

Information and Communication Technology a Tool for Sustainable Livelihood Activities in Rural Kauru, Kaduna State of Nigeria

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Abstract

The influences of information and communication technology (ICT) in the activities of farmers' in Kauru Local Government Area of Kaduna State were determined with 300 farmers using closed structured questionnaire. The instrument was randomly distributed in five villages in each of the selected three districts (Kauru, Kwassam and Kumana). In each village, 20 farmers were randomly selected. Data were subjected to descriptive statistics and mathematical techniques using confrontation indexes (CI). Results indicated that 80 % were male within 15-25 years (52.7 %). Majority of the farmers were married (51 %) and educated (86 %). Of the 6 sources of information acquisition, radio (29.7 %) and mobile phone (22.5 %) dominated. On the awareness of ICT facilities in agriculture, food processing for homes (2.68) dominated followed by use of computer in storage of information (2.44) while use of CD in determining market price ranked low (2.13). Farmers' perception revealed that ICT increases efficiency (3.5) and helps in market price of goods (2.2) *inter alia*. Although farmers were aware of the roles and benefits of ICT, their efforts were limited by lack of ICT infrastructures and maintenance (3.5), poor community involvement and inadequate skill personnel (3.2). The study concluded that provision of ICT facilities, infrastructures, training on usage and good community leadership will improve farmers' livelihood for sustainable agricultural development.

Keywords: *Information, Needs, Farmers, Rural, Livelihood, Sustainability*

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Background to the Study

Information and communication technology (ICT) is an expanding assembly of technologies that are used to collect, store and share information between people using multiple devices and multimedia (Adekanmi, 2007). Such devices could be in form of hardware, software, computer, internet, e-mail and digital camera among others. There are also traditional media like radio, television and video (Munyua and Adera, 2009), which over time has played convergence with conversational media such as digital camera, digital video camera, slide projector and mobile telephones (Michiel and Van Crowder 2001; Ramirez, 2008). The devices are linked with others to facilitate sharing and exchange of information (Ivande, Ugboji and Ojike, 2018), hence usher in the application of electric extension services in rural information dissemination (Alleman and Paul, 2005).

Smallholder farmers are crucial in food security and livelihoods of rural people in Sub-Saharan Africa and contribute 80 % of agricultural food production (Ali, 2011; Kathless and Fridah, 2017). Such farmers often engage in both commercial and subsistence farming (Munya, Adera and Jensen, 2009) and contributes one third of their country's gross domestic product (World Bank, 2017), by cultivating few hectares of land and keeping 10-20 animals. Exportation of yam from Nasarawa, ginger and ginger oil from Kaduna and the recent government interest to produce and export cassava and rice (Nwanosike, 2010), requires quick global information system on production and marketing of such produce to meet the international standard, particularly that majority of farmers growing these crops are subsistence in nature.

Information is the cardinal component of rural development and decision making, and poor access to it has constituted major impediment to livelihood activities in the rural areas of developing countries (Cash 2001; Rao 2006). The present use of personal computers, internet, mobile phones and television provided wide choice in the collection, storage, processing, transmission and presentation of information in multiple formats towards diverse requirements and skills of people in rural environments (Nwanosike, 2010; Kwadwo and Daniel, 2012). Poor connectivity and disintegration of market, unreliable and delayed information to farmers, small land holding, non-adoption or less adoption of improved technology were reported as the problems of agriculture particularly among smallholder farmers (Singh, Santosh, and Sarita, 2017). Therefore timely availability of information and proper utilization is paramount. In addition to effective extension services, ICT (e-agriculture) devices can be used to propagate information, transfer technology, procure inputs and sell outputs. Michael (2019) is of the view that digitalization of agricultural information dissemination is a “game changer” for smallholder farmers.

This therefore implied improved social and economic livelihood activities of the people because the devices enabled farmers' up-to date information in crop production, diseases, marketing, raising livestock's, catching fish and processing (Ali and Kumar, 2011; Singh et al., 2017; Ivande *et al.*, 2018). The “Shamba Shape Up” (SSU), a TV programme in East Africa (Kenya and Tanzania) consistently tackles issues on soil fertility, poor crop and animal health, dietary diversity among others and has consequently increased youth's participation in

farming (Sawa, 2019). The use of Global Positioning system (GPS) and Geographic Information System (GIS) has benefitted farmers in geo-fencing, map-making, surveying and precision farming. GIS is used to determine soil type and possible crop to cultivated using historical data and sampling (en.wikipedia.org). Report in Wikipedia also confirmed the use of SMS and GPS in preventing elephant bull from destroying farmer's crop by tagging the animal with a device that sends message to the concerned farmers once they are moving towards farms in Kenya.

Radio is extensively used (Munyua and Adera, 2009) and farmers tend to rely on it and dump current technologies. Kauru Local Government is dominated by subsistence agrarian farmers and despite the increasing efforts of Federal and State Government, even NGOs to improving food production, little or nothing has been achieved. Ivande *et al.*, (2018) reported that provision of current and up to- date information to rural farmers in the areas of improved agricultural practises, chemical and fertilizer availability, market location and market prices, food proceeding and storage is necessary for increased food production, income growth and food security. Therefore, the study will establish information needs of farmers by examining ICT awareness, available devices, the roles and problems among farmers. Such information among others will benefit policy makers, extension agents and improve standard of living of the farmers.

Objectives of the study

The study seeks to;

1. Examine the socio-economic characteristics of the farmers
2. Access the level of awareness of the farmer in the use of ICT
3. Identify ICT devices available to the farmers
4. Determine farmers perception on the roles of ICT in farming activities and
5. Determine the problems of farmers in the use of ICT devices in farming

Research Questions

The following research question will guide the study;

1. What are the available ICT devices to the farmers?
2. What is the awareness level of ICT among the farmers?
3. Is the application of the roles of ICT known to farmers?
4. What are impeding factors to the use of ICT by farmers in Kauru

e-Agriculture deals with conceptualization, design, development, evaluation and application of innovations and its dissemination through devices, networks, mobile services, telephones, televisions, radios and satellites (en.wikipedia.org). Several devices have been produced to assist rural poor resource farmers improve their livelihood and increase agricultural output. However, Akinbile (2009) associated the inadequate food production in Nigeria to weak sustainable technology dissemination, consequently farmers' household dwell in food insecurity (World Bank, 1994), resulting to declined food production growth rate. Nwanosike, (2007) associated it with porous link between researchers, extension services and the farmers. The rural farmers are experienced in the traditional technological transfer in all aspects of

food production through parents and friends, the use of information and communication technology using electrical and electronic services in processing and disseminating food production information will facilitate communication easily and quickly (Singh *et al.*, 2017).

Materials and methods

The study was conducted in the three districts; Kauru, Kwassam and Kumana in Kauru LGA of Kaduna State. A total of 300 closed structural questionnaire comprising of demographic and sources information, level of awareness and available devices, knowledge of the roles and problems of ICT were randomly distributed to the farmers. In each of the 15 selected villages in the three districts, 20 questionnaires were distributed to farmers in the field with the help of coordinated village research assistance in 2019.

Data on demographic and sources of information were subjected to descriptive statistics while level of awareness, farmers' perception of the role and problems of ICT were analysed with mathematical techniques using confrontation index amended from Aurup, Monirul, and Tasm Uddin, (2017). A 3-point response category of yes, fair and No with corresponding weighted values of 3, 2, and 1, respectively was used for awareness while 4 point response category of strongly agreed (SA), agreed (A), disagreed (D) and strongly disagreed (SD) were assigned values of 4, 3, 2 and 1, respectively for farmers' perception on the roles and problems of ICT. Such mathematical techniques were called awareness, role and problem confrontation indexes and calculated using the relationships below;

$$ACI = [A_y \times 3] + [A_f \times 2] + [A_n \times 1]$$

Where ACI = Awareness confrontation index

AY = Number of farmers that ticked 'yes' in each item

AF = Number of farmers that ticked 'fair' in each item

AN = Number of farmers that ticked 'No' in each item

$$RCI = [R_{SA} \times 4] + [R_A \times 3] + [R_D \times 2] + [R_{SD} \times 1]$$

Where RCI = Roles confrontation index

SA = Number of farmers that ticked strongly agreed in each item

A = Number of farmers that ticked agreed in each item

D = Number of farmers that ticked disagreed in each item

SD = Number of farmers that ticked strongly disagreed in each item

$$PCI = [P_{SA} \times 4] + [P_A \times 3] + [P_D \times 2] + [P_{SD} \times 1]$$

Where PCI = Problem confrontation index

SA = Number of farmers that ticked strongly agreed in each item

A = Number of farmers that ticked agreed in each item

D = Number of farmers that ticked disagreed in each item

SD = Number of farmers that ticked strongly disagreed in each item

The range of ACI will be 1-900 while that of role and problems will be 1-1200. The mean was calculated by dividing each confrontation index with total number of farmers used while mean decision bench mark of 2.0 indicated that farmers were aware of the use of ICT facilities. On the role and problems of ICT, mean of ≥ 2.5 suggested that farmers knows the roles ICT plays in agriculture and determined the magnitude of the problem (Ivande *et al.*, 2018).

Results and Discussion

Results (Table 1) revealed that male (80 %) with an average age of 33.3 years dominated farming activities. However farmers within age range of 15-25 years (52.7 %) were majority. This implied adequate male youth's workforce in agriculture and gender insensitivity possibly due to the cultural practise which does not allow women particularly the young out of their husband's house. Micheal (2019), reported that the current youth participation in the sector has the potential to transform agriculture but should capitalize on digital source of information to make it more attractive to employment and marketing. Results also showed that 51 % were married while 86 % were educated. Educated in the sense that the farmers attended secondary (40 %) and tertiary (46.7 %) schools, however field experience showed that majority read course other than agriculture. The age and education level of the farmers will facilitate ICT training.

Table 1: Demographic information of the farmers in Kauru Local Government Area, Kaduna State, 2019
N= 300

S/no	Characteristics	Frequency	Percent (%)	Average	
1	Sex	Male	239	79.9	33.3
		Female	61	20.3	
2	Age	15-25	158	52.7	
		26-36	107	35.7	
		≥ 37	35	11.6	
3	Marital status	Single	135	45.0	
		Married	153	51.0	
		Divorced	12	4.0	
4	Education	Primary	40	13.3	
		Secondary	120	40.0	
		Tertiary	140	46.7	

N = total number of farmers used

The use of radio (29.7 %) followed by mobile phone (22.5 %) dominated sources of information acquisition of the farmers possibly because such devices are handy and available to the farmers (Table 2). Television as a source ranked very low (16.0 %) due to scarce farming programmes and incessant power failure in the rural Kauru. Sensitive ICT devices are not available and in most cases inadequate particularly the use of computers (14.7 %) and CD audio and video (9.9 %). Results also showed that print media (7.2 %) such as hard copies of farming books, journals, magazines, posters among others were grossly inadequate. Field observation revealed that, although majority of the farmers were educated, the interest in

reading print media is poor as they pre-occupy themselves with farming. The domination of radio and mobile phone as sources of agricultural information in rural areas has been reported (Ivande *et al.*, 2018). Nwanosike and Yaroson (2008) also reported that ICT has extended to the use of cell phones because is cheap, easy to use by literate and illiterate farmers, convenient and easy to handle. Therefore, development of software using farmer's local language will facilitate understanding, economically empower local farmers and create investment opportunities for the programmers.

Table 2: Sources of information and communication acquisition in agricultural activities in Kauru Local Government Area, Kaduna State, 2019
N = 475

S/no.	Sources	Frequency	Percent (%)
1	Radio	141	29.7
2	Mobile phone	107	22.5
3	Television	76	16.0
4	Computer	70	14.7
5	CD audio and visual	47	9.9
6	Print media	34	7.2

Multiple choice was allowed, N = total number of farmers used

Results (Table 3) showed level of awareness of farmers to the seven applications of the ICT facilities in farming with high confrontation index of 638 to 805 in a range of 1 to 900, which corresponded to mean rank of 2.13 to 2.68. However, recording transmitted pictures in food processing technology (2.68) and use of computer in storage of information (2.44) ranked high. Farmers were also aware of acquiring information on farming practises from television (2.14) and mobile phone (2.34) but are handicapped with epileptic power supply in rural Kauru and the expensiveness of television, internet connectivity and mobile phones with such facilities. Farmers were aware of the application of CD audio and visual (2.13) in marketing agricultural commodities but cannot effectively use it for lack of computer to convert information and electricity to power the devices.

Marketing techniques using the right information system does not favour smallholder farmers in Nigeria, instead the middlemen and processing companies. For instance, Olam's sourcing for cashew in Nigeria initiated in 1989, according to Venkataramani Srivathsan (2019) changed agricultural land scape of Africa into an engine for agricultural growth, job creation, poverty reduction and food security. The company's packaged foods, and rice and wheat milling operations for domestic African market also favours the company while the farmers are forced by challenges of storage, poor income and illiteracy to sell off produce sometime in the farm or immediately after harvest.

Table 3: Level of awareness of farmers in the use of information and communication technology facilities in agriculture in Kauru Government Area, Kaduna State, 2019
N = 300

S/no	Device usage	ACI	Rank	Decision
1	Use of ICT devices to record transmitted pictures in food processing at home	805	2.68	Aware
2	Use of computers and other devices to store information	782	2.44	Aware
3	Use of TV in learning farm practises for food security	723	2.41	Aware
4	Use of mobile phones improved varieties information	702	2.34	Aware
5	Use of internet to advertise, sell and order goods	670	2.23	Aware
6	Use of printed media to acquire information on farm practises	665	2.22	Aware
7	Use of CD audio and visual on market price of agricultural commodities	638	2.13	Aware

N = number of farmer used, ICT = information and communication technology, ACI = awareness confrontation index, N = total number of farmers used

Farmers' perception on the roles of ICT in improving livelihood and standard of living for sustainable development is presented in table 4 and the results revealed high CI of 648 to 1064 in a range of 1 to 1200 with mean rank of 2.2 to 3.5. Farmers accepted six out of seven presumed ICT roles identified in the study with the exception of using ICT to ascertain market price (2.2). However, increase in efficiency of farming (3.5) and marketing of commodities (3.2) followed by the use of ICT device such as internet in ordering of goods and services (3.2) ranked high. Reports has shown that ICT impacted positively and significantly in livelihood activities of farmers as it improves efficiency ascertain market price and ordering of goods and services and connects rural communities' farmers to online services (Yahaya, 2002; Zarmai, Okwu, Dawang, and Nankat, 2014; Ivande *et al.*, 2018).

Table 4: Farmers perception in the application of roles of information and communication technology in farming activities in Kauru Government Area, Kaduna State, 2019
N = 300

S/no	Roles of ICT	CI	Rank	Decision
1	Helps to increase efficiency of farming	1064	3.5	Accepted
2	Help to provide marketing of agricultural commodities	953	3.2	Accepted
3	Helps in ordering goods and services of farm produce	950	3.2	Accepted
4	Provides information on fashion and designing and pattern making	946	3.2	Accepted
5	Eases market survey	936	3.1	Accepted
6	Improves information on crop varieties to cultivate	869	2.9	Accepted
7	Helps to ascertain market price	648	2.2	NA

ICT = information and communication technology, CI = Confrontation index, NA = Not accepted, N = total number of farmer used

Results (Table 5) showed six important problems militating against the use and application of ICT in Kauru with high confrontation indexes of 893 to 1043 within CI range of 1 to 1200 and a corresponding mean rank of 3.0 to 3.5. Although the six problems identified were significant, lack of infrastructure and maintenance (3.5) was the most impeding factor followed by poor community involvement (3.3) in the use of ICT. Results also revealed that, inadequate skilled personnel, cultural barriers, local needs and lack of interest, and poor community leadership style limits ICT application in Kauru, hence the need for cooperative among farmers to facilitate use and application of the available devices for sustainable livelihood. Poor infrastructure and maintenance of ICT centres are associated with insufficient resources, inadequate repairs and equipment as well as inconsistent power supply, in most communities', complete lack of electricity (Ivande *et al.*, 2018).

Singh *et al.* (2017) reported that application cognitive technology is imperative in agriculture to enable farmers chose best crop, best seed base on farm condition and farmer's need. They further explained that image processing is efficient in determining diseases or pest for crops from where remedies are sent to farm directly. Kaduna State as a cosmopolitan state offers opportunity of education to its citizens and the acquired educational knowledge of the farmers in Kauru will facilitate effective application of ICT when good community leadership and interest is encouraged. Such educational qualities will easy adoption of imaging techniques to enable farmers determine vegetative index, land mapping and type of weeds in the area (Singh *et al.*, 2017) if properly trained. Reports have shown that poor infrastructural and maintenance, and culture are major hindering factor in ICT in rural communities (Ivande *et al.*, 2018).

Table 5: Problems associated with farmers' use of information and communication technology devices in Kauru Local Government Area, 2019

N = 300

S/no	Problems	CI	Rank	Decision
1	Lack of infrastructure and maintenance	1043	3.5	Accepted
2	Poor community involvement	974	3.3	Accepted
3	Inadequate skilled personnel	953	3.2	Accepted
4	Cultural barriers	951	3.2	Accepted
5	Local needs and interest of the people	933	3.1	Accepted
6	Poor community leadership style	893	3.0	Accepted

CI = Confrontational index, N = total number of farmers used

Conclusion

Agriculture is a major sector in Nigeria economy although mostly practised by smallholder poor resource income farmers who rely in traditional technological practises. The use and application of ICT devices will revolutionize Nigeria agriculture and improve the livelihood of the rural communities particularly in information dissemination and updates in production, processing and marketing of farm produce. However, rural Kauru community farmers in Kaduna State although are educated and aware of positive impacts of ICT in

farming, are still dominated with traditional information acquisition, depending mostly on radio whose programmes does not show case much information on agricultural activity. Such farmers' perception on the use of ICT on improving the farm activities and standard of living is such that, when the infrastructural devices are made available and maintained with good community governance, skills will be developed to enhance sustainable agricultural activities. Therefore, major donors, governments, private sector, individuals and other stakeholders are advised to assist the poor farmers.

Recommendations

Base on the findings of the investigation, the following are imperative;

- i. State Government, NGOs, community leaders and other stakeholder should assist Kauru community farmer to establish well equipped information and communication technology centre, to enable them combine indigenous skill with exogenous knowledge to improve their livelihood
- ii. Efficient and frequent extension services will encourage more contacts with farmer and increase productivity for sustainable development in the area.
- iii. There is a need to organise training for farmers through adult education, farm shows and exhibition to expose and inculcate the skill of different farming activities using ICT facilities. Such training should be done in groups possibly through formation of cooperatives instead of the present individual farmers participation experienced in the area
- iv. The 79.9 % domination of males demands that consented effort must be made to encourage and increase female participation in farming

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