

ASSESSMENT OF EFFECTIVE USE OF TABLET COMPUTERS AS A TOOL FOR DATA COLLECTION IN NASARAWA STATE, NIGERIA

Adenuga¹, A. H., Ojehomon², V. E. T., Diagne³, A., Omotesho⁴, K. F. and Ayinde⁵, O. E.

ABSTRACT

¹ Department of Agricultural Economics and Farm Management, University of Ilorin, Ilorin, Kwara State, Nigeria

² National Cereals Research Institute (NCRI) Badeggi, P. M. B. 8, Bida, Niger State, Nigeria

³ Leader, Impact Assessment and Policy Unit, Africa Rice Centre, Cotonou, Benin Republic

⁴ Department of Agricultural Extension and Rural Development, University of Ilorin, Ilorin, Kwara State, Nigeria

⁵ Department of Agricultural Economics and Extension Services, IBB University, Lapai, Niger State, Nigeria

Corresponding Author: adenugahenry@gmail.com, +2348030404468

The use of information technology as a tool for data collection in developing countries has generated a lot of interest in agricultural surveys. However, very little research if any has been done to assess the effectiveness of this technology in data collection. This study was therefore specifically carried out to assess the determinants and constraints to effective use of tablet computers in data collection from local rice farmers in Nasarawa state, Nigeria. Nine enumerators were trained to collect data from two local government areas in the state using Android Tablet PCs provided by Africa Rice Centre, Cotonou. Data were collected using stratified random sampling technique from 120 local rice farmers in the study area. Descriptive statistics and logistic regression analysis were the major analytical tools employed for the study. Results of the analysis showed that number of educated people in the household; education and age of the household head where the major determinants of effective use of tablets computers in data collection in the study area. Village infrastructure, volume of data collected and means of communication were identified as the major factors militating against the effective use of the technology in data collection in the study area. For sustainable development to be achieved, the study recommends that the government should lay more emphasis on the education of the farming households and development of village infrastructure.

Keywords: Tablet Computers; Technology; Logistic Regressions; Communication

INTRODUCTION

One of the major challenges facing Africa's development agenda is lack of comprehensive, reliable and timely statistics. The demand for reliable and accurate data has been an issue of immense importance in the last few decades given the unprecedented increase in the demand for better official statistics as a result of the evidenced based policy approach to development. The demand for better statistics is not only being championed by statisticians but also at the highest political and policy enactment level, business as well as at individual levels. Reliable and accurate data is essential to formulate plans and implement programmes necessary to achieve poverty reduction strategies and the millennium development goals (Danso-Manu, 2007). The data gap in Africa has been attributed to lack of capacity building and training, poor statistical advocacy and sensitization, poor dissemination and inadequate budgetary support for statistical programmes, lack of harmonized and standardized statistical methodologies as well as political and ethnic conflict in many African countries.

The focus on the need to measure development, has led to improvements in statistical data availability. However, despite these general improvements in amount of data available, official statistics in developing countries is often not very recent, of varying quality and reported with low frequency (OECD global forum on development, 2013). New opportunities for improving the speed and frequency at which data is collected and statistics is produced have recently emerged, largely due to the rapid expansion in mobile and internet connectivity and the rapidly declining costs of innovative technologies that can be deployed for surveying. According to (World Bank, 2012), Globally, the number of cell phone subscribers has grown from 1 billion in 2000 to over 6 billion today, of which nearly 5 billion are in developing countries. Such technological advances means that traditional paper and enumerator surveys can potentially be replaced with new ways of collecting data that are faster, cheaper and can be conducted more frequently. The changing trends in technology have been the driving force in the evolution of surveying methods. The need to adopt modern technology in data collection cannot be overemphasized given the continued increase in the cost of using the pen-and-paper interviews (PAPI). Besides, the use of paper questionnaires usually delays in the processing of data, distortion of fact, inconsistencies, poor documentation and could even lead to loss of vital data. Computer assisted personal interviewing (CAPI) is an umbrella term for a set of survey technologies that substitute traditional paper surveys with electronic forms on tablets, smart phones, mobile phones or computers. Although, CAPI has been tested by many developing countries to improve the efficiency and accuracy with which data is collected, but has not become widely adopted particularly in Africa. CAPI software and devices can increasingly handle complex and long questionnaires and is therefore becoming a

real, viable alternative to paper (PAPI) surveys. Africa Rice Centre in 2012 developed the Mlax application on Tablets and Smartphones to collect baseline data in the Rice Sector in Africa. Tablet computers are generally small (screen size 12.1 inches or less), light weight (2.0 kg or less) and allow input from keyboard, mouse, or interactive pen (Lindsey, 2003; Mendelsohn, 2003). The gadget has been accepted in many educational contexts where the flexibility of input is a definite advantage (McCloskey, 2004). Some tablet computers are designed similar to traditional laptop computers but with pen-sensitive screens that can be swiveled to a horizontal position for pen-based input. Tablet computers that come equipped with an integrated keyboard are known as "convertibles." Other tablet computers function more like "electronic slates", with keyboards as optional devices. The Mlax survey application installed in the tablet computers is well suited for socioeconomic data collection. It is designed in such a way that data collected are sent to the server automatically by simply connecting to the internet and running the application. This is essential to avoid the risk of losing data. Another advantage of the use of the application is that on-field supervision of data collected is easily done. This study was carried out to assess the determinants and constraints to effective use of tablet computers in data collection in the study area

METHODOLOGY

Study area

The study was carried out in the Nasarawa/Benue rice hub, Nigeria. Rice Sector Development Hubs are zones where rice research outputs are integrated across the rice value chain to achieve development outcomes and impact. The Hub involves large groups of farmers and other value-chain actors, such as rice millers, input dealers and rice marketers (Cisse, Arouna and Diagne, 2012). The Nasarawa/Benue hub is made up of four local government areas of Guma and Gwer-west in Benue state and Lafia and Obi Local government areas in Nasarawa state. Benue state is located within longitude 7° 47' and 10° 0' East and Latitude 6° 25' and 8° 8' North while Nasarawa state is located within 8°32' and 8.533°North and 8°18' and 8.3°East (Wikipedia, 2013). The states are among the North Central states of Nigeria and are highly agrarian with a large percentage of their populace engaged in rice farming and other agricultural activities. Rainfed upland and rainfed lowland are the major rice production ecologies in the study area. Both states share a common boundary and have rich and diverse agricultural produce which include rice, yams, beans, cassava, potatoes, maize, Soya beans, sorghum, millet and coco-yam.

Sources of data

The study made use of primary data from the NCRI/Africa rice baseline survey in which tablet computers were used to obtain information from local rice farmers. The data was collected by enumerators who were trained on the use of tablet computers for data collection.

Sampling technique -

A stratified random sampling technique was used to obtain data from 120 rice farmers in the study area. A list of all villages in the hub was constructed after which villages where rice is not produced or where rice is not grown in the target ecology were sorted out, so that, only villages where rice is grown in the target ecology were left. All remaining villages were then grouped into 3 homogeneous classes (strata) using village accessibility as a criterion. These are: "villages with good accessibility throughout the year", "villages with poor accessibility" and "villages with very limited accessibility". Accessibility in this context is related to both road condition and distance from an urban area. Due to the high intensity of the field activities, villages with very limited access were not considered. Each of the two remaining village groups were then classified into two classes based on dominant crops (rice in the target ecology as major crop and rice in the target ecology as minor crop). The 'accessibility' and 'dominant crop' criteria then resulted into four strata of villages namely: villages with poor access but with rice as major crop, villages with poor access but with rice as minor crop, villages with good access but with rice as major crop and villages with good access but with rice as minor crop. From each of the stratum, 8 villages were then randomly selected to make up a total of 32 villages. 10 households were then randomly selected from each of the 32 villages such that in total, we had 320 rice farming households. However, due to time constraints, data from 120 rice farming households was used for analysis.

Method of data collection

Data was collected using two tablet computers. The number of hours used to collect data from the individual rice farming households was recorded and used for analysis.

Method of data analysis

Various analytical tools and procedures were employed for this study. Descriptive statistics such as percentages, frequencies means and standard deviation were used to explain the demographic and socio-economic characteristics of the respondents while the logistic regression analysis was used to assess the determinants of effective use of tablet computers in data collection.

Logistic regression model

Two models frequently used in studies relating to determinants of usage are the logit and probit models. Usually a choice has to be made between logit and probit, but, as Amemiya (1981) has observed, the statistical similarities between the logit and probit models make such a choice difficult. The logit model was however selected for this study because it is computationally easier. In the Logit model the dependent variable is dichotomous in nature, taking the value 1 or 0. A household is assigned the value of 1 if it finished answering the questions from the tablet computers within the stipulated time frame and 0 if otherwise. Following Gujarati (1988), the logit model is specified as:

$$\ln(P_i/(1-P_i)) = X_i\beta + e_i$$

Where X_i is the index reflecting the combined effect of independent X variables that prevent or promote the timely and effective usage of tablet computers in data collection. The index level can be specified as:

$$X_i = \beta_0 + \beta_1 X_1 + \dots + \beta_6 X_6 + e_i$$

Where:

X_1 = Age of the household head (in years)

X_2 = Gender of Household Head (dummy; Male = 1; Female = 0)

X_3 = Marital Status of Household head;

X_4 = Educational level of the household head (in years)

X_5 = Household size (in no)

X_6 = Number of educated people in the household

β_0, β_6 = Parameters to be estimated

e = error term.

The dependent variable is the natural log of the probability of effectively making use of the tablet computers in data collection divided by the probability of not using it effectively (1-P). The model was estimated using the maximum likelihood method of the Statistical Package for the Social Sciences (SPSS) software, version 16.0

RESULTS AND DISCUSSION

The socio-economic characteristics of the respondents are presented in Table 1. The result of the analysis showed that the farmers are mostly males (87.5%). This implies that female involvement in rice farming in the study area is still very low. This could be in view of the fact that majority of the respondents in the study area are Muslims. About 33% of the respondents have no formal education with only 21% and 12% having secondary and tertiary education respectively. The average age of the respondents is 50.17 years, while the modal age was 41-50 years and as much as 25% are in the age range of 51-60 years. This implies that the farmers in the study area are gradually getting old. Majority of the respondents are married (86.7%) and the average household size of farming households in the study area is 8. Virtually all the respondents (87.5%) have agriculture as their primary occupation. This implies that agriculture is the major source of livelihood in the study area.

Determinants of effective use of tablet computers in data collection

As shown in table 2, the logistic model explained 82 percent of the total variation in the effective use of tablet computers. The chi-square statistic (22.47; $p < 0.01$) shows that the parameters included in the model were significantly different from zero at the 1% level. The -2 Log Likelihood also showed the high predictive ability of the model. The variables that significantly influence the effective use of tablet computers in data collection are age of the household head, educational level of the household head and the number of educated people in the household. The negative sign in the age variable implies that data collection making use of the tablet computers is likely to be easier with younger farmers than with older farmers. The odds in favour of responding effectively to questions using tablet computers decreases by 0.62 ($p < 0.01$) for older farmers. The result of the analysis also showed that data collection using tablet computers is easier for farmers with higher education compared to farmers with lower level of education. The odds in favour of household head with higher education is 2.28 ($P < 0.05$). Also, for households with higher number of educated people, the odds in favour of effectively responding to questions using tablet computers in data collection is 9.17 ($P < 0.05$).

Constraints to the usage of tablet computers in data collection

As identified by the enumerators, poor village infrastructure in the form of lack of electricity and good roads, internet facilities and good accommodation was identified as the most important constraints militating against the effective use of tablet computers in data collection in the study area. Other constraints identified were communication barrier between the enumerators and the respondents as well as the large volume of data to be collected.

Table 1: Socio-economic characteristics of respondents

Characteristics	Frequency	Percentage
Gender		
Male	105	87.5
Female	15	12.5
Total	120	100
Educational Status		
No Formal Education	39	32.5
Quranic Education	8	6.67
Primary Education	25	20.83
Junior Secondary	9	7.50
Senior Secondary	25	20.83
Tertiary Education	14	11.67
Total	120	100
Age		
21-30	8	6.67
31-40	27	22.50
41-50	36	30.00
51-60	31	25.83
>60	18	15.00
Total	120	100
Marital Status		
Married	104	86.67
Single	1	0.83
Widow/Widower	15	12.50
Total	120	100
Household Size		
1-5	34	28.33
6-10	53	44.17
11-15	26	21.67
>15	7	5.83
Total	120	100
Primary Occupation		
Agriculture	105	87.50
Employee	10	8.33
Handicraft	3	2.50
Others	2	1.67
Total	120	100

Table 2: Parameter estimates of determinants of effective use of tablet computers in data collection

Variables	Coefficient	Wald statistics ^c	Exp(B)
Constant	-0.779	0.000	0.459
Age of Household Head	-.473***	10.365	0.623
Gender of Household Head	0.945	0.002	2.573
Marital Status	6.299	0.067	543.822
Educational Level	0.824**	4.026	2.280
Household Size	0.191	1.315	1.210
No of Educated people in the household	2.216**	4.660	9.174
-2 Log likelihood		82.39	
Model chi square		22.47***	
Overall cases correctly predicted		85.8%	

Note: ** = significant at 5% level, *** = significant at 1% level

CONCLUSION AND RECOMMENDATIONS

The study assessed the determinants of effective use of tablet computers in data collection among rice farmers in Nasarawa state, Nigeria. The study was able to show that tablet computers can be effectively used to collect more accurate and secured data in Nigeria in particular and in Africa in general. The study concluded that new technologies can substantially advance statistical capacity to report faster and more frequent data, even in the most challenging institutional and capacity constrained environments. Though data collection using tablet

computers is new in Nigeria, it will bring about rapid development in the country if effectively utilised. This is because accurate and reliable data is an essential tool for the sustainable development of any society. In line with the results of the study, the following recommendations are made

The design of the data collection application used in the tablet computers in the future should include audio expression of the questions in local languages to minimise communication barriers.

The government should lay more emphasis on the education of the farming households and development of village infrastructure in the rural areas

Younger people should be encouraged to go into agriculture by providing an enabling environment in the rural areas. This is because they are more dynamic and get used to modern technology much more easily than older people.

ACKNOWLEDGEMENT

We gratefully acknowledge the contribution of Africa Rice Centre, Cotonou and the National Cereals Research Institute (NCRI) Badeggi, in providing technical and financial support for the study. We also recognize the technical contribution of Professor O. A. Omotesho

REFERENCES

- Amemiya, T. 1981, Qualitative Response Models. *A Survey Journal of Economic Literature* 19:1483-1536
- Cisse B., Arouna B. A. and Diagne A. 2012. Rice Sector Development Hubs: Overview of Hub Activities and Selected sites in the countries. A Paper presented at the Africa Rice Science Week and GRiSP-Africa Science Forum, Cotonou, Benin
- Danso-Manu K. B. 2007. Challenges in the production of statistical data in Africa. *CPMS Sessions*, 12 pp.
- Gujarati, D. N. 1988. *Basic Econometrics*, 2nd edition, New York, New York: McGraw-Hill
- Lindsey, S. D. 2003. On-demand lectures create an effective distributed education experience. *THE Journal*, 31(4), 16-18.
- McCloskey, P. 2004. Tablet PCs stake out higher ed. *Syllabus Technology for Higher Education*. <http://www.syllabus.com/motion/article.asp?id=6985>
- Mendelsohn, J. 2003. *Will tablet PCs replace laptops on college campuses?* Electronic file, Retrieved from http://www.bentley.edu/news-events/pr_view.cfm?id=910
- Ncube M. 2011. Challenges of Data Collection in Africa A paper presented at the 13th PAMRO Conference , Dakar, Senegal
- OECD global forum on development, 2013. 'Knowing in time': how technology innovations in statistical data collection can make a difference in development. *Discussion paper for session 3.2*
- World Bank 2012. Asia Knowledge and Innovation Initiative Scoping Mission Report to Indonesia. *World Bank internal mimeo*.