

Use of ICT in Securing Marketing Information among Small Scale Farmers in Niger State, Nigeria

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Abstract—This study examined the use of information communication technology (ICT) on securing marketing information among small scale farmers in Niger State, Nigeria. Data were obtained from 90 respondents through the use of structured questionnaire. The information collected was analyzed using descriptive statistics and multinomial logistic regression technique. Results of the analysis showed that majority of the respondents were in their active age of production and were married. Most of the respondents obtained their information from radio, television, and newspaper. The finding also indicated that the years spent in school and not the educational achievement is what is likely to increase the probability of awareness. Problems identified with regards to the usage of ICTs by the respondents include language barrier, poverty, and illiteracy. It was therefore recommended that government and nongovernmental organizations should collaborate to include ICT workshop and training in farmer education programmes, encourage programmes like NYSC ICT volunteer group, and translate technology to local languages.

Index Terms—Information communication technology, marketing, small scale farmers.

I. INTRODUCTION

Information and Communication Technology (ICT) is an umbrella term that includes any communication device or application encompassing; radio, television, cellular phones, computer, network of hardware and software, and satellite system. It covers all forms of computer and communication equipment and software used to create, design, store, transmit, interpret, manipulate, produce and present information in its various formats [1]. The interest in the application of ICT tools in agriculture arises from the perennial problems farmers face in accessing agricultural information [2]. Small scale farmers, who form majority of the farming population of Nigeria, tend to be poor in terms of access to agricultural production and marketing information services linking these farmers to markets therefore continues to be a major challenge. This challenge is as a result of poor connectivity, illiteracy, contents and costs [3]. Similarly, Information technology is becoming the main engine of economic growth. It will displace oil, just as oil displaced steel in the second half of the last century, as the main engine of the economic growth. Production will increasingly be knowledge based, and increasing advances in ICT, especially

in the telecommunications sectors, will quicken the pace of globalization of trade [4].

ICT provide researchers with a steady avenue for the dissemination of research reports and findings [5]. Lack of Information and Communication Technology has led to low levels of agricultural commercialization among small scale farmers. This information-poverty traps farmers in subsistence farming thus preventing them from adopting profitable production and also keeps them supplying low paying market outlets [6]. In the absence of market information, opportunistic behavior (by traders and other market actors) tend to develop; such behavior encompasses cheating on the quality which in turn results in failure of traders to establish long-term business relations with farmers and other traders [7]. Information and Communication Technology has played a vital role in food production in Nigeria.

The assessment of the awareness and the use of ICTs is worthwhile not only because of its contribution to the economy of the nation, but in the final analysis, it will improve the lives of small scale farmers since information is an essential ingredient in agricultural development programme. Kenya Agricultural Commodity Exchange (KACE) is a private sector firm launched in 1997 to facilitate linkage between sellers and buyers of agricultural commodities, provide relevant and timely marketing information and intelligence, provide a transparent and competitive market price discovery mechanism and harness and apply information and communication technologies (ICTs) for rural value addition and empowerment. Studies in rural Thailand and Columbia also showed that the introduction of telephones enabled farmers to check prices regularly which led to a doubling of farm incomes while in Columbia, community telephone access increased trade, employment and government service delivery [8]. Djankov et al. [9] reported that independent radio broadcasting services have been found to be positively and significantly correlated with a range of development outcomes, including improved lives and better functioning markets. In Albania, studies show that information that is available to different markets has reduced price differences across markets [10]. Souter et al., [11] in his three country study (India, Tanzania and Mozambique) finds significant correlations between telecommunications and indicators of socio-economic development. In Niger, Aker [12] found that mobile phones reduced search costs by 50 percent compared with personal travel and that mobile phone use increased both traders' and consumers' welfare. Traders' profits increased by 29 percent not because they traded more products but because they obtained better prices through real-time market research

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conducted via mobile phone. Mobile phones were also associated with a 3.5 percent reduction in average consumer grain prices [13]. In Albania, studies showed that information that is available to different markets has reduced price differences across markets [10].

Some benefits of ICT include reduction in costs of agricultural information exchange and spurs commercialization thus improving the welfare of the farming communities. The availability of market information also enables farmers to check on the prices they receive vis-à-vis the prevailing market prices. In addition, an internet network among farmer organizations has dramatically increased farmers' incomes by providing information about crop status, weather, global market prices and training [14]. Timely access to market information via communication networks also helps farmers makes well informed decisions about what crops to plant and where to sell their produce and buy inputs. ICT provides opportunities for farmers to communicate with one another through email, mailing lists, and chat rooms. It also provides a quicker and easier access to more extensive and current agricultural information. ICT increase efficiency, provide access to new markets or services, create new opportunities for income generation. It is based on these advantages that this article seeks to examine the use of ICT in securing market information among small scale farmers in Niger State by seeking answers to the following research concerns: the socio-economic characteristics of the farmers in the study area, the various ICT media through which farmers obtain their information, the level of awareness of ICT by the respondents in the study area, the factors that affect the level of usage of information by the farmers and the constraints militating against the usage of ICT in the study area. To provide information on these research concern, this paper seeks to describe the socio-economic characteristics of the respondents; assess the level of awareness of ICT among small scale farmers; assess the various ICT media through which the farmers obtain their information; determine the factors that affect the level of awareness on ICT gadgets and their usage by the respondents; and identify the constraints militating against the usage of ICT in the study area. The findings in this study would provide a full understanding on the various ICT media through which the respondents obtain their market information, and what factors influences their level of awareness on these ICT media. The findings will provide a basis to policy authorities on the needed policy direction in order to integrate farming with ICT and thus promote greater commercialization of farmers by providing the necessary framework upon which their operational decisions are based.

II. METHODOLOGY

The study area was Niger State. The state's population is 3,950,249 [15] and covers a total land area of 76,363km². It experiences distinct dry and wet seasons with annual rain fall varying from 1,100mm in the northern part to 1,600mm in the southern parts. The maximum temperature usually not more than 60 °C is recorded between March and June, while the

Minimum is usually between December and January. The rainy seasons last for about 150 days in the Northern parts to about 120 days in the Southern parts of the State. The three principal ethnic groups of the state are the Nupe, the Gwari and the Hausa.

This study was based on primary data collected by administration of questionnaire. Simple random sampling technique was used to select Minna metropolis made of three Local Governments Areas (LGAs) namely Bosso, Chanchaga and Paikoro out of the four metropolises in Niger State i.e. Minna, Bida, Suleja and Kontagora. Minna metropolis has the added advantage of being more diverse in terms of the living population being the seat of the State Governor and is the only metropolis with more than one LGA. It also has both urban and rural areas and of higher living conditions than the other metropolises. Three villages were then selected randomly from each of the LGAs and 10 respondents were randomly selected in each of the villages, making a total of 90 respondents for the study. The data collected were socio-economic, awareness, frequency of use, importance and other information on ICT gadgets. Some of the information were collected using likert scale. The data was collected between January and July 2012.

The data collected were analyzed using descriptive statistical tool such as frequency tables, means, percentages, and standard deviations. These were employed to analyze socioeconomic characteristics, the level of awareness, importance and frequency of use of ICT gadgets, as well as constraints militating against the use of ICT in the study area. The factors affecting the level of awareness of the various ICT gadgets were determined using the multinomial logistic model. Multinomial models are appropriate when individuals can choose only one outcome from among the set of mutually exclusive, collectively exhaustive alternatives. The choice of this method is based on the fact that the level of awareness (dependent variable) is a categorical variable which can take three levels (low awareness=0, medium awareness=1, and high awareness=2). The probability that the *i*th farmer belongs to the *j*th risk behavior group reduces to:

$$P_{ij} = \frac{e^{\beta_j X_i}}{1 + \sum_{k=j} e^{\beta_k X_i}} \quad (1)$$

The generalized multinomial model is expressed as

$$P_{ij} = \frac{e^{\beta_j X_i}}{1 + \sum_{k=0}^j e^{\beta_k X_i}} \quad (2)$$

While the probability of being in the base outcome group is

$$P_{i0} = \frac{1}{1 + \sum_{k=0}^3 e^{\beta_k X_i}} \quad (3)$$

To estimate the model the coefficients of the base outcome

are normalized to zero (0). This is because the probabilities for all the choices must sum up to unity. Hence, for 3 choices only (3-1) distinct sets of parameters can be identified and estimated. The natural logarithms of the odd ratio of equations (1) and (2) give the estimating equation as

$$\ln \frac{P_{ij}}{P_{i0}} = \beta_i X_i \tag{4}$$

This denotes the relative probability of each of the other groups to the probability of the base outcome. The estimated coefficients for each choice therefore reflect the effects of X_i 's on the likelihood of the farmers choosing that alternative relative to the base outcome. The estimation was done using Stata Statistical/Data analysis 11.2 software [16]. The final estimates were selected based on the variables that converged during iteration. The coefficients of the base outcome were then recovered in line with in line with Nmadu *et al.* [17]

$$\beta_3 = -(\beta_1 + \beta_2) \tag{5}$$

where β_3 = coefficient of the variable of the base outcome (risk aversion), β_1 = estimated coefficient of the medium level awareness group, β_2 = estimated coefficient of the high level awareness group. In addition, the partial derivatives or marginal effects and quasi-elasticities of the model were obtained from the software. Finally, McFadden's [18] likelihood ratio index (LRI) also known as pseudo R^2 , similar to the R^2 in a conventional regression, was computed as

$$LRI = 1 - \frac{\ln L}{\ln L_0} \tag{6}$$

where, $\ln L$ = log-likelihood function

$\ln L_0$ = log-likelihood computed with only the constant term.

III. RESULTS AND DISCUSSION

The Socio-economic and demographic characteristics of the respondent of the respondents is presented on Table I showing that majority of the respondents are male and married with average of one wife and six children. The respondents are still in their productive years (33 ± 13 years). Less than 50% of them have acquired secondary education, which is the highest attained haven spent about 6years acquiring formal education. Their farm holdings tend to be medium scale (9.985 ± 9.6 ha) scattered in more than three locations. The level of awareness of ICT gadgets and formats and the importance attached to ICT gadgets for securing market information are presented on Tables 2 and 3 showing that awareness is high for E-mail, Mobile phone, Radio, Television, Satellite receiver, Newspaper and I-pad while much importance is attached to Mobile phone, Internet, Radio and Television. Frequency of use of these ICT gadgets is presented on Table 4 showing that by the respondents frequently used Mobile phone, Internet, Radio, Television and Satellite receiver in seeking market information. Table V shows the number of ICT gadgets possessed by respondents, their mean purchase price and mean amount those who do not have are willing to spend to purchase one indicating that most

respondents have only mobile phones, radio and television among all the ICT gadgets surveyed while quite a number expressed willingness to purchase what they do not have. The various market information sought for by the respondents is presented on Table 6 showing that only institutions involved in marketing is not sought by the respondents.

TABLE I: SOCIOECONOMIC CHARACTERISTICS OF THE RESPONDENT

Variables	Frequency	Percentage
Age		
11-20	18	20.0
21-30	27	30.0
31-40	30	33.3
41-50	6	6.7
51-60	8	8.9
61-70	1	1.1
Gender		
Male	88	97.78
Female	2	1.11
Marital Status		
Single	29	32.22
Married	61	67.78
Number of wives		
0	29	32.22
1	32	35.56
2	22	24.44
3	5	5.56
4	2	2.22
Number of children		
0	29	32.22
1-3	15	16.67
4-6	23	25.56
7-9	10	11.1
10-12	7	7.78
13-15	2	2.22
16-18	2	2.22
19-21	1	1.11

28-30	1	1.11
Religious affiliations		
Muslims	88	97.78
Christians	2	2.22
Educational level		
None	37	41.11
Primary	19	21.11
Secondary	30	33.33
Polytechnic	2	1.11
College of education	2	2.22
Years spent in formal education		
0	38	42.22
1-3	2	2.22
4-6	16	17.77
7-9	3	3.33
10-12	21	23.33
13-15	9	10
16-18	1	1.11
Farm Size		
1- 2	44	48.9
2.1- 3	38	42.2
3.1- 4	5	5.6
4.1-5	3	3.3
Number of plots of land		
0	15	16.67
1	4	4.44
2	4	4.44
3	11	12.22
4	32	35.56
5	24	26.67
Income		
Below 10,000	15	16.7
10,001-20,000	15	16.7
20,001-30,000	8	8.9
30,001-40,000	5	5.6
Above 40,000	47	52.2

TABLE II: DISTRIBUTION OF RESPONDENTS ACCORDING TO THE LEVEL OF AWARENESS OF ICT GADGETS AND FORMATS

ICT Formats	Low	Medium	High
E-mail	64	7	19
Internet	75	10	5
Mobile phone	24	25	41
Radio	2	18	70
Television	6	20	64
Satellite	36	22	32
Newspaper	23	13	54
Journal	87	2	1
I-pad	53	16	21
Blackberry	79	8	3
Online Paper	89	0	1
Podcast	72	12	6

TABLE III: DISTRIBUTION OF RESPONDENTS ACCORDING TO THE IMPORTANCE ATTACHED TO ICT GADGETS FOR SECURING MARKET INFORMATION

	Very important	Important	Not sure	Not important	Not very important
Mobile phone	45	10	6	2	24
Internet	17	3	6	35	29
Email	0	2	1	46	40
Radio	33	21	6	15	13
Tele	23	31	19	12	4
Satellite	9	20	14	13	34
Newspaper	1	9	12	15	53
Journal	1	1	1	22	65
I-Pad	1	0	0	21	66
Blackberry	0	1	8	17	62
Online newspaper	0	0	0	22	66
Pod cast	0	1	0	23	65
community radio	0	2	4	16	67
Laptop	0	0	1	22	67
Desktop	0	0	0	22	67

TABLE IV: FREQUENCY OF USE OF THE VARIOUS ICT GADGETS BY THE RESPONDENTS

	Regularly	Occasionally	Rarely	Never
Mobile phone	58	16	13	3
Internet	19	7	9	54
Email	0	1	10	77
Radio	33	26	5	24
Television	25	55	6	4
Satellite	10	29	29	20
Newspaper	1	15	22	51
Journal	0	4	10	75
I-Pad	0	0	1	88
Blackberry	1	0	7	80
Online information	0	0	0	88
Pod cast	0	0	0	88
community radio	0	5	6	77
Laptop	3	2	7	76
Desktop	0	0	6	82
Other	3	4	3	45

Table VII gives the coefficient estimates of the variables included in the chosen multinomial logistic model of factors affecting the level of awareness of ICT in the study area. The final model shows that that the likelihood ratio (χ^2) is statistically significant at the 1% level meaning that the variables considered jointly exert a very significant influence on the level of awareness. This is an indication that all or some of the slope coefficients are significantly different from zero. It therefore means that the model is capable of showing and explaining the determinants of level of awareness of the respondents. This indication is also confirmed by the LRI of

respondents, amount spent on purchase (+), farm size (+) and 0.5533 which is quite higher than that obtained by Nmadu et al. [17], Rahji and Fakayode [19], Abadi ghadim and Pannell, [20] and Zepeda [21]. The model further shows that while number of years spent in formal education (+) and educational age (-) also determined the probability of high level of awareness significantly. Finally, Table VIII shows the constraints encountered in using ICT and their severity showing that poverty and language barrier are the most severe setback to the use of ICT by the respondents.

TABLE V: NUMBER OF ICT GADGETS POSSESSED BY RESPONDENTS, THEIR MEAN PURCHASE PRICE AND MEAN AMOUNT THOSE WHO DO NOT HAVE ARE WILLING TO SPEND TO PURCHASE ONE

	1	2	3	4	5
Mobile phones	113	24	0	6435.56	2007.78
internet	0	0	0	0	0
Email	0	0	0	105.56	377.78
Radio	77	18	0	5025.56	3930
Television	51	10	0	5486.67	8033.33
Satellite dish receiver	4	0	0	1722.22	7
Newspapers	3	0	0	7.78	97.44
Journals	0	0	0	0	333.33
I pad	0	0	0	0	0
Blackberry	0	0	0	0	8814.61
Online newspaper	0	0	0	0	0
Podcast	0	0	0	0	0
Community radio	0	0	0	0	0
Laptop	0	0	0	555.56	4
Desktop PC	0	0	0	0	4
Others	8	0	0	450	1705.56

1=Total Number possessed, 2=Those who borrow to use, 3=Those who rent to use, 4=Mean purchase price, 5=Mean amount willing to spend to purchase by those who don't have

TABLE VI: DISTRIBUTION OF RESPONDENTS ACCORDING TO THE MARKET INFORMATION SOUGHT FOR

Types of market information sought	Regularly	Sometimes	Rarely	Never
Price of the products	50	31	6	3
Price changes	49	30	6	5
Grading of products	22	13	3	52
Institutions	1	1	0	88
Available markets	31	19	4	36
Consumers	23	14	3	51
Sales information	28	17	3	42
Product planning	8	5	1	77
Weather report	8	5	1	76

The result on Table I shows that most of the farmers were still within the economically productive and technological age. This agrees with Meera *et al.* [22] and Ndag *et al.* [23] in their studies have concluded that younger farmers prefer to

use ICT more compared to older farmers. One factor responsible for this is that the younger farmers have higher educational achievement and hence exposed more to ICT gadgets and formats. The level of education of farmers is assumed to influence the level of awareness and ability to adopt innovation. Whether this assertion is the case in this study is to be confirmed shortly. In addition, there is an indication that the farmers' income level is high, as of them possessed more than one ICT format (Mobile phone, Radio). This agrees with the research carried out by Cecchini and Scott [24] which revealed that Farmers with high incomes had more than one ICT (normally radio and mobile phone) and therefore were in a better position to access market information through these items than those with less income who had only one type of ICT.

TABLE VII: MULTINOMIAL LOGISTIC REGRESSION ESTIMATES OF FACTORS AFFECTING THE LEVEL OF AWARENESS OF ICT IN THE STUDY AREA

	Low (base outcome)	Medium	High
Religion		-2.851622 (5044.439)	-28.7337 (1415.406)
Amount spent on purchase	31.58532 -0.00127	.0002867 (.0002819)	.0009858** (.0004148)
Number of years already use ICT	0.279191	-.0242216 (.125407)	-.2549689 (.22577)
Income from non-farm sources	0.279191	3.09e-07 (1.34e-06)	2.98e-07 (1.75e-06)
Total farm income	-6.1E-07	-9.57e-07 (1.57e-06)	-1.69e-06 (1.49e-06)
Farm size	2.65E-06	-.0475948 (.1444892)	.2150959* (.1345725)
No of plots	-0.1675	.3954043 (.3671769)	.2429625 (.3919486)
No of children	-0.63837	-.0174802 (.3536431)	.372351 (.4143786)
Number of years spent in formal education	-0.35487	.7886686** (.3253022)	1.673886*** (.6178728)
Educational level (secondary)	-2.46255	-7.321308** (3.171993)	-11.57743** (5.072752)
Marital status	18.89874	-.0980686 (1.564173)	-.4867929 (1.87616)
Age	0.584862	-.1294683 (.1478901)	-.4790346* (.2720705)
Constant	0.608503	1.052042 (5044.441)	27.88516 (1415.42)

LR $\chi^2 = 66.28^{***}$ Log likelihood = -26.753232 Pseudo $R^2 = 0.5533$

NB: Values in parenthesis are standard errors, *** $P < 0.01$, ** $P < 0.05$, * $P < 0.10$

TABLE VIII: DISTRIBUTION OF RESPONDENTS ACCORDING TO SEVERITY OF CONSTRAINTS ENCOUNTERED WHEN USING ICT

Constraints	Serious	Mild	Not a constraint
Illiteracy (lack of education)	46	36	8
Poor network coverage	5	25	60
Poor access to ICT infrastructure	7	45	38
Poverty	52	36	2
Lack of technical know-how	18	53	19
Poor access to internet connectivity	7	36	47
Inadequate capacity and affordability	12	50	28
Language barriers	58	25	7

The results on Tables III-IV indicated that level of awareness, importance of the ICT gadgets in securing market information, frequency of use of the ICT gadgets and

formats, and the type and number of gadgets possessed are not uniform. The result further shows that the respondents used radio, television, newspaper and mobile phones more to obtain their marketing information. The least ICT gadgets used were podcast, online papers and blackberry. This implies that even though the respondents own these gadgets, they do not use them to obtain marketing information. According to Djankov *et al.* [9], independent radio broadcasting services have been found to be positively and significantly correlated with a range of development outcomes, including improved lives and better functioning markets.

The results on Table VI showed that prices and price change information are most sought after by the respondents. This probable was to enable them set prices that would satisfy them and the consumers. The least sought after is information on marketing institutions, product planning and weather. Probably this information is not needed because there is no specialization in Nigerian agriculture. Farmers tend to produce based on previous years' experience thereby being caught in the so-called cobweb problem. In addition, various grades of agricultural produce is not a key information because most agricultural produce in Nigeria are not sold by grades neither is there any standard unit of measure.

The results on Table VII is quite contradictory with regards to number of years spent in formal education (+) and educational level (secondary) (-) and contrary to the views expressed earlier. The implication of this finding is that the years spent in school and not the educational achievement is what is likely to increase the probability of awareness. The average number of years spent in school is about 6 years which suggest that most of the respondents might have just attempted secondary school but did not complete. Of course, it is important to stress to the farmers that education is key to achieving a sustained increase in farm output through easy and cheap information exchange, the platform which is provided by ICT. Even the planned distribution of mobile phones to 5m small scale farmers in Nigeria during the 2013 fiscal year can only achieve the stated objectives if the issue of education and training is intensified to let the farmers know the benefit derivable by the exercise. Surprisingly, age of the farmer tends to reduce the probability of awareness of ICT platform. As the farmer grow older, so also are the responsibilities growing, like paying children school fess or cost of health care; providing food for his growing family etc. In fact in this community, the size of the family seems to be large. This might deprive the farmer for seeking anything outside the basic necessities of life including ICT. Purchase power and farm size tends to increase the probability of awareness which is in line with expectation. As the farmer open more farmlands, there is increase income which increases his purchasing power.

The results on Table VIII shows that most of the respondents had language barrier as the most serious constraint as indicated by Deraman and Samsul [25]. They asserted that language is one of the main problems faced by the agriculture community in using ICT. The result also showed that Poverty was one of the major problems faced by small scale farmers; this deprives the farmers from expanding their farms and making use of ICT as a result, information

poverty sets in. This information poverty traps farmers into subsistence farming thus preventing them from adopting profitable production [6].

IV. CONCLUSION AND RECOMMENDATIONS

This study was designed to examine the use of ICT in securing marketing information among small scale farmers in Niger state. Descriptive analytical tool and multinomial logistic regression analysis were used to analyze the data. The result of the descriptive analysis showed that 63.3% of the respondents were between the ages of 21-40years. It was noticed that large proportion of the respondents were married (67.8%), with fairly large household size, and 41.1% of the respondents were not educated. The result also shows that majority of the respondents were more aware of Radio, Television and Newspapers as a source of market information but they obtained their information through Radio, Television and Newspapers respectively. The type of information they mainly sought for were those of prices and price changes respectively. Further analysis of the result shows that language barrier, poverty, and illiteracy were the most serious problem encountered by the respondents. The finding also show the number of years in formal education increased the probability of awareness while the attaining the level of secondary education tend to reduce awareness. Based on this, efforts should be made by the government to ensure that ICT workshops and trainings are included in farmer education, entrepreneur development and skills acquisition programmes in agriculture, which will assist in market orientation and appropriate technology acquisition. In addition, there is need to translate the technologies to local languages especially radio broadcasts. The government should encourage programmes like National Youth Service Corps (NYSC) ICT Volunteer Group to provide sensitization at the rural communities where they are posted. The NYSC can be an effective tool for fostering ICT development in rural communities as it can provide the man-power and high level competence required to manage ICT centre and train locals on ICT use for agricultural development purposes. Besides, due to its wide coverage of rural areas, networking between NYSC groups in various communities can foster rural-urban communication, extending information to rural farmers and providing relevant market access information.

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