent on agriculture, in the 1970s, Nigeria shifted its focus to oil exports. The National Bureau of Statistics (2020) reported that the contribution of the Nigerian agricultural sector to the Gross Domestic Product (GDP) in 2020 was the largest contribution of the sector in the last two years, with the sector contributing 21.96% to the national GDP in2020. The contribution recorded in the first quarters of 2019 and 2018 is greater than 21.89 per cent and 21.66 per cent respectively. In 2020, Nigeria's GDP stood at N16.7 trillion, meaning about N 3.7 trillion was generated by agriculture.

Nigeria is the most populous country in Africa with a population of over 206 million and a labour force of 83.83 million (UN, 2020). Nigeria is blessed with ample sources of labour to boost economic growth.

Nigeria was the world's biggest exporter of groundnuts in the 1960s, the second-largest exporter of cocoa and palm products, and a major exporter of cotton rubber (FAO, 2016; Sekunmade, 2009). The sector has plenty of untapped growth and development potential in terms of the availability of land, water, labour and its broad internal markets. It is projected that approximately 84 million hectares of Nigeria's total land area will have agricultural potential, but only about 40 per cent of this is cultivated (FAO, 2016; Ndaghu, 2011; Lipton, 2012). Productivity is also low in the cultivated lands because of small farm holdings and primitive farming practises. Nigeria, therefore, has become heavily dependent upon food imports.

In addition to diverse and rich vegetation that can support heavy livestock populations, it also has the potential for surface and underground water irrigation of about 267.7 billion cubic metres and 57.9 billion cubic metres (Azizah, 2018; Anderson & Feder, 2016). Nigeria's large and growing population, through a vibrant internal market, offers the potential for improved agricultural production. The state of agriculture in Nigeria remains weak and largely underdeveloped, despite these resources. The industry continues to rely on primitive methods to sustain a growing population without efforts to add value. Among other things, this has been negatively reflected in the productivity of the sector, its contribution to economic growth and its capacity to fulfil its traditional position in the production of food.

The nation was self-sufficient in the production of food, and in 1960, exports of major crops accounted for over 70 per cent of total exports. However, owing, among other things, to declines in local production, food imports began to increase and food products such as bread made from imported wheat flour began to replace cheap staple foods. As all the staples consumed in the nation come from crop production, 90 per cent of which is accounted for by small-scale farmers, the food production position of the agriculture sector depends largely on this subsector. Yam, cassava, sorghum, millet, rice, maize, beans, dried cowpeas, groundnuts, cocoyam, and sweet potato are the main crops grown. The second-largest is the livestock market, which contributed an average of 9.2 per cent between 1960 and 2015 (FAO, 2016). The largest source of animal protein is this field, including dairy and poultry products. The economic importance of the subsector is therefore evident through the provision of food, job creation and profits, as well as the provision of the hide as raw material.

Despite this, the sub-contribution sector to economic growth decreased between 1983 and 1984, according to Omotayo (2015), the share of livestock in agricultural GDP was about 19 per cent, but decreased as low as 6 per cent between 2004 and 2005. In the fishing sub-sector, local production is insufficient for domestic demand and consumption. Nigeria imports 700,000 MT of fish annually, 60,000 MT more than the current national intake (Essien & Effiong, 2010). However, the sub-sector reported the highest average growth rate of 10.3 per cent compared to the 6 per cent recorded in crop production in the same period (Central Bank of Nigeria (CBN), 2012; CBN, 2018).

However, in the provision of industrial raw materials (wood), the provision of income and the conservation of biodiversity, the sub-sector play an important role. In these sub-sectors, productivity is poor and contributions to the economy are below forecasts. Low productivity has been described as a major contributor to the declining growth rate in the Nigerian agricultural sector, among other constraints.

It was further explained that this was due to inadequate capital investment and rapid growth in the population and labour force. Per capita productivity is also recommended by Muhammad-Lawal & Atte (2006; Adekoya, 2016) through the inclusion of improved agricultural production technologies. A positive and significant relationship between the GDP growth rate, the population growth rate and the index of consumer prices has also been described as influencing Nigeria's domestic agricultural production.

1.3 Agriculture in the Nigerian Economy

In Nigeria, 70% of the population is employed in the agricultural sector and without the sector being developed, it would be almost impossible to achieve economic growth. The fastest way to promote economic growth is to explore the nation's productive advantage in this region. Research shows that a positive relationship exists between agricultural sector investment and GDP growth (Adekoya 2016).

However, the Gross Domestic Product (GDP) grew by 1.9% in 2019, compared to 0.8% in 2018. The non-oil sectors drive the growth with 2.0% increase, while oil sector output grew by 1.1%. The services, agricultural, industrial and construction sectors contributed 1.1%, 0.5%, 0.3% and 0.1%, respectively, to GDP growth, while the trade sector contributed negative growth of -0.1% (CBN, 2019). This clearly shows that, the agricultural sector significantly contributed to recent growth in Nigerian economy apart from services sector.

Moreover, the sectorial GDP growth (%) of the major real sectors of Nigerian economy as shown by the CBN (2018), clearly indicates that, the agricultural sector grew with 2.9%, 4.3%, 3.5%, 4.1%, and 3.4% of year 2016, 2017, 2018, 2019 and 2020, respectively. This shows that, the sector has not recorded any negative growth in comparison with industrial sector that recorded -0.1%, -3.8% and -9.4% of year 2013, 2019 and 2020 respectively. Similarly, the construction, trade and services sectors also recorded negativegrowth from 2016 to 2020 (CBN, 2020).

1.4 Economic Growth and Agriculture

The Nigerian agricultural sector has slowed its growth rate for the first quarter of 2020 to 2.2 per cent, an indication that the coronavirus pandemic has impacted the sector's activities. On a year-on-year basis, the sector's growth decreased by 0.97 percentage points from 3.17 per cent in the first quarter of 2019 to 2.2 per cent in the same quarter

of 2020 on a quarter-on-quarter basis, while the sector also decreased by 0.11 percentage points from 2.31 per cent in the previous quarter of 2019 to 2.2 per cent in the first quarter of 2020 (National Bureau of Statistics, (NBS) 2020). In the first quarter of 2020, the total contribution of the sector to the country's GDP in real terms for the period was 21.9 per cent, marginally higher than its contribution of 21.8 per cent in the first quarter of 2019. It declined quarterly from 26.09% reported in the fourth quarter of 2019.

As Nigeria imposes lockdowns and restrictions on movement measures to control the spread of the novel coronavirus in the region, the agriculture sector has been largely affected by disruptions in food supply systems. From crop production to livestock and fish, main stakeholders through agricultural value chains have been badly impacted. Farmers have reported high post-harvest loss volumes as trucks transporting agricultural products from farms to markets are delayed at various checkpoints and extorted at these checkpoints by security operatives (NBS, 2020).

Several previous studies have focused on understanding the relationship between agricultural and economic growth, but there is some disagreement. Although some researchers have proposed that agriculture should be the foundation of economic development (CBN, 2018). The role of agriculture in the quest for industrialization should not be ignored, as has been the case in Nigeria.

Nigeria's agricultural sector contributes to a significant part of the country's GDP. Between April and June 2021, the agriculture contributed to 22.13 percent of the total nominal GDP, a slight decrease by about two percentage point compared to the same period of 2020 (CBN, 2021).

1.5 Productivity

Nigerian agricultural products can be divided into two major groups: food crops processed for domestic consumption and cash crops (export products). Table 1.1 displays the major food crops, including beans, sesame, cashew nuts, cassava, yam, corn, paddy, maize, groundnuts, Arabic gum, kola nut, millet, cocoa beans, palm kernels, palm oil, plantains, rice, rubber, sorghum, soybeans, bananas and yams. In the past, Nigeria was famous for the export of groundnut and palm kernel oil. The export rate of this product has decreased over the years.

However, local Nigerian firms started exporting groundnuts, cashew nuts, sesame seeds, and moringa seeds and so on. Local businesses such as Lantbruk Global Integrated Services Limited have paved the way for other businesses to continue upgrading Nigeria’s agricultural system. The country’s agricultural products fall into two main groups: food crops processed for domestic consumption and exports, respectively. Before the Nigerian civil war, the nation was self-sufficient in food, but after 1973, it grew steeply (CBN, 2018).

Bread produced from American wheat has replaced domestic crops as the cheapest staple meal. From 1980 to 2015, yam production grew from over 5 million tonnes to 44 million tonnes (Hassan et al., 2019; Verter, 2015). Cocoa is the leading non-oil foreign exchange earner, but the dominance of smallholders and lack of farm labour are holding back development due to urbanization. In 1969, Nigeria produced 145,000 tonnes of cocoa beans, but it can produce over 300,000 cocoa beans per year.

Table 1.1: Food crops production Trends in Nigeria (Tonnes)

Crops	1980	2000	2016
Maize	612,000	4,107,000	64,678
Millet	2,824,000	5,814,000	1,468,668
Guinea Corn	3,690,00	7,711,000	6,939,335
Yam	5,250,00	26,210,000	44,109,615
Cassava	11,500,000	32,697,000	57,134,47
Rice, paddy	1,090,000	3,298,000	6,070,813
Melon seed	94,000	345,000	569,398
Cocoyam	208,000	3,886,000	3,175,842
Sesame seed	15,000	72,000	460,988

The palm oil industry is a major sector of the Nigerian economy, supplying food and raw materials to the fruit, cosmetics, pharmaceuticals, plastics and bio-energy industries. The Nigerian Institute for Oil Palm Research is the institute with useful oil palm expertise in Nigeria.

Table 1.2: Cash Crops Production Trends in Nigeria (Tonnes)

Crops	1980	2000	2016
Oil Palm fruit	5,750,000	8,220,000	7,817,207
Cocoa	153,000	338,000	236,521
Groundnut	471,000	2,901,000	3,028,571
Kola nut	135,000	82,000	143,829
Ginger	200	98,000	522,964

1.6 Nigeria'sAgricultural land area

From 1961 to 2016, the arable land area of Nigeria during that period, the average land area was 32.1 per cent with a minimum of 18.1 per cent in 1981, a maximum of 40.6 per cent in 2007, the agricultural land at 77.7 per cent in 2016, 2017 and 2018 (World Bank, 2018). The share of arable land, permanent crops, and permanent pastureland refer to agricultural land. Arable land includes land known as temporary cropland by the FAO (double-crop areas are counted once), temporary mowing or pasturing meadows, market land or kitchen gardens, and temporary fallow land. Land that has been abandoned is removed due to changing agriculture. Land under permanent crops is land that is cultivated with crops that have occupied the land for a long time and do not need to be replanted, such as cocoa, coffee and rubber, after each harvest. This category encompasses flowering shrubland, fruit trees, nut trees, and vines, but excludes trees from wood or timber-grown land. Permanent pasture island that has been used for foraging, both natural and cultivated crops, for five or more years (Abdul jabbar & Sonia, 2021).

1.7 Information and Communication Technologies (ICTs) Use in Agriculture

The application of information and communications technology (ICT) in agriculture is increasingly important. Electronic Agriculture (E-Agriculture) is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes (FAO, 2020). More specifically, e-agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communicationtechnologies (ICT) in the rural domain, with a primary focus on agriculture. E-Agriculture is a relatively new term and we fully expect its scope to change and evolve as our understanding of the area grows (Ali et al., 2020). Some studies have shown that ICT has played an important role in information sourcing (Zulqarnain et al., 2020; Hassan et al., 2019; Ramli et al., 2019; Umar et al., 2019). Studies showed further that findings could be disseminated using the tools of established efficient and effective communication networks between researchers, extension workers and farmers in the field of agricultural knowledge. In Africa, Nigeria has been ranked first among high-level radio ownership nations. The Africa study by Mayer (2008) reinforced that radio is a strong mass media that converges with other ICT resources such as computers, mobile phones and MP3 players. In the context of emergencies and the context of humanitarian assistance, she said an invaluable instrument, describing radio as a community source of knowledge. In a survey, Fadiji (2007) found that most rural farmers in Nigeria use radio as their daily and weekly source for extension information.

1.8 Agricultural Extension Services in Nigeria

The Federal government of Nigeria provides and subsidises extension programmes. The three government relations, Federal, State and Local Government, play varying roles in distribution and financing. The Federal Government provides coordination and policy guidance through the Federal Ministry of Agriculture and Natural Resources, which is carried out by the National Food Reserve Agency (NFRA), formerly known as the project of the Coordinating Unit (PCU). It was initially referred to as the Federal Agricultural Coordinating Unit (FACU), which was merged with the Monitoring and Evaluation Unit for Agricultural Projects (APMEU) and its sister agency's Project Coordinating Unit (PCU). The FACU and APMEU were established in the early 1980s, along with state ADPs and World Bank funding. The ADPs are the agencies of the State with the mandate to provide extension services to increase agricultural production and improve rural living conditions.

To decentralise the development policy at the local level, 774 local government councils were set up under a 1976 law. The decree creating them specifies that they should be greatly responsible for the provision of extension services (World Bank, 2018).

One of the powerful mechanisms of extension delivery is a link between agricultural science, extension and farmers. The agencies include the ADPs, the National Food Reserve Agency (NFRA), a department responsible for coordinating Agricultural

Development Projects (ADPs) sponsored by multilateral donors under the Federal Ministry of Agriculture and Water Resources (FMA & WR). The United State Agency for International Development (USAID, 2003), the National Agricultural Extension Research and Liaison Services (NAERLS), is the planning and coordination agency for the National Agricultural Extension Liaison and for the conduct of technology transfer and acceptance research. Zonal REFILS activities are coordinated by institutes organising zonal research. The Institute for Agricultural Research (IAR) of Ahmadu Bello University, Zaria, is responsible for the Northwest Region.

At the end of the project, most of the ADPs in Nigeria had a weak and unpredictable funding mechanism and got poorer service from such semi-autonomous development institutions than expected.Nonetheless, although intended to play a temporary role, the ADPs have assumed a permanent place in the provision of expenditure and services in line with the comparatively ineffective line agencies, which supports the point that this type of agency was necessary to achieve the growth envisaged in the programme. But, except in a few nations, the administrative organisation of the ADPs has not been corrected to reflect its new status as a permanent development agency.

1.8.1 University and Research Institutes Operated Extension

Several universities in Nigeria undertake rural development programmes, in addition to their teaching and research duties. Typical examples are the Badeku Project of the University of Ibadan; the Okpuje Project of the University of Nigeria, Nsukka; the Isoya Rural Development Project of the Obafemi Awolowo University; and the Ahmadu Bello University, Zaria Rural Shift Project funded by Zaria; these projects are carried out in selected manageably small population villages to boost socio-economic conditions; (World Bank, 2018). The agricultural universities in Umudike, Abeokuta and Makurdi are also engaged in extension activities in surrounding regions, in addition to the extension outfits of the traditional universities.

A cooperative farmer extension works in selected villages for the University of Agriculture at Makurdi. The Abeokuta University of Agriculture has an immense Infrastructure and Extension Center for Agricultural Media. The Micheal Okpara University of Agriculture at Umudike extension outreach has been initiated by the College of Agricultural Economics, Rural Sociology and Extension. The Agricultural Research Council of Nigeria (ARCN), a supervisory body of the 18 Agricultural Research Institutes, has reintroduced the adopted definition of the village in all the NARIs (NARIs). It is now mandatory for each institution to run at least one adopted village (Abdullahi et al., 2007).

1.8.2 Ministry of Agriculture Operated Extension

This dates back to 1893 when a Botanical Research Department was set up at Olokomeji in the current state of Ogun. The headquarters of the Agriculture Departments of Southern and Northern Nigeria were later set up in 1910 and 1912,

respectively. Thirty-seven agriculture ministries (one in each state) and the FCT (Abuja) are represented today. This was put under the supervision of the agriculture extension service. In doing so, the Federal Ministry of Agriculture gave each ministry financial and technical assistance (Udiandeye, 2009). Some of the basic functions of the Ministries of Agriculture include training of workers, training of skilled staff, training of technical staff and farmers in the production, distribution, processing and marketing of agricultural products, provision of agricultural inputs to farmers, assistance in social development and home and youth development (Udiandeye, 2009; FAO, 2016).

1.8.3 Commodity/Sectoral Agency Extension

This was intended to increase the production of a single crop as quickly as possible, thus establishing commodity boards in strategic regions of the world where commodity production was a major occupation, with favourable agro-climate conditions. The Commodity Board was semi-autonomous and employed its staff and provided farmers with input at subsidised rates. The clientele of each board was the farmer growing the specific crop, hence the few to mention the Cocoa Board, Groundnut Board (Udiandeye, 2009).

1.8.4 Extension Work by Registered NGOs

To perform extension, work and communication creation, some registered NGOs have hired extension workers for their target system. Each of these NGOs is funded financially by the government. However, they derive their funds from national and international organisations (Udiandeye, 2009). Although the majority of international NGOs involved in extension delivery are Christian-based foreign organisations, such as ECWA, CRUDAN, and COCIN. The only international NGO recognised primarily for its extension operations in Nigeria is Sasakawa Global 2000 (Arokoyo, 2008).

1.8.5 Farmers Organizations Involved in Providing Advisory Services

There are various forms of farmer-based organisations in Nigeria. These include cooperatives for producers, farmers and commodity unions, and farmers' associations. As part of the cooperative system in the country, there are Ministries of Commerce and Cooperatives in all states. However, the success of cooperatives, especially farmers' cooperatives, has been questioned (Giwa, 1992). As a consequence of the unsatisfactory production of farmers' cooperatives and the government's desire for the private sector to participate in development activities, many farmers' associations emerged in the 1990s. The commodity base and the association of registered producers of commodities, for example.

While others remain general, such as the All-Nigerian Farmers Association (AFAN), the Nigerian Farmers Association (FOFAN), the Nigerian Farmers Association (FAN), etc. Any of these groups are aimed at serving their members' interests. As such, grassroots activities are not an important part of their contribution to the provision of consultancy services (Natinal Agricultural Extension Research &Liason Servicess (NAERLS), 2018).

The Farmers' Associations are not specifically interested in supplying their members with extension services. They are however, indirectly engaged in providing technical advice to their members through farm facilitators. A variety of initiatives in Nigeria use the Community Participatory Approach in addition to this initiative. These include the National Fadama Projects, the Community-based Project for Agricultural and Rural Development (CBARDP), the National Special Food Security Program (NSPFS), the Local Empowerment and Environmental Management Project (LEEMP), only a few of which have been listed (NAERLS, 2018).

1.8.6 Extension agent farm family ration in Nigeria

Table 1.3 has shown the extension agents farm family ratio in Nigeria. According to Nigeria Agricultural Extension Research and Liason Services (2018), the extension agents/farmers ratio is high where in some states one extension agent is expected to serve about 4600 farmers. This is far beyond the United Nation recommendation of 800 to 1 extension agent. This is also an indication that the current trend of conventional extension method been practiced in the study area can not yield and positive result. There is need to adopt ICTs in the extension service delivery, this will help to bridge the gap of extension agents farm family ratio in the study area.

Table 1.3: Extension Agents Farm Family Ratio in North-East, Nigeria

States	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Adamawa	1:2549	1:1000	1:1212	1:1212	1:1414	1:1800	1:1618	1:1701	1:2400	1:2400
Bauchi	1:1971	1:1300	1:1700	1:1731	1:1850	1:1940	1:1940	1:1950	2050	1:2060
Borno	1:1971	1:1971	1:1971	1:1961	1:2225	1:400	1:1400	1:1600	:1751	1:1840
Gombe	1:350	1:1741	1:1741	1:1250	1:1250	1:1400	1:3825	1:1811	1:1984	1:2200
Taraba	1:3200	1:3200	1:3200	1:3200	1:3200	1:3700	1:3960	1:3960	1:4100	1:4600
Yobe	1:350	1:1800	1:1100	1:1212	1:1225	1:1400	1:1480	1:1600	1:1800	1:1880

[Source: NAERLS (2018)]

1.9 Problem Statement

In Nigeria, studies have shown that agricultural growth has been hampered by the low level of exchange of agricultural knowledge. This has necessitated the implementation of ICT as a panacea to agricultural development.

A comprehensive empirical investigation on the mediating role of motivation on ICT adoption which is beneficial to extension organizations and extension staff remain scarce. After a wide review of literature, a research gap was observed within studies on mediating role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICTs among the extension agents in Nigeria and the North-East geo-political zone. Several studies (Sennuga et al., 2020; Sennuga & Fadiji, 2020; Adekoya & Ajayi, 2016; Dire et al., 2016; Umar, et al., 2015; Omotayo, 2015; Yakubu et al., 2013 etc) were conducted on ICT awareness, ICT access, ICT adoption, ICT relevance, organizational support perception of agricultural extension agents, none of the studies tries to correlates the various relationships that exist between the variables (Awareness, accessibility, perceived organizational support and adoption of ICT).

However, no study was conducted in the study area to determine the mediation role of motivation. Furthermore, all of those studies conducted in the area have not used powerful tools of analysis such as the SEM to arrive at evidence-based findings and conclusion (Aker, 2010). Also, an earlier study in North-East, Nigeria on Awareness of Agricultural Extension Agents has recommended the need for further studies onmediating role of motivation and the various relationships between awareness, accessibility and adoption of information and communication technologies among extension agents (Dire et al., 2016).

In addition to the empirical issues, there is a practical problem in the field of agricultural extension service in Nigeria and in the study area as well, that this research intends to address; the extension agents in the study area are inadequate to meet the demand of farmers in the study area. NAERLS (2018) reported that up to 4600 farmers in the study area are served by one extension agent. Evidence can be seen in Table 1.3. The number of extension staff is also small, according to Bell, (2015), extension workers can lack relevant knowledge and skills and institutional encouragement and resources to meet farmers).

ICT can respond to a range of problems facing public extension system (FAO, 2015). This research explores the mediating role of motivation in the relationships between awareness, accessibility, perceived organisational support and adoption of ICTs among extension agents.

1.10 Research Questions

The research questions for this study are

1) What is the extension agent's level of ICT adoption?

2) What is the extension agent's level of awareness, accessibility, motivation, perceived organizational support?

3) Is there a significant relationship between awareness, accessibility, perceived organizational support and adoption of ICTs among extension agents?

4) To what extend do awareness, accessibility, perceived organizational support and socio-demographic factors influence adoption of ICTs?

5) How does motivation mediate the relationships between awareness, accessibility, perceived organizational support and adoption of ICTs?

1.11 Objective of the Study

1.11.1 General Objective

The general objective of the study is to determine the mediation role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of information communication technologies among extension agents.

1.11.2 Specific Objectives

1) To determine the level of ICT adoption among the respondents;

2) To identify the respondents' level of awareness, accessibility, perceived organizational support and motivation;

3) To clarify the relationship between awareness, accessibility, perceived organizational support, motivation and adoption of ICTs among the respondents;

4) To examine the most influential factors influencing the adoption of ICTs among the respondents; and

5) To examine the mediation role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICT's.

1.12 Significance of the Study

This study has found its justification for several reasons. These are outlined as follows:

1) The study will to determine the various relationships between the adoption of information communication technologies and awareness, accessibility, perceived organizational support among the extension agents.

2) The study will also unveil the mediation role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of information communication technologies among extension agents.

3) The Information generated from the study would be of immense value to policy planners in the area of planning. It is essentially fundamental that policy issues related to the use and application of ICT will be made available to the people for public knowledge.

4) Various stakeholders in an agricultural extension would derive benefits from the findings of this study. For example, the extension organizations will know the significance of motivation and its influence on ICT adoption in extension work, the farmers would be able to identify the ICTs they can use for their benefits, the researchers and research institutes would be able to identify research areas to explore, the educational systems would set targets for training and curriculum design, ICT providers would know their ICT users and areas for marketing potentials, and finally, donor agencies (e.g. Non-governmental Organizations (NGOs), Community Based Organizations (CBOs), would be able to get those areas where they could intervene in terms of ICT usage.

5) The data generated through this study would be given analysis using various statistical tools like descriptive and regression, correlation and SEM. In this regard, the findings of this study would provide a baseline reference point for future studies.

1.13 Definitions of Term

1.13.1 Information and Communication Technology

Conceptual: The processing and transmitting of information by electronic means such as radio, television, telephones (fixed and mobile), computers, Pocket PCs and the Internet are known as ICTs (CTA, 2003).

Operational: It refers to the application of information and communication technology tools by extension agents in various extension works.

1.13.2 Awareness

Conceptual: The ability to recognise and sense, to sound, or to be aware of events, instruments or objects directly. More generally, it's the state of something being aware of (Labar & Redisterhoft, 1998).

Operational; It is the acquisition of information, education, and understanding that a consumer believes is sufficient to learn and use ICT and to understand its overall features, strategic functionality, and competitive advantage. It refers to the information of extension agents about the use and application of ICT tools in their work in the context of this research

1.13.3 Accessibility

Conceptual: Accessibility can be seen as the capacity of any device or person to access and gain from it (Federal Communications Commission 1999).

Operational: In this study, Accessibility refers to access to ICT tools by extension agents or enabling access through the use of technology.

1.13.4 Perceived Organizational Support

Conceptual: Perceived organisational support is defined as an individual's mindset or global conviction about the degree to which their business supports their efforts and cares about their overall well-being (Eisnberger, 2016).

Operational: Perceived organisational support in this study refers to the assurance that assistance from the organisation will be readily available when assistance is required to carry out one's work efficiently or to cope with difficult circumstances or the feeling that their efforts are appreciated by their organisation.

1.13.5 Motivation

Conceptual: Motivation is the process that initiates, directs and maintains goal-oriented behaviours. It's what someone's got to act on. Motivation involves the biological, emotional, social and cognitive forces which cause behaviour (Nevid, 2013).

Operational: A goal-directed behaviour exhibited by extension agents toward accomplishing their task.

1.13.6 Adoption

Conceptual: Rogers (1962), describes adoption as a "full use of innovation" decision as to the best available course of action.

Operational: In the context of this study, it refers to a decision to full use of ICT resources by the extension agents in extension work.

1.13.7 Diffusion

Conceptual: Rogers (1962) identifies diffusion as the mechanism through which an innovation is transmitted through certain networks over time among the members of a social structure.

Operational: Here the innovations are referring to the ICT tools, how they have been accepted over time by the extension agents.

1.13.8 Innovation

Conceptual: innovation: An invention is a concept, process, or project that a person or other unit of adoption perceives as new (Rogers, 1962).

Operational: An invention may have been invented a long time ago, but it may still be an innovation for them if individuals view it as new.

1.14 Organization of Thesis

This research titled "Mediating role of Motivation in the Relationships between Awareness, Accessibility Perceived Organizational Support and Adoption of ICT's among Extension Agents in North-East, Nigeria" it consists of title page, abstracts, table of contents, main body made up of five chapters, list of references and appendices. The five chapters are arranged in the following order:

Chapter one highlights the background to the research, the problem statement, objective and significance. The chapter introduces the topical issues of Nigeria's agricultural sector, the role of agriculture in Nigeria's economy, the agricultural extension services. Finally, the chapter defined the major variables of the study.

Chapter two provides a review of the literature. It covers the literature materials on the concept of information and communication technology (ICT). The concept of agricultural extension. Factors influencing the use of ICT. The chapter explained the theories adopted and used in this research. It also defined and explained the relationship between awareness, accessibility, perceived organizational support, and ICT adoption. The chapter stated the mediating role of motivation in the relationships between awareness, accessibility, perceived organizational support and ICT adoption. Finally, the theoretical framework of the study was highlighted and explained.

Chapter three explains the research design including the methodological approach, the conceptual framework and instrumentation. It further illustrates the location of the study, states the population of the study, sample size and sampling technique. Procedure for data collection and analysis was also discussed in this chapter.

Chapter four presents the results of the demographic profile of the respondents, the levels of all the variables of the study (Awareness, Accessibility, perceived organizational support and adoption of ICT). Descriptive statistics were used in the above-mentioned analysis. The chapter also presented and discussed the results of Pearson Product Moments Correlation which was used to determine the relationship between awareness, accessibility, perceived organizational support and adoption of ICTs among extension workers. The results of multiple regression analysis were also presented which was used to determine the factors influencing the adoption of ICTs among extension workers. And finally, the chapter presents and discusses the results of Structural Equation Modelling which was used to examine the mediation role of motivation in the relationships between awareness, accessibility, perceived organizational support and adoption of ICTs.

Chapter five is the summary of the research, conclusions, implications, scope of the study and policy recommendation. Thus, it begins with an introduction and provides a summary of the main findings of the study. Conclusions for this study were provided based on the findings. The implication for the actual study was also provided based on the results.

REFERENCES

Abate, J.R. (2008). Agricultural Advisory Services. Background Paper for World Development Report 2008, Agriculture for Development. Washington, D.C.

Abdul jabbar S., Sonia S. (2021). The Empirical Analysis of Agricultural Sector and Its Contribution to Economic Growth in Nigeria. 2 Vol-7 Issue-2 2021 IJARIIE-ISSN(O)-2395-4396 14088

Abdullahi, Y. M., Auta S. J., Chikwendu D. O., Murtala, G. B., Ilu I.Y., Abubakar, S.Z. (2007). Testing Participatory Agricultural Extension in North-Western Nigeria: Needs, Prospect and Challenges. Proceedings 12th Annual National Conference (AESON).

Aboh, L. C. (2008). Assessment of The Frequency of ICT Tools Usage by Agricultural Extension Agents in Imo State, Nigeria. J. Agric. Social Res. (JASR) 8:2.

Abraham, R. (2007). Mobile Phones and Economic Development: Evidence from the Fishing Industry in India. Journal of Information Technologies and International Development; 4 (1): 5-17

Adebayo, A. A., Umar, A. S., (1999). Hydrology and Water Resources. In: Adebayo, A. A. and Tukur, A.L. (eds.) Adamawa State in Maps. Paraclete Publishers, Yola Nigeria pp.101-123.

Adedeji O. A. (2017). An e- Readiness and Attitude Assessment of Agricultural Science teachers to ICT in teaching and learning.

Adekoya, A. E. (2017). Information and Communication Technologies (ICTs) Revolution and Relevance to the Process of Unlocking the Agricultural and Rural Development Potentials of Nigeria: In Proceedings of the Fifteen Annual Congress of the Nigerian Rural Sociological Association (NSRA), Nigeria 6-9th November 2017, pp6-16.

Adekoya, A.E., Ajayi, M.A. (2016). An Assessment of Farmers' Awareness and Practices of Land Management Techniques in Ido L.G.A. of Oyo State. Journal of Environmental Extension, 1(1): 98- 104.

Aderinto, A., Adedoyin, S. F., Awotide, D. O., Adamu, C. O. (2008). Use of Information and Communication Technologies (ICTs) Among Extension Personnel in Ondo State. Nigerian Journal of Rural Sociology, 8(1): 66-70.

Adesope, O. M., Matthews, N. (2007). Perceived Effect of Information Technology on agricultural Research among Agriculturists in Nigerian Tertiary Institutions. In: Proceedings of Agricultural Extension Society of Nigeria (AESON) 10th Annual Conference, Ilorin, Nigeria, 10: 96-101.

Adeyanju Agbelemoge, A., Akinwumi, D. M. (2015). Utilization of Extension Information among Pig Farmers in Oke-aro Farm Settlement in Ogun State of Nigeria. American kJournal of Humanities and Social Sciences 3(1): 1 – 6

Agwu, A, E., Uche-Mba, U, C., Akinnagbe, O, M. (2008). Use of Information Communication Technologies (ICTs) among Researchers, Extension Workers and Farmers in Abia and Enugu States: Implications for a National Agricultural Extension Policy on ICTs, Journal of Agricultural Extension: 12 (1): 37 – 49.

Agwu, A. E., Chah, J.M. (2007). Access and Utilization of Modern Information Communication Technologies among Extension Personnel in Benue State of Nigeria. In: Agricultural Extension Society of Nigeria (AESON). Agricultural Extension and The Challenges of The Millennium Development Goals (Mdgs). Proceedings of the 12th Annual Conference of The Agricultural Extension Society of Nigeria (AESON). Maiduguri, 4th – 7th July 2007

Ahmed, S.O. (2000). Agriculture Share of the Gross Domestic Product and its Implications for Rural Development. Report and Opinion, 2 (8), 26-30.

Airasian, P., Gay, L., Mills, G. (2003). Mixed-Methods Research Methodologies. The Qualitative Report, 17(1), 254-280

Ajmal, A., Bashir, M., Abrar, M., Khan, M. M. (2015). The Effects of Intrinsic and Extrinsic Rewards on Employee Attitudes: Mediating Role of Perceived Organizational Support. Journal of Service Science and Management, 8, 461-470.

Ajzan, B. B. (1975). Motivational Factors of Employee Retention and Engagement in Organizations. International Journal of Advances in Management and Economics, 1(6), 88- 95.

Aker J.C. (2010). Dial 'A' for Agriculture: Using Information and Communication Technologies for Agricultural Extension in Developing Countries. Tuft University, Economics Department and Fletcher School, Medford MA02155.

Akhtar, N., Aziz, S., Hussain, Z., Ali, S., Salman, M. (2014). Factors Affecting Employees Motivation in The Banking Sector of Pakistan. Journal of Asian Business Strategy, 4(10), 125- 133.

Ali, A. S., Altarawneh, M., Altahat, E. (2012). Effectiveness of Agricultural Extension Activities. American Journal of Agricultural and Biological Science, 7(2), 194-200.

Ali, M., Man, N., Ismail, I., Melissa, F. M., Omar, S. Z. (2018). The Use of Information and Communication Technologies in Agricultural Risk Management by the Agricultural Extension Services in Malaysia.*International Journal of Agriculture, Environment and Food Sciences, 2(1), 29-35.*

Ali, M., Man, N., Muharam F. M. (2020). Intention Level of Farmers to Use Information Communication Technologies for Agricultural Risk Management in Malaysia.*Journal of International Agricultural and Extension Education Volume 27, Issue 2*

Allen, D. G., Shore, L. M., Griffeth, R. W. (2003). The Role of Perceived Organizational Support and Supportive Human Resource Practices in The Turnover Process. *Journal of Management, 29*(1), 99–118.

Altalb, A. A. T., Filipek, T., Skowron, P. (2015). The Role of Agricultural Extension in the Transfer and Adoption of Agricultural Technologies. Asian Journal of Agriculture and Food Sciences, 3(5), 500–507.

Anandajayasekeram, P., Puskur, R., Workneh, S., Hoekstra, D. (2017). Concepts and Practices in Agricultural Extension in Developing Countries: A Source Book. IFPRI (International Food Policy Research Institute), Washington, DC, USA, and ILRI (International Livestock Research Institute), Nairobi, Kenya.P. 275.

Anderson J.R., & Feder G (2016). Agricultural Extension: Good Intentions and Hard Realities. The World Bank Research Observer

Apantaku, S. O., Lawal-Adebowale, O. A. (2009). ICT Status of Agricultural Research and Extension Organizations in South-Western Nigeria: Policy Implications for ICT-Based Information Exchanges. Journal of Applied Agricultural Research, 1:3-12.

Apantaku, S. O., Lawal-Adebowale, O. A. (2009). ICT Status of Agricultural Research and Extension Organizations in South-Western Nigeria: Policy Implications for ICT-Based Information Exchanges. Journal of Applied Agricultural Research, 1:3-12.

Armstrong, J. S. (2012). Illusions in Regression Analysis. International Journal of Forecasting, 28(3), 689–694.

Arokoyo T. (2008). ICTs in Transformation of Agricultural Extension: The Case Study of Nigeria;

Ary D., Jacobs L.C., Sorensen C.K., Walker D. (2013). Introduction to Research in Education. Cengage Learning; New York

Ary, D., Jacobs, L., Razavieh, A., Sorenson, C. (2003). Introduction to Research in Research Education. Belmont, CA: Wadsworth.

Ary, D., Jacobs, L., Sorense, C. (2010). Introduction to Research in Education. (C. C. C. Shortt, Ed.) (eight editions). United States: Wadsworth 10 Davis Drive Belmont, CA 94002-3098 USA.

Aselage, J., Eisenberger, R. (2003). Perceived Organizational Support and Psychological and Turnover Intention: The Mediating Effects of Personal Sacrifice and Job Fit. Journal of Social Psychology, 150(3), 238-257

Aselage, J., Eisenberger, R. (2018. Perceived Organizational Support and Psychological and Turnover Intention: The Mediating Effects of Personal Sacrifice and Job Fit. Journal of Social Psychology, 150(3), 238-257

Asenso-Okyere, K., Mekonnen, D. A. (2012). The Importance of ICTs In the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa. Working Paper. (30pp) UNDP.

Asfaw S, Di Battistab F, Lipper L. (2016) Agricultural Technology Adoption under Climate Change in the Sahel: Micro-evidence from Niger, J Afr Econ, 25:1–33

Atala, T., Umar, M. (2006). An Evaluation of The Global System of Mobile Communication (GSM) Use in News Gathering and Reporting in Kaduna, Nigeria. The Nigerian Journal of Communications, Communications, 4 (Nos 1&2): 149-155.

Awang, A. R. (2016). Assessment of the Recent Modifications in The Operations of Agricultural Development Programmes In Nigeria: A Case Study of The Anambra State Agricultural Development Project (ADP). In: Proceedings of The Fifth Annual National Conference of Agricultural Extension Society of Nigeria (AESON), Nigeria, Pp 53-65.

Azizah, S. (2018). Definition of Agricultural Extension.

Azman, A., D'Silva, J.L., Samah, B.A., Man, N., Shaffril, H.A.M. (2014). Relationship Between Attitude, Knowledge, And Support Towards the Acceptance of Sustainable Agriculture Among Contract Farmers in Malaysia. Asian Social Science, 9(2), 99-105.

Bajpai, R., Bajpai, S. (2014). The Goodness of Measurement: Reliability and Validity. International Journal of Medical Science and Public Health, 3(2), 112.

Baron, H., Henley, S., McGibbon, A., Mcarthy, T. (2002). Motivation Questionnaire Manual and User Guide. Sussex: Seville & Holdsworth Limited.

Baron, R.M., Kenny, D.A (1986). The Moderators-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations, Journal of Personality and Social Psychology, 51(6), 11-73

Barrick, M. R., Stewart, G.L. (2002). Personality and Job Performance: Test of the Mediating Effects of Motivation among Sales Representatives, Journal of Applied Psychology 37 (1) 1-9.

Bell, M. (2008). Powering Behaviour Change for a Brighter Agricultural Future. MEAS Discussion Paper, University of California

Bell, M. (2018). Internet Delivery of Short Courses for Farmers: A Case Study of a Course on Precision Agriculture', RIRDC Publication No. 02/085, Rural Research and Development Corporation, Canberra (online). (Accessed on 12.05.2013).

Bello, A. (2008). Introduction to Agricultural Extension and Rural Sociology: National Open University of Nigeria, Nigeria.

Bene, C., Kodio, A., Lemoalle, J., Mills, D., Morand, P., Ovie, S., Sinaba, F. and Tafida, A.A. (2009). Participatory Diagnosis and Adaptive Management of Small-Scale Fisheries in The Niger River Basin. *CPWF Project Number 72: CGIAR Challenge Programon Water and Food Project Report Series*

Bolarinwa, O. (2015). Principles and Methods of Validity and Reliability Testing of Questionnaires Used in Social and Health Science Researches. Nigerian Postgraduate Medical Journal, 22(4), Pp 195.

Boyatzis, R.E. (2008). Competencies in the 21st Century. Journal of Management Development. 27 (1), 5-12.

Brenda, L. M. (1998). Computer Anxiety Levels of Virginia Cooperative Extension Field

Bryan, E., Deressa, T. T., Gbetibouo, G. A., Ringler, C. (2009). Adaptation to Climate Change in Ethiopia and South Africa: options and constraints. Environmental science & policy, 12(4), 413-426.

Burkens, I., Webb, A. (2009). African Women and ICTs: Investigating Technology, Gender, and Empowerment. IDRC/UNISA/Zed Books, 22p.

Byrne, B. M., Van de Vijver, F. J. (2010). Testing for Measurement and Structural Equivalence in Large-Scale Cross-Cultural Studies: Addressing the Issue of Nonequivalence. International Journal of Testing, 10(2), 107-132.

Campbell, J.P., Pritchard, R.D. (1976). Motivation Theory in Industrial and Organizational Psychology.In M.D. Dunnette (Ed.). Handbook of Industrial and Organizational Psychology (63–130). Chicago: Rand Mcnally.

Central Bank of Nigeria (2012). Annual Report and Statement of Accounts, CBN, Abuja.Contribution of Agriculture to Economic Growth in Nigeria, 2012.

Central Bank of Nigeria (2018). Annual Report and Statement of Accounts, CBN, Abuja.Contribution of Agriculture to Economic Growth in Nigeria, 2018.

Central Bank of Nigeria (2019). Annual Report and Statement of Accounts, CBN, Abuja.Contribution of Agriculture to Economic Growth in Nigeria, 2019.

Central Bank of Nigeria (2020). Annual Report and Statement of Accounts, CBN, Abuja.Contribution of Agriculture to Economic Growth in Nigeria, 2020.

Central Bank of Nigeria (2021). Annual Report and Statement of Accounts, CBN, Abuja.Contribution of Agriculture to Economic Growth in Nigeria, 2021.

Cheema, D. F.-E.-A., Shujaat, S., Alam, R. (2013). Impact of Non-Monetary Rewards on Employees' Motivation: A Study of Commercial Banks in Karachi. Journal of Management and Social Sciences, 9(2), 23-30.

Cheong, W.H. (2002). Internet Adoption in Macao. Journal of Computer-Mediated Communication, 7(2), 11-18.

Chiang, C., Hsieh, T. (2012). The Impact of Perceived Organizational Support and Psychological Empowerment on Job Performance.The Mediating Effect of Organizational Citizenship Behaviour. International Journal of Hospitality Management, 31(1), 180-199.

Christoplos, I. (2010). Mobilizing the Potential of Rural and Agricultural Extension.The Global Forum for Rural Advisory Services. Food and Agriculture Organization (FA0): Rome.

Chung, J. E., Park, N., Wang, H., Fulk, J., McLaughlin, M. (2010). Age Differences in Perceptions of Online Community Participation Among Non-Users: An Extension of The Technology Acceptance Model. Computers in Human Behavior, 26(6), 1674-1684

Chung, W., and Paynter, J. (2002). An evaluation of Internet Banking in New Zealand. Proceedings of the 35th Hawaii International Conference on System Sciences, Hawaii, Jan, p 185

Cochran, P. (1977). Indigenous Perspectives on Snow and Ice. *Mother Earth Journal*

Cohen, L., Manion, L., Morrison, K., Wyse, D. (2007). A Guide to Teaching Practice. Routledge

Cole S.A., Fernando A.N. (2012). The Value of Advice: Evidence from Mobile Phone-Based Agricultural Extension. Working Paper 13-047, Harvard Business School, Harvard University.

Conelly, L.M (2008). Pilot studies. Medsurg Nursing, (17(6), 411-413

Creswell, J. W. (2008). Research design: Qualitative, quantitative and mixed method 167 aproaches. SAGE Publications

Cronback L.J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), Pp 297-334.

CTA (Centre for Agricultural and Rural Cooperation) (2003). ICTs – Transforming Agricultural Extension? An E-discussion held 20th August, - 29th Sept. 2003 Edition.

Dawley, D.D., Houghton, J.D., & Bucklew, N.S., (2010). Perceived Organizational Support *Development*: *Methods and Concepts*. Owerri, Springfield Publication.

Desai, M. Hart, J. and Richards, T. (2008) E-learning: a Paradigm Shift in Education, Education, 129(2), 2008, 327-334.

Detilleux, J., Theron, L., Beduin, J.M., Hanzen, C. (2012). A Structural Equation Model to Evaluate Direct and Indirect Factors Associated with a Latent Measure of Mastitis in Belgian Dairy Herds. Preventive Veterinary Medicine, 107(3), 170-179

DeVellis, R. F. (2003). Scale development: Theory and applications. Thousand Oaks, CA, Sage Publications, 2nd ed. Vol. 26

Devi, R., Sulaiman, W. (2014). Motivation as a Strategy to Retain Employees: Study Based on Selected hotels in Sri Lanka. Research Gate, 1-13.

Dire, B. Onu, J. I. Jungur, A. A. U. Ndaghu, A. A., Giroh, D. Y. (2016). Awareness on The Use of Information and Communication Technologies (ICT) Among Agricultural Extension Agents in North - Eastern Nigeria Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development Vol. 16, Issue 1, 2016 Print Issn 2284-7995, E-Issn 2285-3952

Durojaiye, L. O., Abubakar, S. Z., Omeneza, Z. E, Muhammed, S., Wahab, A. A, Ismail, F.O., Musa, R.A., (2013). An ICT-Based Agricultural Extension Service Delivery for Nigeria. Journal of Agricultural Extension 17 (2): 16 – 22

Eisenberger, R., Armeli, S., Rexwinkel, B., Lynch, P. D., Rhoades, L. (2001). Reciprocation of Perceived Organizational Support. Journal of Applied Psychology, 86, 42-51

Eisenberger, R., Huntington, R., Hutchison, S., Sowa, D. (1986). Perceived organizational. Support Journal of Applied Psychology, 71(3) 500-507.

Eisenberger, R., Malone, G.P., Presson, W.D. (2016). Optimizing Perceived Organizational Support to Enhance Employee Management. SHRM-SIOP Science of HR Series.

Ekbia, H. R., & Evans, T. P. (2009). Regimes of information: Land use, management, and policy. The Information Society, 25(5), 328–343.

Ekumankama, O. O., Nwankwo, G., (2002) Radio Farm Broadcast: A Study of Adoption of Agricultural Innovations in Umuahia Zone, Abia State. Journal of Agricultural Extension k6 (1): 17 – 23.

Eraly, A., (2009). Management Humain, Bruxelles: Presses Universitaires de Bruxelles

Essien, A. & Effiong, J. (2010). Economic Implications of Fish Landings in Nigeria: A Case Study of Ayadehe and Oku Iboko Fishing Communities in It u Local Government Area of Akwa Ibom State, Nigeria. International Journal of Economic Development Research and investment, 1(2&3):10.

Ezeh Ann, N. (2013). Extension Agents Access and Utilization of Information and Communication Technology (ICT) In Extension Service Delivery in South-East Nigeria. Journal of Agricultural Extension and Rural Development.Vol.5(11), pp. 266-276, December 2013 DOI: 10.5897/JAERD2013.0511 ISSN 2141-2170 ©2013 Academic Journals

Fadiji, T. O. (2007). The Effectiveness of Sources of Information and Farmers' Awareness of Farm Practices in Rural Communities of Kaduna State, Nigeria. Global Journal of Pure and Applied Sciences, 13(1): 17-22.

Fakhar Shahzad., GuoYi Xiu., Imran Khan·, Muhammad Shahbaz., Muhammad Usman Riaz., Adnan Abbas (2020). The moderating role of intrinsic motivation in cloud computing adoption in online education in a developing country: a structural equation model. Systems Journal, 14(4), 64–77.

FAO (2016). E-agriculture Solutions Forum.

FAO, (2008). Climate Change Implications for Fisheries and Aquaculture. In: *The State of Fisheries and Aquaculture 2008*. FAO, Rome, Italy, pp. 87–91.

FAO, (2020). Success Stories on Information and Communication Technologies for Rural Development. RAP Publication 2020/02. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific.

Farh, J., Hackett, R. D., and Liang, J. (2007). Individual-level Cultural Values as Moderators of Perceived Organizational Support-Employee Outcome Relationships in China: Comparing. The Effects of Power Distance and Traditionality. The Academy of Management Journal.Vol. 50, No. 3 (Jun. 2007), Pp. 715-729.

Feder, G. & Umali, D.L. (1993). "The Adoption of Agricultural Innovations: A review." Technological Forecasting and Social Change 43 (3-4), 215-239.

Feder, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (2010). Evaluating the use of exploratory factor analysis in psychological research. Psychological Methods, 4(3), 272-299.

Federal Communications Commission, (1999). FCC on Telecommunications Accessibility for the Disabled.

Field, A. (2001). Discovering Statistics Using SPSS (3rded) London: Sage.

Food and Agriculture Organization of the United Nations (2017). Information and Communication Technology (ICT) in Agriculture A Report to the G20 Agricultural Deputies

Food and Agriculture Organization of the United Nations, (FAO). (2015). Success Stories on Information and Communication Technologies for Rural Development. RAP Publication 2015/02. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific.

Formel & Larcker (1985). Economic Growth and the Income of the Poor. CAER II Discussion Paper No. 36. Harvard Institute for International Development, Boston, MA.

Fraenkel, J. R., Wallen, N. E., Hyun, H. H. (2012). How to Design and Evaluate Research in Education. New York: McGraw-Hill.

Frempong, F.A., kwarteng, J., Agunga, R. and Zinnah, M.M., (2006). Challenges of Infusing Information and Communication Technologies in Extension for Agricultural and Rural Development in Ghana. J. Extn. System, 22:69-82.

Fuglie, K.O., Kascak, C.A. (2001). Adoption and Diffusion of Natural Resource-Conserving Agricultural Technology. Review of Agricultural Economics, vol. 23, no. 2, pp. 386-403.

Gay L. R. Geoffrey E. Mills (2003). Principles of Correlation Analysis. Journal of the Association of Physicians of India, 65, 78-81. Retrieved from http://japi.org/

Gay L. R. Geoffrey E. Mills Airasian, P. (2011). Educational Research; Competencies for Analysis and Application.10th Edition. Library of Congress Cataloging-in-Publication Data

Gerba, E.L. (2018). Food Production Versus Biodiversity: Comparing Organic and Conventional Agriculture. Journal of Applied Ecology, 50(13): 317-328.

Gerba, E.L. Radelet, S., Warner, A. (2017). Economic Growth and the Income of the Poor. CAER II Discussion Paper No. 36. Harvard Institute for International Development, Boston, MA.

Giwa R.I. (1992). Assessment of Viable Cooperative in Northern Nigeria. Funded by EECNigeria Cooperative Project;

Godbold, K. E. (2010). Didiman: Australian agricultural Extension Officers in the Territory of Papua and New Guinea, 1945-1975 (Doctoral dissertation, Queensland University of Technology).

Hair, F.J., Black, W.C. Babin, B.J. (2010). RE Anderson multivariate Data a Global Perspective

Hair, F.J., Tomas, G.M.H., Christian, M.R., Marko, (2014). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)

Hamisu, S., Ardo, A. M., Makinta, M. M., Garba, L. and Musa, G. (2017). A Review on Current Status of Agricultural Extension Service in Nigeria: Asian Journal of Advances in Agricultural Research 1(3): 1-8, 2017; Article no. AJAAR.34875.

Hassan, S., Galadima, M., Man, N**.,** and Abu, I. (2019). Exploring Farmers Attitude, Practice and Relationship with Adoption of Improved Pearl Millet Technology in North-Eastern Nigeria. International Journal of Scientific and Technology Research (2019), 8(9), 1098-1105. ISSN: 22778616

Heale, R., Twycross, A. (2015). Validity and Reliability in Quantitative Studies. Evidence-Based Nurs, 18(4), 66-67.

Ho, F.S. (2000). "Food Policy in Nigeria." Agricultural Research Bulletin Vol. 1: 162\

Hu, F.N. & Chang, H.B. (2008). Foundation of Behavioral Research (4th Ed.) Fort Worth. TX: Harcourt College Publishers

Iddings, R. K., Apps, J. W. (1990). What Influences Farmers' Computer Use. Journal of Extension, XXVIII (spring), 19-20.

International Telecommunication Union (ITU). (2011). What a decade…

Iqbal, S., & Hashmi, M. S. (2001). Impact of perceived organizational support on employee retention with the mediating role of psychological empowerment. Pakistan Journal of Commerce and Social Sciences, 9(1), 18-34.

Isiaka, B.T., & Abubakar, L. (2008). Agricultural Extension Agents' Awareness of ICT Potentials and Training Needs on Usage for Improved Extension Service Delivery in Selected Southwest States. Nig. J. Hum. Soc. Sci. Creative Arts 4(1):18-30.

Isife, B. I., Ofuoku, A.U. (2008). Communication in Agricultural Extension and Rural Development: Methods and Concepts. Owerri, Springfield Publication.

Islam, S.M., and Grönlund, A. (2011). "Factors Influencing the Adoption of Mobile Phones among the Farmers in Bangladesh: Theories and Practices." International Journal on Advances in ICT for Emerging Regions 2011 04 (01): 4 – 14

Issahaku, A. (2014). Perceived Competencies of Agriculture Extension Workers in Extension Services Delivery in Northern Region of Ghana, Perspective from Literature. Developing Country Studies, 4(15), 107–115.

Ivancevich, K., Kono, P., & Matheson L. (2001). Agricultural Productivity Growth and Poverty Alleviation. Development Policy Review, 19 (4), 449-466.

Jabil, I.Y. (2009). Marketing of Selected Processed Dairy Product in Bauchi State: Unpublished M.Sc. Thesis Department Agricultural Economics and Extension, School of Agriculture and Agricultural Technology, Atbu Bauchi

Jayathilake, H. A. C. K., Jayaweera, B. P. A., Waidyasekera, E. C. S. (2010). ICT Adoption and Its' Implications for Agriculture in Sri Lanka.Journal of food and agriculture, 1(2).

Jensen, R.T., (2007). The Digital Provide Information (Technology), Market Performance, and Welfare in the South Indian fisheries sector. Q. J. Econ. 122(3), 879—924

Kalba, K. (2008). "The Adoption of Mobile Phones in Emerging Markets: Global Diffusion and the Rural Challenge." International Journal of Communication, vol. 2, pp. 631-661

Katengeza, S.P., Okello J.J., Jambo, N.N. (2011). Use of Mobile Phone Technology in Agricultural Marketing: The Case of Smallholder Farmers in Malawi, ICT Research and Development in Africa, 2(2).

Kehinde, A. T., Ayobami, A. L., (2015). Training Needs Assessment on the Use of social media Among Extension Agents in Oyo State, Nigeria. Journal of Agricultural Informatics 6 (1):100 – 111

Kiplang'at, J. (2003). "Does Agricultural Extension Have a New Beginning Because Of Icts: Reflection on Experiences in Sub-Saharan Africa". A Keynote Paper Presented at the 6th Consultative Expert Meeting on CTA's Observatory on ICTs. Wageningen.

Kiruja, E.K., Mukuru, E. (2013). Effect of Motivation on Employee Performance in Public Middle-Level Technical Training Institutions in Kenya, International Journal of Advances in Management and Economics, 2 (4)73-82.

Klin, R. (2005). Principle and practice of structural equation modelling. New York: The Guilford Press

Kline, R. B. (2011). Assumptions in Structural Equation Modelling. In Handbook of Structural Equation Modeling (R. Hoyle, ed.). Guilford Press, New York, This volume

Kondra, I. (2020). "Use of IT in Higher Education". UGC Care Journal. India: Studies in Indian Place-Names. 40: 280.

Koyenikan, J.M. (2011). Extension Workers' Access to Climate Information and Sources in Edo State Nigeria, Archives of Applied Science Research, 3(4), 11 – 20

Krejcie, R.V., Morgan, D.D (1970). Determining Sample Size for Research Activities.Educational & Psychological Measurement, University of Minnesota, Duluth Texas A. & M. University Press.

Kumar, R. (*2011*) *Research Methodology*: A Step-by-Step Guide for Beginners. 3rd Edition.Sage, New Delhi.

Kwadwo, Asenso-Okyere D., Ayalew M., (2012). The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa. Working paper-United Nation Development Program-WP 2012-015: January 2012

Labar, K.S., Disterhof, J.F. (1998). Conditioning Awareness and the Hippocampus. 8 (6): 620-6 doj:10.1002 (SIC) 1098-1063 (8:6) AID-HIPO4. 3.0 CO2 PMID 9882019

Lamm, K. W., Lamm, A. J., Davis, K., Swaroop, B. J. (2018). Effective advocacy for extension networks: An evaluation of critical capacities. Journal of International Agricultural and Extension Education, 25(2), 43–56.

Lamm, K. W., Lamm, A. J., Davis, K., Swaroop, B. J., & Edgar, L. D. (2019). Identifying information and communication technology use capacity needs of extension networks. Journal of International Agricultural and Extension Education, 26(3), 58-71.

Lance, A. (2011). Organizational Behavior, 4th edition, Boston: IrwinMcGraw

Lee, N. C., Krabbendam, L., Dekker, S., Boschloo, A., De Groot, R.H.M. & Jolles, J. (2012). Academic Motivation Mediates the Influence of Temporal Discounting on Academic Achievement During Adolescence, Trends in Neuroscience and Education, 1, 43-48.

Levine, H., Li, E., Nuberg, I. & Bruwer, J. (2019). Understanding farmers' adaptation intention to climate change: A structural equation modelling study in the Mekong Delta, Vietnam. Environmental Science & Policy, 41, 11-22.

Lipton, M. (2012). Learning from Others: Increasing Agricultural Productivity for Human Development in Sub-Saharan. United Nations Development Programme, Regional Bureau for Africa.

Lissitz, R. W. & Green, S. B. (1975). Effect of the number of scale points on reliability: A Monte Carlo approach. Journal of Applied Psychology, 60(1), 10. Lobell, D. B., Schlenker, W., & Costa-Roberts, J. (2011). Climate trends and global crop production since 1980. Science, 333(6042), Pp 616-620.

Liu, W. (2010). Economic Development with Unlimited Supplies of Labour. The Manchester School, 22 (2), 139-191.

Mabe, R., Hall, A., Kalaivani, N. J., Dorai, K., & Vamsidhar Reddy, T. S. (2012). Necessary, but not sufficient: Critiquing the role of information and communication technology in putting knowledge into use. Journal of Agricultural Education and Extension, 18(4), 331- 346.

MacMillan, R. C., Schumacher, J. T. (2014). Applications of Structural Equation Modelling in Psychological Research. Annual Review of Psychology, 51(1), 201-226.

Maduka, C. E. & Okafor, O., (2014). Effect of Motivation on Employee Productivity: A Study of Manufacturing Companies in Nnewi, International Journal of Managerial Studies and Research (IJMSR) 2 (7), 137-147.

Mahant, M., Shukla, A., Dixit, S., & Patel, D. (2012). Uses of ICT in agriculture. International Journal of Advanced Computer Research, 2(1), 46-49.

Man, N.& Isah, S. N. 2019 The Influence of Attitude, Social Norms on Adaptation Practices of Oil Palm Smallholders, and Mediation Role of Intention Towards Climate Change Impact in Malaysia *International journal of scientific & technology research vol 8 (9), 2019*

Maningas, R. V. (2006). Mainstreaming farmers and intermediaries into information and communications technology (ICT): A strategy towards adopting ICT for rural development and agricultural extension. American Society of Agricultural and Biological Engineers, 4th World Congress Conference, Orlando, Florida, United States of America

Masianini, B. & Rokotuibau, M. (2009). Case Study: Listening to Farmers. In: ICT Update (Issue No 49) June, p10-11.

Mathora, P. (2007). Technological Forms and Ecological Communication: A Theoretical Heuristic (Lanham, Boulder, New York, London), pp. 200-202.

Matthews, M. (1998). Constructivism in Science Education: A Philosophical Examination. Dordrecht: Springer Science & Business Media. pp. x.

Mayers, M. (2008). Radio and Development in Africa: A Concept Paper. Prepared for the International Development Research Centre (IDRC) of Canada. Updated Report in March 2009.

Mclver, M. & Camines, B. (1981). "Factors Affecting the Adoption of Mobile Banking Services. Journal of Internet Banking and Commerce, vol. 8, pp. 0306-04.

McNamara, K. (2009). Improving Agricultural Productivity and Markets: The Role of Information and Communication Technologies. Agriculture and Rural Development Notes, Issue 47, April, The World Bank, Washington DC.

Meera, S.N., Jhamtani A, Rao D.U.M. (2004). Information and Communication Technologies in Agricultural Development: A Comparative Analysis of three Projects from India. Network, p. 135. Agricultural Research and Extension Network.

Mittal, S., Gandhi, S., Tripathi, G. (2010). Socio-Economic Impact of Mobile Phones on Indian Agriculture. Indian Council for Research on International Economic Relations (ICRIER), working paper no. 246

Mittal, S., Mehar, M. (2015): Socio-economic Factors Affecting Adoption of Modern Information and Communication Technology by Farmers in India: Analysis Using Multivariate Probit Model, The Journal of Agricultural Education and Extension, DOI: 10.1080/1389224X.2014.997255

Mtega W. P., Dulle F., Malekani A. W., Chailla A. (2014). The usage of e-resources among agricultural researchers and extension staff in Tanzania.*Library and Information Research*, Vol. 38(119): 47-66

Muhammad-Lawal, A., Atte, O. (2006). An Analysis of Agricultural Production in Nigeria.African Journal of General Agriculture, 2 (1). Nigeria, C. W. (2012). www.cia.gov.

Muktar, B. G., Man, N., Saleh, J. M., Daneji, M. I. (2019). Evaluation of ICTs Access, Use and Preferences for Livelihood Resilience: Results from A Survey of Malaysian Fisher Folks. *The Journal of Agricultural Education and Extension, 24*(4), 377-388

Mungo, A., Vermeulen, M. (2011). Let's Talk About the Use of ICTs In African ` Agriculture. Farming Matters (March 2011 issue):18-20

Murtala, N. Jibril, S. A., Haruna, U. and Atumeyi, G. A. (2007). Role of Information and Communication in the adoption of new technologies by farmers in Jos-South Local Government Area, Plateau State. Proceedings of the 12th National Conference of AESON, 4-7th July, Pp38-45: Maiduguri, Nigeria.

Nakasone, E., M. Torero, B. M. (2014). The Power of Information: The ICT Revolution in Agricultural Development. Annual Review of Resource Economics, Vol. 6: 533-550

Narine, L. K., Harder, A., & Roberts, T. G. (2019). Farmers' intention to use text messaging for extension services in Trinidad. Journal of Agricultural Education and Extension, 25(4), 293-306.

National Bureau of Statistics, (2020) Nigerian Gross Domestic Product quarterly report. August 2020 report.

Nawawi, H. (2001). Human Resources Management of Competitive, Gajah Mada University Press, Yogyakarta

Ndag, I., Sanusi R. A. Aigbekaen E. O. (2008). "Comparative Analysis of Information and Communication Technology (ICT) use by Agricultural Extension Workers in South-West and North-central Nigeria", Proceeding of the 19th Annual International Information Management Association. pp. 35-40.

Ndaghu, A. A., (2011). Use of Information and Communication Technologies (ICTs) among Women Farmers in North-Eastern Nigeria. An unpublished doctoral thesis, University of Ibadan, Nigeria

Nevid, J.S. (2013). *Concepts and Applications*. Belmont, CA: Wadsworth Cengage Learning; 2013.

Newby, T. Stepich, D. Lehman, J., Russell, J. (2000). Instructional Technology for Teaching and Learning: Designing Instruction, Integrating Computers, and Using Media (Columbus, OH: Prentice-Hall, 2000).

Nielsen, R.L. (1999). Cyberspace and Agricultural Technology Transfer: An Indiana Experience', Purdue University, West Lafayette, presentation, (online). (Accessed on 12.06. 2013).

Nkwocha, V. I., Ibeawuchi, I. I., Chukwueke, N. O., Azubuike, N.O. Nwkwocha, G. A. (2009). "Overview of the Impact of ICT on Agricultural Development in Imo State, Nigeria", Proceedings of 43rd Annual Conference of the Agricultural Society of Nigeria, Abuja. pp. 711-14.

Nola, R., Irzik, G. (2006). Philosophy, Science, Education and Culture.Springer Science & Business Media.p. 175.

Nwabugwu, T. S (2019). Awareness and Use of E-Resources Among Public Extension Personnel in Anambra State, Nigeria Journal of Agricultural Extension. Vol. 23 (1) Journal Seek, Scientific Commons, ISSN(e): 24086851; ISSN(Print); 1119944X

Oladosu, I.O. (2008). Extension Workers' Information Technology Use Characteristics and Training Need in Nigeria. The Social Science, 3(5):384-387.

Oliver-Hoyo, M., Allen, D. D. (2006). The Use of Triangulation Methods in Qualitative Educational Research. Journal of College Science Teaching, 35(4), 42.

Omotayo, O. M. (2005). "ICT and Agricultural Extension: Emerging Issues in Transferring Agricultural Technology in Developing Countries", Adedoyin S.F (Ed) Agricultural Extension in Nigeria, AESON, (145-58pp).

Omotayo, O.M. (2015). ICT and Agricultural Extension: Emerging Issues in Transferring Agricultural Technology in Developing Countries. In: S. Fola Adedoyin (Ed), Agricultural Extension in Nigeria. Agricultural Extension Society of Nigeria (AESON), Ilorin, Nigeria, 145-158.

Ozyer, K., Polatci, S. (2017). The Effects of Organizational and Social Support on Employee Psychological Well-Being: International Journal of 3(3), 258-267.

Padachi et al. (2008)."Investigating in to the Factors that Influence the Adoption Of Internet Banking in Mauritius", Proceedings of The 2007 Computer Science And IT Education Conference.

Pallant, J. (2011). SPPS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS (2011th Ed.). Australia: Allen and Unwin.

Patra, J., Singh, D. V., Pati, J. K. (2016). Kisan mobile advisory service: An effective ICT tool for technology dissemination. International Journal of Humanities and Social Science Invention, 5(6), 68-72.

Piaget, J. (1980). Psychology and Epistemology: Towards a Theory of Knowledge (New York: Grossman, 1971).

Pick, J.B., Nishida, T. (2015). "Digital Divides in The World and Its Regions: A Spatial and Multivariate Analysis of Technological Utilization", Technological Forecasting and Social Change, 91, 2015, pp. 1–17

Prado, P., Camara, M. A., Figueiredo, M.A. (2011). Evaluating ICT Adoption in Rural Brazil: "A Quantitative Analysis of Telecenters as Agents of Social Change." Journal of Community Informatics, Vol. 7 (Nos. 1 & 2).

Purnomo, S. H., Lee, Y. (2010). An Assessment of Readiness and Barriers towards ICT Programme Implementation: Perceptions of Agricultural Extension Officers in Indonesia. International Journal of Education and Development using Information and Communication Technology 6 (3): 19 - 36.

Raksha I., Rao S, Meera S. N., Kumar V. (2015). E-Readiness in Agricultural Extension System.*Indian Journal of Extension Education.*15 (2): 77- 81

Ramli, N.S., Norsida, M., Hassan, M. S., Bahaman, A. S., Omar, S. Z., Sarina, Y., Rahman, N. A. A., & Ibrahim, M. S. (2019). Pattern of Mobile Phone Usage Among Paddy Farmers. International Journal of Academic Research in Business and Social Sciences, Vol. 9, No. 12, 2019.

Rhoades, L., & Eisenberger, R. (2002). "Perceived Organizational Support: A review of the Literature." Journal of Applied Psychology, 87, 698–714.

Rhoades, L., Eisenberger, R. (2017). Perceived Organizational Support: A review of the Literature. *Journal of Applied Psychology, 87*(4), 698–714

Rhodes, L & Eisenberger, R., Armeli, S. (2018). Affective Commitment to the Organization: The Contribution of Perceived Organizational Support. Journal of Applied Psychology 86(5):825-36.

Robbins, S. & Judge, F. (2013). Organizational Behavior, 6th edition, Englewood Cliffs: Prentice-Hall, 1993

Robert, E. R. H., Hutchison, S., Sowa, D. (1986). Perceived organizational support. Journal of Applied Psychology, 71(3), 500-507.

Rogers, E. M. (1962). *Diffusion of innovations*. New York: Free Press.

Roos, W., Van E. (2013). The Relationship between Employee Motivation, Job Satisfaction and Corporate Culture, SA Journal of Industrial Psychology, 34 (1), 54-63

Roya, K., Maimunah, I., 1Zoharah, B.O., Nor Wahiza, A. W., Mohammad, B. (2012). Organizational Support and Achievement Motivation in Leadership Role of Extension Agents in Malaysia. American Journal of Applied Sciences 9 (5): 633-640, 2012 ISSN 1546-9239 © 2012 Science Publications

Salau E.S., Saingbe N.D. (2008). Access and Utilization of ICTs Among Agricultural Researchers and Extension Workers in Selected Institutions in the Nassarawa State of Nigeria. pp. 1-6.

Saleh, J. M. &Man, N. (2017) Training Requirements of Agricultural Extension Officers Using Borich Needs Assessment Model. *Journal of Agricultural & Food Information, 18*(2), 110-122

Seepersad, J., (2003). Case Study in ICTs in Agricultural Extension in Trinidad and Tobago.In CTA ICTs – Transforming Agricultural Extension? The 6th Consultative Expert Meeting of CTA's Observatory on ICTs, Wageningen, 23-25 September 2003.

Sekunmade, A. (2009). The Effects of Petroleum Dependency on Agricultural Trade in Nigeria: An Error Correlation Modelling (ECM) Approach. Scientific Research and Essay, 4 (11), 1385-1391. Shovan, R. (2004). Roles of Agriculture: Buffer Role of Agriculture in Crisis Management. Rome: Food and Agriculture Organization.

Sennuga, S.O., Fadiji, T.O. (2020). Effectiveness of Traditional Extension Models Among Rural Dwellers in Sub-Saharan African Communities, International Journal of Advanced Research, 8(4), 401-415.

Soliha, E., Dharmmesta, B. S., Purwanto, B.M. Syahlani, S.P., (2014). Message Framing, Source Credibility, and Consumer Risk Perception with Motivation as Moderating Variable in Functional Food Advertisements, American International Journal of Contemporary Research. 4(1) 193-208.

Springer, G. J. (2011). A Study of Job Motivation, Satisfaction, and Performance Among Bank Employees. Journal of Global Business Issues, 5(1), 29-42.

Stephen, L.S.& Robbins, J, (2017). Growth Prospects for the Nigerian Economy. Convocation Lecture Delivered at the Igbinedion University Eighth Convocation: Research Department, Central Bank of Nigeria.

Stone-Romero, E. F., Anderson, L. E. (1994). The Relative Power of Moderated Multiple Regression and the Comparison of Subgroup Correlation Coefficients for Detecting Moderating Effects.Journal of Applied Psychology, 79(3), 354.

Tabachnick, B. G., Fidell, L. S. (2001). Using Multivariate Statistics (3rd edition). New York:

Taragola, N. and Lierde, D.V. (2005). Adoption of ICT in horticulture: Confronting Scientists' Opinions with Practice in Flanders, Belgium, (online).

Tarhini, A., Hone, K., Xiaohui L. (2014). User Acceptance Towards Web-based Learning Systems: Investigating the Role of Social, Organizational and Individual factors in European Higher Education Procedia Computer Science 17 (2013) 189 – 197 Thesis, Virginia Polytechnic Institute and State University

Tiraieyari, N. (2009). Relationships between Extension Workers' Competencies and Job Performance in Implementing the Good Agricultural Practices Programme in Malaysia (Doctoral dissertation, Universiti Putra Malaysia).

Tumovic, P. (2001). Food Security and Economic Growth: An Asian Perspective. Center for Global Development Working Paper No. 51, Available at SSRN.

Udiandeye, C.U. (2009). Current issues in Agricultural Extension and Technology. Keynote at the Department of Agricultural Economics and Extension, Faculty of Agriculture, Bayero University Kano, Nigeria.

Uganneya, S., Ape, R., Ugbagir, N. (2012). Information Services Provision and User Satisfaction in Agricultural Research Libraries in Nigeria. International Journal of Library and Information Science 3(6): 88 – 93

Umar, S., Man, N., Nawi, N. M., Ismail Abd Latif, & Mukhtar, B. G. (2019) Underlying Structure of Job Competency Scale in Climate- Smart Agricultural Extension Service *Pertanika J. Soc. Sci. & Hum. 27 (T): 93 - 111 (2019*

Umar, S., Man, N., Nawi, N. M., Ismail Abd Latif, & Mukhtar, B. G. (2019) Underlying Structure of Job Competency Scale in Climate- Smart Agricultural Extension Service *Pertanika J. Soc. Sci. & Hum. 27 (T): 93 - 111 (2019).*

Umar, S., Man, N., Nawi, N.M., Latif, I.A., Samah, B.A. (2017). Core Competency Requirements among Extension Workers in Peninsular Malaysia: Use of Borich's Needs Assessment Model. *Evaluation and Program Planning*, *62*, 9-14.

Umar, S., Michael, W., Musa, Y., Toluwase, O., Rabiu, S. (2015). Awareness and Use of Information and Communication Technologies among Extension Agents in the Kaduna State of Nigeria. Journal of Agricultural Extension Service (EJS), Vol.19 (1)

UN, (2020). United Nations World Population prospects, (2020) Revision. Census Reports and other Statistical Publications from National Statistical Offices

United Nations, (2016). Global E-government Readiness Report: From E-Government to E-Inclusion. UNPAN/2016/17s, United Nations, New York.

United State Agency for International Development, (USAID, 2003). Agricultural Inputs Markets in Nigeria.An Assessment and Strategy for Development.Sponsored by Federal Government of Nigeria.

Uzonna, U. R. (2013). Impact of Motivation on Employees' Performance: A Case Study of Credit West Bank Cyprus. Journal of Economics and International Finance, 5(5), 199-211.

Van Dijk J. A. G. M. (2009). The digital Divide in Europe. In the Routledge Handbook of Internet Politics (Chadwick, A and Howard PN, Eds), Routledge, London and NY, 2009, pp. 288-304

Van Dijk, J.A.G.M. (2005). The Deepening Divide: Inequality in the Information Society, SAGE Publications, Thousand Oaks, CA, 2005.

Verter, N. (2015). "An Analysis of Yam Production in Nigeria". Acta Universitatis Agriculture et Silviculturae Mendelianae Brunensis. 63: 659–665.

Vroom, V.H. (1964). *Work and motivation.* Wiley Publishers.

Wang, Y., Wu, M., and Wang, H. (2009). "Investigating the determinants Age and gender Differences in the Acceptance of Mobile Learning." British Journal of Educational Technology, 40(1), 92-118

Warren, M. F. (2002). Adoption of ICT in Agriculture: Intrinsic and Instrumental Roles in Technology Transfer. The 3rd Conference of the European Federation of Information Technology in Agriculture, Food and the Environment, Montpellier, AgroMontpellier, pp. 675-679.

Wims, P. (2007). Analysis of Adoption and Use of ICTs among Irish Farm Families. J. Extn. Systems. 23(1):14-27

World Bank (2011). Project Coordinating Unit.Annual Report on Agricultural Extension Service Delivery.

World Bank, (2018). ICT in Agriculture: Connecting Smallholders Knowledge, Networks and Institutions, Report number 64605.

Yakubu, D. H., Abubakar, B. Z., Atala, T. K., Muhammed, A. (2013). Use of Information and Communication Technologies among Extension Agents in Kano State, Nigeria. Journal of Agricultural Extension 17 (1): 162 – 173

Yekinni, O. T., Hussein, L. A. (2008). An assessment of the Relevance of Information and Communication Technologies (ICTs) to Agricultural and Rural Development by Research and Extension Personnel in South-Western Nigeria. Nigerian Journal of Rural Sociology, 8(1): 76-82.

Zainudin, A. (2015). SEM Made Simple. A Gentle Approach to Learning Structural Equation Modeling (Edition 1.). Bandar Baru Bangi, Selangor, Malaysia: MPWS, Rich Publication.

Zhang. J., Xiaoping, Z. Z., Zhang, X., Fu, Z. (2010). Farmers' Information Acceptance Behaviour in China.African Journal of Agricultural Research. Vol. 5 (3) pp. 217-221.

Zohara, C. (2007). Statistical alchemy--The use of factor scores in linear regression.

Zohrabi, M. (2013). Mixed-Method Research: Instruments, Validity, Reliability and Reporting Findings. Theory and Practice in Language Studies, 3(2), 254–262.

Zulqarnain., Man, N., Juwaidah S., Muhammad R., Salim H. (2020.) Factors Influencing Attitude Towards Technology Adoption among Permanent Food Production Park (PFPP) Program Participants in West Malaysia *Journal of Agricultural Science and Technology B 10 (2020) 89-97a*nd (2020)

Zwane, E.M. (2012). Does Extension Have a Role to Play in Rural Development? South African Journal of Agricultural Extension.Vol. 40(1).