



Availability and Use of Information and Communication Technology by Oil Palm Farmers in the Akyemansa District, Ghana

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Authors' contributions

This work was carried out in collaboration among all authors. Authors FKMS and WOD designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Author EKMS designed the survey used in the study and managed the analyses of the study. All authors read and approved the final manuscript.

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ABSTRACT

The use of ICTs forms part of efforts to achieve the Sustainable Development Goals (SDGs) especially ensuring inclusive and equitable quality education and promote life-long learning opportunities for all. In the agricultural sector, access to the right knowledge and information in a timely manner enhances agricultural production and thus increase food production. In Ghana, several studies have reported on the access and use of ICT tools by farmers in food crop and poultry sectors, however, much work has not been done in the tree crop sector, especially the oil palm subsector.

This study sought to determine the availability and use of Information and Communication Technologies (ICTs) by oil palm farmers in the Akyemansa District of Ghana. The primary data used in the study were collected through focus group discussions and structured questionnaires administered to 150 randomly selected oil palm farmers. Both descriptive and inferential

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statistics were employed in analyzing the data. Results show that 99.00% of farmers have access to radio with very low availability and access to a computer. Chi-square test analysis showed that there was a significant difference $p = (0.00 \text{ and } 0.00)$ between farmers' extent of access to ICTs and their use for oil palm production activities. However, there was no significant relationship $p = (.8137, \text{ and } .2233)$ between farmers extent of access to the mobile phone, radio and how often farmers used them for oil palm production. There is a need to improve organizational structures, technical and infrastructural facilities regarding ICT availability to allow more access to and use of these facilities.

Keywords: Information and communication technologies (ICTs); oil palm production; ICT access; agricultural knowledge systems.

1. INTRODUCTION

Agriculture Sector has been identified to play a significant role in developing economies that could help achieve the much needed global goal of poverty reduction, in a much more sustainable way [1]. In Ghana, the Agriculture sector accounts for about 20% of the Gross Domestic Product (GDP) and employs more than half of the workforce, mainly small landholders [2].

The oil palm industry which is second to cocoa is segmented into different types of agro-systems, ranging from large agro-industry plantations to smallholder farmers who may or may not be organized into formal groups. This small scale sector is characterized by low-yielding oil palm varieties, low productivity of farms and mills, and low-quality Crude Palm Oil (CPO), which is sold in the village or at small-town markets. Among the constraints faced by the local industry are little demand-driven research, limited access to land and finance, high production costs, low levels of technology, low extraction rates and poor quality CPO, and lack of adequate government support [3].

To position themselves against the adverse effects of the constraints identified, smallholder farmers in the oil palm industry need to empower themselves through training, facilitation, and networking. Smallholder farmers need to share knowledge in farm and agronomic management through linking with "expert farmers", who provide a rich source for identified technologies in input use and the sharing of experiences [3].

The conventional public extension service delivery system is bedeviled with several constraints, thus affecting their efficiency and effectiveness. Attah [4] identified the unfavourable extension agent farmer ratio as a serious problem confronting the use of face-to-face contact to provide the required information to farmers in Nigeria.

To cope with the low extension contact hours by farmers, these farmers adopt other ways to get agricultural information. Some of these include exploring the ICT tools that are available [5].

Information and communication technologies may be broadly defined as the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware [6].

Okroku [7] also defined ICT to be the digital processing and utilization of information by the use of electronic computers. It further includes the storage, retrieval, conversion and transmission of information.

ICT covers all forms of computer and communication equipment and software used to create, design, store, transmit, interpret and manipulate information in its various formats. Personal computers, laptops, tablets, mobile phones, radios, television and transport systems are among the many examples of ICT tools.

ICT also covers any communication device or application that include radio, television, cellular phones, computer and network hardware and software, satellite systems, as well as the various services and applications associated with them, such as video-conferencing and distance learning [8].

The benefits inherent in the utilization of ICT for agricultural extension and training purposes are well documented [9-11].

According to Nwagwu and Soremi [12] ICTs offer the potential to increase efficiency, productivity, competitiveness and growth in various aspects of the agricultural sector by way of increasing access and exchange of information. ICT promote farmers' access to agricultural information services and are being used as a

platform to integrate traditional knowledge as well as building the capacities of smallholders farmers in Africa.

ICTs are considered as being able to improve and enhance two-way information flows and most developments efforts fail due to lack of two-way information flow [11]. At the farm level, farmers require information on the supply of inputs, new technologies, early warning systems (on drought, pests and diseases), credit, market prices and their competitors. In the agricultural sector, access to the right knowledge and information promptly enhances agricultural production and thus increase food production [13].

The use of ICTs forms part of efforts to achieve the Sustainable Development Goals (SGDs) especially ensuring inclusive and equitable quality education and promote life-long learning opportunities for all. Lifelong learning embodies all types of teaching and includes every kind of learning activity undertaken throughout a person's lifetime Alafodimos et al. [14].

Nayda, [15] reported that Lifelong learning is an active process in which the student searches for knowledge and understanding and uses it to meet his/her professional lifetime needs. Tan, [16] also noted lifelong learning to cover official and non-official learning with the learner's independence being a major factor in the learning process. The benefits of lifelong learning have been clearly enumerated by Alafodimos et al. [14] and Kikilias et al. [17].

Rural areas and poorer communities in developing countries are disadvantaged in their access to ICT compared with the urban areas and wealthier social groups [18]. Therefore, issues regarding access to ICT by poor rural households have become critical, despite the increasing potential of ICT for promoting economic growth, alleviating poverty and improving food security [19-22].

Given the fact that knowledge and information are basic ingredients of food security, ICTs if properly harnessed, offer the potential to store and transmit needed information for agricultural and rural development. However, rural communities in Ghana are marginalized in this era of global integration by being denied access to ICTs [23].

In Ghana, a number of studies have reported on the access and use of ICT tools by farmers in

food crop and poultry sectors [24-27], however much work has not been done in the tree crop sector, especially the oil palm subsector.

This study was therefore conceived to investigate the availability and use of Information and Communication Technologies (ICTs) by oil palm farmers in the Akyemansa District of Ghana. For this study, the ICT tools assessed were radio, television, computer/internet and mobile phone.

The objectives of the study are:

- i. To investigate the common ICT devices that oil palm farmers adopt?
- ii. To determine possible relationships between the extent of access and use of ICT by oil palm farmers in the Akyemansa District.
- iii. To determine the modes by which farmers source for agricultural information for oil palm production.

2. MATERIALS AND METHODS

2.1 Study Area

The study was undertaken in the Akyemansa District in the Eastern Region of Ghana. Akyemansa District is located on longitude 1° 10'W and 1°0'E. The district has a land size of 611.80 km² and population of 97,374 constituting 3.4% and 3.7% of the total land size and population of the Eastern Region of Ghana respectively. Agriculture employs about 80% of the labour force who cultivate oil palm and cocoa as cash crops. Akyemansa district was purposively selected as the study area because of their active involvement in oil palm production as their livelihood activity and also the presence of two radio stations, (Obouba FM, a privately-owned radio station and Sunrise FM, a state-owned radio station) that run farmers' education programmes. Also, this location was selected based on a pre-survey in the district that indicated a fair distribution of the ICTs in the area. The scientists wish to investigate radio, TV, mobile phone, computer and internet.

2.2 Sampling, Questionnaire and Data Collection

Through the assistance of the Department of Agriculture in the district, eight communities in the district were purposively selected due to their active involvement in the production of oil palm. Through simple random sampling, five communities were selected from the eight. The

five communities were AkimOfoase, Akokoaso, Abenase Ayirebi and Chia.

The total farmer population was 200 and through simple random sampling technique (30) farmers were selected per community, making a total of 150 oil palm farmers as the sample size for the study.

A structured survey questionnaire was developed based on in-depth literature review and consultation with experts. The questionnaire was pre-tested with 20 respondents who were randomly selected to complete and make inputs into the content of the questionnaire to ensure clarity of the information obtained. The data collection instrument was subjected to face validity among the different stakeholders involved in oil palm production and Information and Communication and Technology issues. The questionnaires were administered to 150 farmers between June and August, 2019 to collect data. All the questionnaires were answered and returned, making a recovery rate of 100%. Three focused group discussions were done to obtain some qualitative data to further explain the observations made in the questionnaire. There were six persons per group.

Data were analysed by using the Statistical Package for Social Sciences (SPSS) 21.0. Descriptive statistics such as frequency counts and percentages were used to describe the data. Tables, graphs and percentages were used to present the data and enhance the readability of the results. Chi-square test was employed to examine the significant difference between categories and within the variable.

3. RESULTS AND DISCUSSION

3.1 Access to and Use of ICT by Oil Palm Farmers

Fig. 1 shows oil palm farmers access to ICT devices. This indicates that oil palm farmers have more access to radio, mobile phones and television compared to internet and computer. Access to radio was observed to be the most common ICT device used by oil palm farmers (99%) in the Akyemansa District of Ghana. This results support the view of Isaya et al. [28] who reported that radio and agricultural extension workers were the primary sources of agricultural information for women farmers in Tanzania. The results further confirm the study by Kevin and Mark [29] that showed radio to be the most widely used medium for disseminating

information to rural audiences across Africa. Radio is more readily accessible to farmers even in communities with limited access to without phones or electricity. Radio, television, newspapers and mobile phones are vital in the wide dissemination of information on climate change information in Tanzania. The high affordability and extensive coverage of radio make it widely accessible to people especially in the rural areas [30,31]. This assertion affirms the responses from the FGD that radio sets are not very expensive, so most farmers are able to buy for use. There are two radio stations, Obouba FM, and Sunrise FM, in the area do the present programme in the local language, that is the Akan Language on agricultural activities and this really situates well with the farmers, thus the high use by farmers who have access to radio.

Of the total number of respondents (N=150), 97% have access to mobile phone for their oil palm production activities and social endeavours. This observation is corroborated by [32] and [33] that mobile phones are among the most exciting forms of ICT, dominant in developing nations, especially among the young population. They are speeding up ways in which farmers exchange or manipulate information. Folitse et al. [27] reported the high penetration of mobile phones in the small scale poultry industry in Ghana. Alam et al. [21] did observe that 81% of rural households, who are mostly farmers in Bangladesh, possessed mobile phones. The findings of this study, however, indicate a rather low population of oil palm farmers with access to a computer (17%) and internet (7%) (Fig. 1). Reasons for this observation were identified in the FGDs as the high cost of the computer, lack of internet cafes in the communities and poor telephone network.

The finding coincides with Jabry et al. [34] who reported of low penetration of computer technology in most of the rural areas due to lack of electricity, illiteracy, lack of local content and limited opportunities.

3.2 The Extent of Access to ICT Tools and Its Use in Oil Palm Production

Table 1 showed a significant relationship between oil palm farmers' access to Television and its use for oil palm production activities ($\chi^2=29.632$, $df=1$, $p=0.001$). This is in agreement with the study by Chachhar et al. [35] that reported 41% of farmers in Sindh Province of Pakistan like watching agricultural-related programmes over other kinds of programmes.

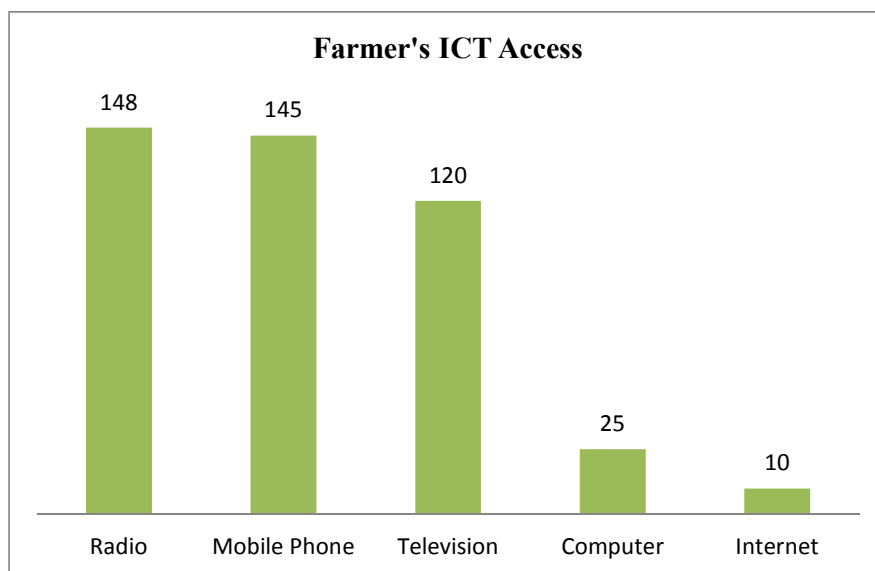


Fig. 1. Access to ICT devices by Oil Palm Farmers (multiple options)

Table 1. Farmers' access to ICT tools and their use in oil palm production

Extent of access to ICT Device	Do you use ICT device in oil Palm production?			How often do you use ICT device in oil palm production?		
	Yes	No	Total	Very often	often	Total
Mobile Phone						
Personal	124.0	9.0	133.0	102.0	22.0	124.0
Non-personal	5.0	7.0	12.0	3.0	2.0	5.0
Total	129.0	16.0	145.0	105.0	24.0	129.0
	$\chi^2=29.8143$, df=1, p=0.00001			$\chi^2=1.5724$, df=1, p=.813749		
Radio						
Personal	120.0	10.0	130.0	116.0	13.0	129.0
Non-personal	14.0	4.0	18.0	2.0	3.0	5.0
Total	134.0	14.0	148.0	118.0	16.0	134.0
	$\chi^2=10.7809$, df=1, p=0.2914			$\chi^2=11.4092$, df=1, p=.2233		
Television						
Personal	50.0	14.0	64.0			
Non-personal	66.0	54.0	120.0			
Total	66.0	54.0	120.0			
	$\chi^2=29.632$, df=1, p=0.00001					

Source: Survey Data 2019

On how access to mobile phone affects the use of oil palm production activities, a significant difference was observed between oil palm farmers who have access to mobile phone and those who do not have access. ($\chi^2=29.8143$, df=1, p=0.001) (Table 1). Mobile phones enable farmers to easily share information among them

at a relatively low cost and in a timely manner. Boadi et al. [36] revealed that farmers in rural Eastern and Central Regions of Ghana get better information flow, enhanced marketing activities, operational efficiencies and cost savings through the use of mobile phones.

Table 2. Farmers' information sources along the oil palm production chain

Agricultural Activity	Source of information	Responses N	Percent cases
Production decision			
	Non ICT source	167.0	128.4
	Phone Calls	34.0	26.1
	TV	1.0	0.76
	Radio	45.0	34.6
Total		247.0	189.7
Input acquisition			
	Non ICT source	123.0	94.4
	Phone Calls	67.0	51.5
	TV	11.0	8.4
	Radio	35.0	26.9
Total		236.0	181.2
Meteorological information			
	Non ICT source	60.0	46.1
	Phone Calls	43.0	33.0
	TV	18.0	13.8
	Radio	112.0	86.0
Total		233.0	178.9
New/improve technology use			
	Non ICT source	108.0	82.9
	Phone Calls	45.0	34.6
	TV	12.0	9.2
	Radio	43.0	33.0
Total		208.0	159.7
Processing & packaging			
	Non ICT source	112.0	86.0
	Phone Calls	57.0	43.8
	TV	18.0	13.8
	Radio	35.0	26.9
Total		222.0	170.5
Marketing			
	Non ICT source	78.0	59.9
	Phone Calls	69.0	53.0
	TV	37.0	28.4
	Radio	40.0	0.7
Total		224.0	72.0

Multiple responses exist, Source: Survey, 2019

The study, as reflected in Table 1, however, showed that mobile phone access was not significantly associated with the frequency of its use in oil palm production ($\chi^2=1.5724$, $df=1$, $p=.813749$). Thus, oil palm farmers with easy access to mobile phones do not use them more frequently for oil palm production activities than farmers without access to mobile phone. Respondents attributed reasons for the observation as poor network, fluctuating service, high cost of making calls and difficulty in getting Agricultural Extension Agents through the phones to source for information. Thus, though they have access to mobile phones they do not frequently use them for their oil palm production

activities. This observation is line with a study by Folitse et al. [27] who reported network failure, fluctuating service and high cost of running mobile phones as some of the constraints faced by poultry farmers in Ghana in the use of mobile phones.

The effect of oil palm farmers' access to radio on its use for oil palm production activities was studied as indicated in Table 1. The findings showed that there is no significant relationship between farmers' extent of access to radio and its use for oil palm production activities since the asymptotic significance of 0.2914 is greater than 0.05. Thus, farmers who have personal

possession of radio do not use it more than farmers who do not personal access to radio for their oil palm production activities. This finding contravenes the study by Adamides et al. [37] who reported that most farmers used radio for agricultural information due to its cost-effectiveness, the low educational level of farmers and the ageing of the rural population. Table 1 further indicates that frequency of use of radio for oil palm production activities was not dependent on its extent of access ($\chi^2=11.4092$, $df=1$, $p=.2233$).

3.3 Sourcing of Agricultural Information for Oil Palm Production

Table 2 revealed that oil palm farmers' information sourcing pattern from production to marketing was skewed towards non ICT sources. Most of the farmers depend largely on non ICT sources, such as face-face with fellow farmers, relatives, friends, AEA's and indigenous knowledge. Thus the farmers are not exploiting the full potential of ICT in their production activities. This finding confirmed the study by [38] in Cyprus that face-to-face communication was among the major sources of agricultural information to farmers. Farmers indicated in a focus group discussion that they are able to strengthen their connection with government policies and other stakeholders through radio programs. Radio is still used as an agricultural information source, both in developed and developing countries. Radio is the most convenient way by which farmers access affordable, relevant and reliable information [39].

4. CONCLUSION AND RECOMMENDATIONS

The study identified the availability and use of ICT tools by oil palm farmers in the Akyemansa District of Ghana. Subsequently, it examined the common ICT devices oil palm farmers adopt.

The study identified that oil palm farmers had varied access to ICT tools such as mobile phones, radio, television, computer and internet. However, radio was observed to be accessible to most of the farmers followed by mobile phones. The statistical analysis also indicates that there was a significant difference between oil palm farmers' access to television and mobile phones and their use for oil palm production activities. Frequency of use of ICT tools such as radio and mobile phone was not dependent on their access by farmers.

Most of the farmers are skewed towards non ICT sources to seek information regarding their production and marketing activities. Thus, they are not fully exploiting the IC Technologies available to them and this calls for more practical ways to help farmers explore the full benefits of innovations available.

However, to harness the full potential of ICT, it is recommended that the government puts in policies that will promote the use of computer and internet among farmers. Specifically, Community Computer Laboratories should be opened in these areas with a reliable source of electricity and training farmers on how to use ICT for sustainable agricultural production.

The farmers' radio programmes should be strengthened in term of content and frequency of broadcast as radio use was observed to be high among the farmers. Further research is recommended to look at the determinants of ICT use among the farmers. Also the study could be undertaken to cover a wider geographical area to present a more holistic view about ICT culture in Ghana.

5. STUDY LIMITATIONS

A limitation of our study was that we limited our survey population to only one oil palm growing district due to resource constraints. It would be beneficial to expand the survey to cover the rest of oil palm growing districts in Ghana.

6. POLICY IMPLICATIONS

These findings have implications for policy direction in the area of developing agricultural extension programmes that will incorporate ICT to provide quick and fast access to information to farmers. The Ministry of Food and Agriculture through its various departments at local level should create more awareness and encourage the use of ICT to facilitate agricultural development at the local level. Furthermore the right policy environment should be provided to promote easy access and use of ICT facilities available.

CONSENT

As per international standard, respondents' written consent has been collected and preserved by the author(s).

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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