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Digital livestock marketing in Kogi State: An examination of ICT adoption

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Abstract:
This study investigates the impact of information and communication technology (ICT) on livestock marketing in Kogi State, Nigeria. A survey of 300 cattle marketers was conducted to determine the extent of ICT use, the factors that influence adoption, and the impact of ICT on marketing outcomes. According to the findings, cell phones, SMS, and social media are the most often utilized ICT tools, accounting for 83.3%, 73.3%, and 60% of respondents, respectively. According to the report, education, access to energy, and ICT infrastructure are important drivers of ICT adoption, but age and the cost of ICT services are significant impediments. According to the research, ICT adoption has enhanced communication (73.3%), market access (66.7%), and income (60%) among cattle traders. The study recommends focused initiatives to improve infrastructure, increase digital literacy, and promote low-cost ICT solutions to empower livestock marketers and improve their livelihoods. The study's findings have implications for policymakers, stakeholders, and development practitioners working to increase ICT usage in agricultural marketing. Livestock marketers can use ICT to increase their competitiveness, respond to changing market demands, and contribute to long-term agricultural development and poverty reduction in rural areas. The study's findings shed light on ICT's potential to alter cattle marketing and boost marketers' well-being.

Keywords: *ICT Adoption, Livestock marketing, Digital agriculture, Rural development*

1. Introduction

The agricultural sector is an important part of Nigeria's economy, contributing significantly to the country's GDP and employing a sizable share of the workforce (CBN, 2020). Within the agricultural sector, livestock production is critical to guaranteeing food security, enhancing rural livelihoods, and providing income for millions of households (FAO, 2019). Given Nigeria's extensive livestock resources and rising demand for animal products, the livestock industry has enormous growth and development potential (Adebayo and Adeola, 2017). However, the livestock business in Nigeria has a number of obstacles that impede its growth and productivity. One of the major issues is an inefficient marketing system, which limits livestock merchants' capacity to reach markets, receive fair pricing, and optimize profitability (Akinbode and Dipeolu, 2014). Nigeria's livestock market is characterized by a lack of market knowledge, weak communication networks, and limited access to credit and other financial services (Ovwasa and Ugwu, 2018).

In recent years, the use of information and communication technology (ICT) has arisen as a possible answer to the cattle industry's issues. ICT can improve market information access, buyer-seller communication, and transaction efficiency. ICT can help improve access to veterinarian and breeding services, as well as other support services required for livestock production (Heeks, 2017). Despite the potential benefits of ICT in enhancing the livestock marketing system, acceptance and use of ICT among Nigerian livestock marketers is low (Adegbite and Adeyemo, 2018). Several reasons contribute to restricted ICT adoption, including inadequate access to ICT infrastructure, a lack of ICT skills, and a lack of knowledge of ICT's benefits (Akinola and Ajayi, 2019).

The purpose of this study is to look into how livestock dealers use ICT in Kogi State, Nigeria's Central Agricultural Zone. The study will look at the current level of ICT usage, identify factors that influence ICT adoption, and investigate the problems that cattle marketers encounter while adopting ICT.

2. Literature review

The application of information and communication technology (ICT) in agriculture has received a lot of interest in recent years, especially in poor nations. ICT has the ability to boost agricultural output, increase market access, and raise farmer and marketer incomes (World Bank, 2019). In livestock trading, ICT can improve access to market information, communication between buyers and sellers, and transaction efficiency (Heeks, 2017).

Several studies have looked into the adoption and use of ICT by farmers and marketers in developing countries. According to Adebayo and Adeola (2017), age, education, and access to extension services all have an impact on ICT adoption among Nigerian farmers. Similarly, Adegbite and Adeyemo (2018) discovered that ICT usage among Nigerian farmers was limited due to reasons such as a lack of ICT skills, limited access to ICT infrastructure, and a lack of understanding of ICT benefits.

Other research examined into the effect of ICT on agricultural productivity and market results. For example, Minten, *et al.* (2016) discovered that farmers in India who used mobile phones had significant increases in agricultural productivity and market outcomes. Similarly, Aker (2011) discovered that farmers in Niger who used mobile phones had better access to market information and higher incomes. Numerous studies on livestock marketing have underlined the potential benefits of ICT in terms of boosting market access and increasing incomes for livestock marketers. For example, Ovwasa and Ugwu (2018) discovered that livestock marketers in Nigeria used ICT to improve their access to market information and raise their revenues. Another study, Onuorah, *et al.* (2019), discovered that using social media by livestock marketers in Nigeria boosted communication with buyers and marketing efficiency. However, despite the potential benefits of ICT in livestock marketing, various barriers prevent its widespread adoption and use. These challenges include restricted access to ICT infrastructure, a lack of ICT skills, and a lack of understanding of the benefits of ICT (Akinola and Ajayi, 2019). Furthermore, the high cost of ICT services and the scarcity of relevant information are important obstacles (Heeks, 2017).

2.1 Theoretical framework

The Technology Acceptance Model (TAM), developed by Davis (1989), will serve as the foundation for this investigation. According to the TAM, attitudes toward use, perceived utility, and perceived ease of use are some of the elements that affect the adoption and use of ICT. Numerous research on ICT adoption in agriculture have made use of the TAM, which has been shown to be successful in elucidating the variables influencing ICT adoption (Adegbite and Adeyemo, 2018).

2.2 Conceptual framework

The TAM will serve as the foundation for this study's conceptual framework. The framework will investigate the aspects that influence the adoption and use of ICT among cattle marketers, such as perceived usefulness, perceived ease of use, and attitude toward use. The framework will also look into the influence of ICT use on market access and income for livestock traders.

2.3 Empirical review

Many empirical researches have looked into the impact of ICT on agricultural productivity and market performance. For example, Jensen (2007) discovered that the usage of mobile phones by fisherman in India resulted in considerable gains in market efficiency and income. Similarly, Aker (2011) discovered that farmers in Niger who used mobile phones had better access to market information and higher incomes.

A number of investigations on livestock marketing have underlined the potential benefits of ICT in terms of boosting market access and increasing incomes for livestock marketers. For example, Ovwasa and Ugwu (2018) discovered that livestock marketers in Nigeria used ICT to improve their access to market information and raise their revenues.

3. Methodology

The study used a cross-sectional survey research approach to explore the use of Information and Communication Technology (ICT) among livestock marketers in Bauchi State, Nigeria.

3.1 Population and sampling

The study's population included all livestock marketers in Kogi State's Central Agricultural Zone. Respondents were selected using a multistage sampling process. The first stage involved selecting three Local Government Areas (LGAs) at random from the Central Agricultural Zone. In the second round, each selected LGA provided a list of livestock markets, from which five were chosen at random. Finally, a random sample of 20 cattle traders was drawn from each market, resulting in a total of 300 responses.

3.2 Data collection

Data was collected using a structured questionnaire. The questionnaire was designed to capture information on the socio-economic characteristics of the respondents, their level of ICT usage, and the factors influencing ICT adoption. The questionnaire was pre-tested to ensure its validity and reliability.

3.3 Data analysis

Data was analyzed using descriptive statistics and inferential statistics. Descriptive statistics such as frequency counts, percentages, and means were used to describe the socio-economic characteristics of the respondents and their level of ICT usage. Inferential statistics such as logistic regression were used to identify

the factors influencing ICT adoption among livestock marketers.

3.4 Model Specification

The logistic regression model was specified as shown in equation 1:

$$ICT\ adoption = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn + \varepsilon \quad (1)$$

Where ICT adoption is the dependent variable, which takes the value of 1 if the respondent adopts ICT and 0 otherwise, $X1, X2, \ldots, Xn$ are the independent variables, which include socio-economic characteristics of the respondents, such as age, education, and experience $\beta 0, \beta 1, \beta 2, \ldots$, βn are the parameters to be estimated and ε is the error term

4. Results and discussion

4.1 Socio-economic characteristics of respondents

The results of the socio-economic characteristics of the respondents are presented in Table 1. According to the study, the majority of respondents (40%) are between the ages of 31 and 40, suggesting that middle-aged people predominate in livestock marketing. This age group probably has a wealth of industry knowledge and expertise. According to the age distribution, 13.3% of respondents are 51 years of age or older, 20% are between 41 and 50, and 26.7% are between 20 and 30.

Table 1: Age Distribution of the Respondents

Characteristics	Frequency	Percentage (%)
Age (years)		
20-30	80	26.7
31-40	120	40.0
41-50	60	20.0
51 and above	40	13.3

The respondents' educational backgrounds show that 16.7% have no formal education, 33.3% have secondary education, 26.7% have tertiary education, and 23.3% have primary education. As seen in Table 2, secondary education is the most common type of formal education, with the majority of respondents having some degree of formal education. The comparatively high proportion of respondents who had a formal education raises the possibility that education may be important in livestock marketing, affecting their capacity to manage money, obtain and use market information, and make wise judgments.

Table 2: Education of the Respondents

No formal education	50	16.7
Primary education	70	23.3
Secondary education	100	33.3
Tertiary education	80	26.7

Table 3 shows that, the respondents' experience in cattle marketing is rather well spread with 33.3% having 1-5 years of experience, 26.7% having 6-10 years and 20% having 11-15 years and 16 years or more, respectively. This shows a mix of newcomers and seasoned professionals, implying that a cattle marketing draws people with diverse levels of expertise. The distribution focuses on chances for information transfer and mentorship between experienced and inexperienced marketers.

Table 3: Experience of the Respondents

Characteristics	Frequency	Percentage (%)
Age (years)		
1-5	100	33.3
6-10	80	26.7
11-15	60	20.0
16 and above	60	20.0

According to Table 4, the revenue generated indicates that different livestock marketers' income levels have been influenced by their use of ICT. 33.3% of respondents make between ₦50,000 and ₦100,000, 20% make between ₦101,000 and ₦200,000, and another 20% make over ₦200,000, according to the table. In the meantime, 26.7% of those surveyed make less than ₦50,000. According to this income distribution, using ICT may increase income, although the advantages vary depending on the respondent.

Table 4: Income (Naira)

Characteristics	Frequency	Percentage (%)
Less than 50,000	80	26.7
50,000-100,000	100	33.3
101,000-200,000	60	20.0
More than 200,000	60	20.0

Table 5 shows the level of ICT tools utilized by livestock marketers, with mobile phones accounting for the highest percentage (83.3%), followed by SMS (73.3%), WhatsApp (66.7%), social media (60%), internet (50%), and computer (40%). The widespread use of mobile phones and SMS indicates that marketers favor easy, accessible, and affordable ICT solutions. The widespread use of WhatsApp and social media reflects an increasing trend of using digital channels for marketing objectives. Overall, the table emphasizes the significance of mobile-based ICT tools in cattle marketing, which can inspire strategies for enhancing market access and information distribution.

Table 5: Level of ICT Usage

ICT Tool	Frequency	Percentage
Mobile phone	250	83.3
Computer	120	40.0
Internet	150	50.0
Social media	180	60.0
WhatsApp	200	66.7
SMS	220	73.3

Table 6 shows the elements driving ICT adoption. Age has a detrimental impact on adoption, whereas education, availability to energy, and ICT infrastructure has a positive effect. The expense of ICT services impedes adoption. Experience has a weak favourable influence. These characteristics underscore the need for focused

initiatives to increase ICT usage among livestock marketers, with an emphasis on education, infrastructure, and affordability.

Table 6: Factors Influencing ICT Adoption

Variable	Coefficient	Standard Error	p-value
Age	-0.05	0.02	0.01
Education	0.10	0.03	0.00
Experience	0.02	0.01	0.05
Access to electricity	1.50	0.30	0.00
Access to ICT infrastructure	1.20	0.25	0.00
Cost of ICT services	-0.05	0.02	0.01

The impact of information and communication technology on livestock marketing is enormous. According to the findings, 73.3% of respondents reported better communication, 66.7% better market access, 60% more income, and 50% lower transaction expenses. These data indicate that ICT adoption has had a favorable influence on cattle marketing, with increased communication being the most significant advantage. This demonstrates the potential for ICT to improve the efficiency and profitability of livestock marketing.

Table 7: Factors Influencing ICT Adoption

Impact	Frequency	Percentage
Improved market access	200	66.7
Increased income	180	60.0
Reduced transaction costs	150	50.0
Improved communication	220	73.3

5. Conclusion

The study shows that ICT improves livestock marketing by increasing communication, market access, and income. Mobile phones, SMS, and social media are significant enablers of this revolution. However, obstacles such as insufficient infrastructure, high expenses, and age-related limitations remain. To fully realize ICT's potential, targeted interventions should prioritize infrastructure development, digital literacy, and cost-effective solutions. Policymakers and stakeholders must emphasize these areas to empower livestock marketers, improve their livelihoods, and encourage economic growth. By addressing these difficulties, ICT can assist to sustainable agricultural growth and poverty reduction in rural areas where livestock sale is an important economic activity. Finally, harnessing ICT can boost livestock marketers' competitiveness and resilience, allowing them to respond to changing market needs and opportunities while enhancing their overall well-being. Effective ICT adoption can have a multiplier impact, stimulating economic growth and development in rural communities.

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