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Determinants of use of Information and Communication Technologies (ICTs) among women grain marketers in Delta State, Nigeria

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Abstract

The study examined determinants of level of use of Information and Communications Technologies (ICTs) among women in grain marketing in Delta State, Nigeria. On the level of use of ICTs, 57.5% of the sampled respondents fell in the category of high level of usage or utilization of ICTs, while 23.3% of them fell under moderate level of usage of ICTs, and 19.2% of them fell under low usage of ICTs. The result of the Multinomial logit (MNL) model, using high level of ICTs usage as the base category, indicated that household size and marketing experience had positive and significant relationship with low and moderate (or medium) level of ICTs usage while age, school children and average annual income were negatively related to low and moderate levels of ICTs usage in the study. Factor analysis result shows that, the constraints to the use of Information and Communication Technologies (ICTs) by women in grain marketing in Delta state were: high cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how; inadequate of patronage and low daily sales; high taxes and association charges and health-related problems; and general insecurity/theft and illiteracy. The study recommends that there is need for sensitization and awareness creation by agencies on the potential influence of the use of ICTs in order to reduce techno-phobia and risks, and also enhance access to ICTs and invariably improve grain marketing performance.

Key words: *ICTs use, Grain marketing, Multinomial logit, factor analysis.*

Introduction

Communication Technology Association defined Information and Communication Technologies (ICTs) as the combination of hardware, software and all other means of production that enable the exchange, processing and management of information and knowledge. ICTs thus connote technologies and methods involved in storing, managing creating, processing and disseminating information.

For example, computers, books, emails, radio, telephones, television, pager, personal digital assistants (PDAs) and the "web" [Communication Technology Association (CTA), 2004].

Marketing, agro-marketing inclusive, is increasingly relying on ICTs like telephone, internet, television and radios that have been noticed to be adopted at a slow pace, haphazardly; and the level of use and access differ among the users. Sustainable information exchange in agricultural markets, technology, and knowledge is becoming a critical area of agricultural development. With the current need of efficiency in understanding market price trends, accessing support services, women marketers need to use more efficient and appropriate ICTs to take advantage of the existing opportunities (Sekabira, 2012).

ICTs improve the ability to search for information and increase the quantity of information available, ultimately reducing uncertainty and enhancing market participation. Answers to question such as "how do buyers and sellers find each other and what price can be achieved?" and "is it better to store the produce or sell it immediately?" can be easily achieved through the use of ICTs (Bertolini, 2004). Despite these aforementioned facts and the growing theoretical and empirical literature about critical role of ICTs in Nigeria, little is known about the level of usage of ICTs by women in grain marketing as well as the factors that influence the level of usage of these ICTs. Closing such knowledge gaps will enable women agro-marketers draw informed and timely reliable decisions for better business margins. This will also serve as a guide for agricultural extension practice in Nigeria, as to what type of ICTs to lay more emphasis on and which of them should be popularize the more among agricultural and food markets participants to enhance profitability and marketing efficiency.

Previous studies dwelt much on ICTs adoption and its determinants for example Sekabira (2012); others that even dwell on acceptance and utilization were carried out in other sectors like health (e.g. Schaper and Pervan, 2004). Those that were even conducted in the area of agriculture were done to examine the use of ICTs among extension professionals and farmers (e.g. Adetunmbi, Olaniyi and Adewale (2013); Agwu, Uche-Mba and Akinnagbe, 2008; Akinbile and Alabi, 2010; Hosseini, Niknami and Chizari, 2009). None of the available studies seem to examine the use of ICTs in grain marketing among women, hence this study aim to examine the determinants of level of use of ICTs in selected grain (i.e. rice, beans and maize) marketing among women in Delta State, Nigeria.

Purpose of the study

This research is broadly aimed at the determinants of use of Information and Communication Technologies (ICTs) among grain marketers in Delta State, Nigeria. To achieve this, the following specific objectives guided the study:

(i). to describe the level of usage of the selected ICTs by women in grain marketing,

(ii). to identify the factors that influence (i.e. determinants of) the level of use of ICTs among women grain marketers in the study area, and

(iii). to identify the constraints to the use of ICTs by women grain marketers in the study area.

Methodology

Sampling Procedure:

Multi-stage sampling procedure was employed for selection of the respondents. First, this involved a random selection of one local government each from the 3 Agricultural zones making 3 local government areas. Second, using purposive stratified technique; two markets which are predominant in the marketing of the selected grains (i.e. rice, beans and maize) were selected from each of the three agricultural zones making a total of twelve markets. The final stage was random selection of 5 wholesalers and 5 retailers from each market, giving a total of 60 wholesalers and 60 retailers. In all, a total of 120 respondents formed the sample for the study.

Data Collection:

Data for this study were obtained mainly from primary source. The primary data were collected using a set of pre-tested structured questionnaire. The questionnaire and/or interview schedule was administered to women agro-marketers eliciting information on their socio-economic characteristics, ICTs facilities, access and level of usage. The questionnaires were administered by some trained enumerators who were conversant with the selected locality.

Econometric model: The Multinomial Logit Model

Multinomial logit model was employed in this study to verify factors that influence the level of usage of ICTs by women grain marketers in Delta state, Nigeria. In the Multinomial Logit Model, a set of coefficient $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ corresponding to three possible options step 1, 2, 3 in marketing which can be categorized into three levels of usage of ICTs i.e. high level of usage, medium or moderate level of usage and low level of usage. This is so because the dependent variable (level of usage) was coded with the following values: 1 for high level of usage, 2 for moderate or medium level of usage, and 3 for low level of usage. It is therefore of a categorical nature, with numbering arbitrarily assigned so that it does not imply order of magnitude.

$$\Pr\ (Z=1)\quad \frac{\ell^{x\beta(1)}}{\ell^{x\beta(1)}+\ell^{x\beta(2)}+\ell^{x\beta(3)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$$\Pr\ (Z=2)\quad \frac{\ell^{x\beta(2)}}{\ell^{x\beta(1)}+\ell^{x\beta(2)}+\ell^{x\beta(3)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

$$\Pr\ (Z=3)\quad \frac{\ell^{x\beta(3)}}{\ell^{x\beta(1)}+\ell^{x\beta(2)}+\ell^{x\beta(3)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Multinomial logit model is a choice between two or more alternative responses (Kartels, Boztug & Muller, 1999). The model however is unidentified in the sense that there is more than one solution to $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ that lead to the same probabilities for Z = 1, Z = 2, and Z = 3. To identify the model, one of the $\beta^{(1)}$, $\beta^{(2)}$, $\beta^{(3)}$ is arbitrarily set to 0, which will be referred to as the reference or base category. In this case, we

set $\beta^{(1)} = 0$, the remaining coefficients $\beta^{(2)}$, $\beta^{(3)}$, will measure the change relative to the Z = 1. In other words, we will be comparing the case of high level of usage (1) of ICTs with other possible forms of level of ICTs usage (2 and 3). As pointed out, the dependent variable "level of usage of ICTs" has three (3) possible values; value 1 if level of usage is high, value 2 if level of usage of ICTs is medium and value 3 if level of use of ICTs is low. The explanatory variables for this study are; Age of the women grain marketer in years, Level of education of the marketer (years of schooling), Household size (number of persons), Number of school children in the household, the primary occupation of the marketer (dummy 1 if marketing is primary occupation, 0 otherwise), average annual income of the women grain marketer (in naira), and experience in grain marketing in years.

Principal component factor analysis model was used to examine the constraints to the use of ICTs in grain marketing.

To actually achieve the level of usage of ICTs the following were to categorize the respondents.

Low level of usage of ICTs: Women grain marketers that used only one of the five identified ICTs for once or two times per week.

Moderate or medium level of usage of ICTs: Women grain marketers that used two of the five identified ICTs for three or four times per week. Also classified in this category, are those that used two of the five identified ICTs for once or twice per week.

High level of usage of ICTs: Women grain marketers that used at least three of the five identified ICTs for not less than three times per week. Also classified in this category, are those that used at least two of the five identified ICTs often or regularly.

Result and Discussion

Level of usage of Information and Communication Technologies (ICTs) among Women grain marketers in Delta State, Nigeria

Figure 1 showed that 57.5% of the sampled respondents fell in the category of high level of usage or utilization of ICTs, while 23.3% of them fell under moderate level of usage of ICTs, and 19.2% of them fell under low usage of ICTs in the study area. This shows that many of the respondents used selected ICTs fairly well more than others, but those used very well were not necessarily used for grain marketing purposes.

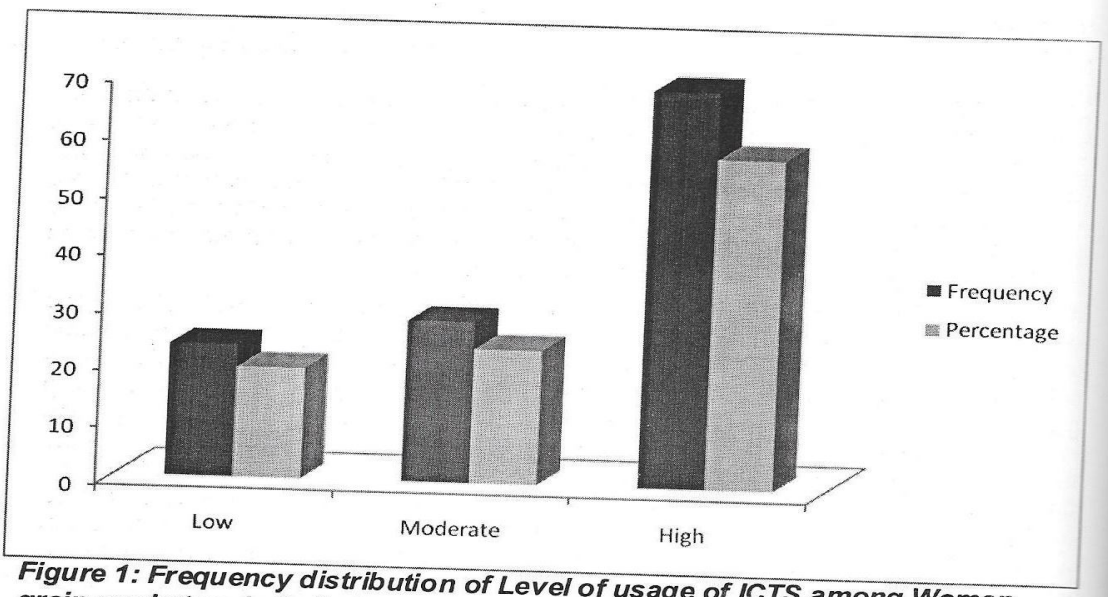

Figure 1: Frequency distribution of Level of usage of ICTS among Women grain marketers in Delta State, Nigeria

Factors that influence the level of usage/utilization of Information and Communication Technologies (ICTs) among women grain marketers in Delta State, Nigeria

The level of usage or utilization of ICTs among women grain marketers depends on a number of factors. Table 1 presents the estimates of the parameters of multinomial logit model characterizing the level of usage or utilization of ICTs among women grain marketers. The likelihood ratio statistics as indicated by χ^2 statistics is highly significant ($P < 0.0000$), suggesting the model has a strong explanatory power. In terms of consistency with *a priori* expectations on the relationship between the dependent variable and the explanatory variables, the model seems to have behaved well.

Age is significantly and negatively correlated with the probability of low and moderate (or medium) levels of utilization information and communication technologies (ICTs) in grain marketing among women. This suggests that as women grain traders grew in age they became more risk averse, only wishing to use technologies they were sure of other than ICTs that are ever full of innovations. With more age spent in running businesses, traders or marketers mastered business patterns, thus the trends and tactics of the business environment. The more traders mastered the business environment the less they preferred changes thus the less

they needed to be informed about new market signals and indicators for fear of new risks.

That explained the reduction in need and use of ICTs to access market information services as marketing experience increased. This result was consistent with Hill, Davies and Williams (2008) that found age to be negatively associated with the likelihood of ICT engagement particularly the internet and that the situation was more serious at later years. This also confirmed the result of Sekabira (2012) who found age to be negatively related with the probability of using ICTs for Market information services (MIS) among traders in Mayuge District, Uganda.

Household size is significantly and positively related to the probability of low and moderate (or medium) levels of utilization of information and communication technologies (ICTs) in grain marketing among women in the study area. This implies that the more the number of people in women grain marketers' households the more likely the use of ICTs for their marketing activities (i.e. communicating with customers, finding out price trend of the producing or sullying firms, etc.), but the marginal effect is higher among moderate ICTs-users. The increment in the utilization probability especially among moderate ICTs-users was probably caused by continued efforts of each household member in advising the women grain marketers in their households given variant information sources. This seems to agree with the result of Sekabira (2012) that the probability of using ICTs for Market information services (MIS) among traders in Mayuge District, Uganda.

Number of school children in the women grain marketer's household is negatively and significantly associated with the probability of moderate use of ICTs for marketing activities in the study area. This suggests that the more the number of school children in the women marketers' households the less likely to moderately use ICTs for grain marketing in the study area. This could be probably attributed to the household per capita expenditure on both food and non-food items.

Average annual income is negatively and significantly associated with the probability of low and moderate utilization of ICTs for marketing activities in the study area. This suggests that the more the average income the less likely to use ICTs for grain marketing among the women grain marketers. This contradicts the *a priori* expectation of positive relationship of annual income with ICT use for market information services (MIS).

Marketing experience is positively related to the probability of moderate use of ICTs for grain marketing activities and this is statistically significant at 5% level of probability as seen in Table 1. This implies that the more the number of years a woman grain marketer has been into grain trading the better the use of ICTs for market information services (MIS).

Table 1: Factors that influence the level of usage of ICTs among women grain marketers in Delta State, Nigeria

Variables	Low utilization			Moderate utilization		
	Coefficient	Standard error	z-ratio	Coefficient	Standard error	z-ratio
Age	-0.106	0.0400	-2.65***	-0.0776	0.0375	-2.07**
Education level	-0.099	0.0730	-1.37	-0.0072	0.0691	-0.10
Household size	0.475	0.256	1.86*	0.655	0.225	2.91***
School children	-0.454	0.300	-1.51	-0.550	0.250	-2.20**
Primary occupation	-0.441	0.677	-0.65	0.876	0.745	1.18
Average annual income	-0.000349	0.0000112	-3.12***	-0.0000179	6.33E-06	-2.83**
Marketing experience	0.150	0.643	2.26**	0.1204	0.0588	2.05**
Constant	4.232	1.879	2.25***	-0.221	2.040	-0.11

**** P ≤ 0.01, ** 0.01≤0.05, * P≤0.10*
Source: Field data, 2013.

Constraints to the use of Information and Communication Technologies (ICTs) by Women grain marketers in Delta State, Nigeria

The principal component factor analysis extraction method was used to analyze the constraints to the use of Information and Communication Technologies (ICTs) by women grain marketers in Delta State, Nigeria. The Kaiser criterion (1960) was used for selecting the number of underlying factors or principal components explaining the data. In this study, the number was decided by leaving out components with corresponding Eigen values (a measure of explained variance) of less than one. Only variables with factor loadings of /0.50/ and above at 10% overlapping variance were used in naming the factors. Variables that have factor loading of less than /0.50/ were not used while variables that loaded in more than one constraints were also discarded (Madukwe, 2004). The communalities represent the relation between the variable and all other variables (i.e. the squared multiple correlation between the item and all other items). Table 2 shows the varimax-rotated principal component analysis of major factors constraining women grain marketers in the use of ICTs in the study area. The true factors that were retained explained 57% of the variance in the 15 constraining variables. From the result, four (4) factors were extracted based on the responses of the respondents. These factors are; factor 1 (High cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how), factor 2 (Inadequate of patronage and low daily sales), factor 3 (High taxes and association charges and health-related problems), and factor 4 (General insecurity/theft and illiteracy).

Factor 1: High cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how. The first factor, i.e. high cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how, explained 17.7% of the total variance in the 15 constraining variables.

High operational cost (0.681), high cost of ICTs components (0.675), high cost of repair (0.642), high cost of maintenance (0.634), lack of adequate fund to expand the business (0.615), and inadequate technical-know how (0.544) loaded heavily in this factor (with factor loading scores />0.50/). The loadings for all the items had positive signs, implying that these six constraints are positively correlated, similarly posed constraints to the use of ICTs together.

Factor 2: Inadequate of patronage and low daily sales. The second factor, i.e. inadequate of patronage and low daily sales, explained 14.1% of the total variance in the 15 constraining variables. Inadequate patronage (0.853) and low daily sales (0.816) loaded heavily in this factor (with factor loading scores />0.50/). The loadings for all the items had positive signs, implying that these two constraints are positively correlated, similarly posed constraints to the use of ICTs together.

Factor 3: High taxes and association charges and health-related problems

High taxes and association charges and health-related problems, being the third factor, explained 13.7% of the total variance in the fifteen constraints. Too many taxes and high taxes (0.778), high charges from marketing association (0.624) and health-related problems (0.587) loaded heavily in this factor (with factor loading scores />0.50/). The loadings for all the items had positive signs, implying that these three constraints are positively correlated, similarly posed constraints to the use of ICTs together.

Factor 4: General insecurity/theft and illiteracy. Factor four, i.e. problem of theft and general insecurity (0.701) and illiteracy (0.585) loaded heavily in this factor (with factor loading scores />0.50/). The loadings for all the items had positive signs, implying that these two constraining variables are positively correlated, similarly posed constraints to the use of ICTs together.

Conclusion and Policy implications

In this study, we investigated the determinants of the level of use of ICTs among women grain marketers in Delta State, Nigeria. Our findings showed that the following factors; household size, marketing experience, age, presence of school children and average annual income (i.e. labour market earnings) influenced the level of ICTs usage. Other results showed that the constraints of women ICT-users range from high cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how; inadequate of patronage and low daily sales to general insecurity/theft and illiteracy. A number of policy implications could be derived from the findings. First, the study proposes the design of sensitization and awareness programme on the use of ICTs among women grain marketers. This will help to reduce techno-phobia especially among low-users of ICTs. Secondly, this sensitization should be done by the relevant agencies like ADPs and National Information Technology Development Agency (NITDA). Thirdly, there is need to reduce tax and other charges by the Local Government authorities on the marketing women in the study area.

Table 2: Varimax Rotated of constraints to the use of ICTs by Women grain marketers in Delta State, Nigeria

Constraints	Component				Commonality
	Factor 1	Factor 2	Factor 3	Factor 4	
High operational cost	0.681				0.640
High cost of ICTs components	0.675				0.648
High cost of repairing	0.642				0.618
High cost of maintenance	0.634				0.488
Lack of adequate fund to expand	0.615				0.496
Inadequate technical know-how	0.544				0.544
Inadequate patronage		0.853			0.796
Low daily sales		0.816			0.755
Too many taxes and high taxes			0.778		0.613
High charges from marketing association			0.624		0.467
Health-related problems			0.587		0.595
Problem of theft and general insecurity				0.701	0.505
Illiteracy				0.585	0.569
Percentage (%) of total variance	**17.69**	**14.06**	**13.69**	**11.54**	

Factor 1 = High cost of ICTs components, repairs, maintenance and inadequate of fund and technical know-how; Factor 2 = Inadequate of patronage and low daily sales; Factor 3 = High taxes and association charges and health-related problems; Factor 4 = General insecurity/theft and illiteracy

Source: Field data, 2013.

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