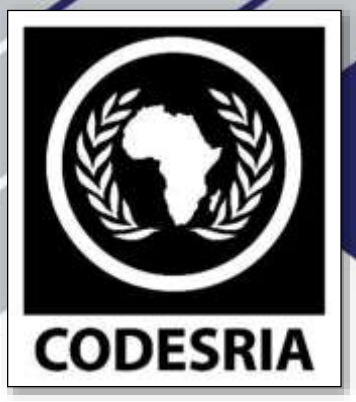

Dissertation

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Willingness to pay for rural telephone services: implications for agricultural technology transfer and poverty reduction in south east Nigeria

JANUARY, 2008.

TITLE

WILLINGNESS TO PAY FOR RURAL TELEPHONE SERVICES: IMPLICATIONS FOR AGRICULTURAL TECHNOLOGY TRANSFER AND POVERTY REDUCTION IN SOUTHEAST NIGERIA

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APPROVAL

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CERTIFICATION

I certify that this research “Willingness to Pay for Telephone Services: Implications for Agricultural Technology Transfer and Poverty Reduction in Southeast Nigeria” was carried out by Patrick Ogbonnia Chukwu (EBSU/PG/M.Sc/2002/00479) under my supervision in Department of Agricultural Economics, Management and Extension of Ebonyi State University, Abakaliki.

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DEDICATION

This Dissertation is dedicated to God Almighty for all His mercies on me. Also to my beloved wife, Mrs. Maureen O. Chukwu and son, Master Emmanuel O. Chukwu for keeping aflame the hope of a better tomorrow in me through their encouragement

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ABSTRACT

This study examined the determinants of the rural people's willingness to pay (WTP) for rural telephone services and the implications on agricultural technology transfer and poverty reduction in Southeast Nigeria. The key research problem was the inability of the telephone providers or regulatory agencies to estimate the amount the people were willing to pay for telephone services. This led to their reluctance to extend telephone services to rural areas where agriculture is practised based on the notion that the people are unable to pay. The sample was made up of 240 agro-based entrepreneurs and 60 extension staff. Primary data were collected using structured interview schedules and well-structured questionnaires containing stochastic payment card design. The data obtained were analyzed using both descriptive (means, percentages, cross-tabulations) as well as inferential statistical tool (logit analysis). Results showed that 60.2% of the respondents were males and had higher WTP for telephone services than females. Majority of the respondents were within the age bracket of 31 – 40 years. Farming was the predominant occupation where 38.9% of them made an annual farm income of about ₦30000. Only about 17.7% of them had access to telephone services while 59.2% had preference for mobile telephones. The maximum, minimum and mean amounts the respondents were willing to pay per minute of telephone service were ₦38, ₦7 and ₦17 respectively. Respondents accepted that rural telephone where available helped them to get information on latest packages on agricultural technology. The perceived problems of agricultural technology transfer using telephone was lack of practical demonstration of technology. Rural poverty was indicated as reduced through provision of employment opportunities for the jobless. The null hypothesis was tested using t-statistic which revealed that years of schooling and access to telephone services significantly influenced WTP at 1% level. Finally, it was recommended that both the Federal and State government should equip the agricultural officers with modern communication technology to enhance their extension activity and that government agencies/or private telecom providers should extend telephone services to rural areas because of the rural people's high WTP.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

The primary objective of universal service or universal access in developing countries is to “break the isolation of communities and households living in rural and remote areas”. This is by bringing the households into a basic communication network. In order to achieve universal access, among other goals, wave of reforms has affected telecom operators in most developing countries including Nigeria. These reforms comprise privatization, the introduction of regulatory authorities and fostering of competition when possible (Torero, et al., 2002)

Willingness to pay (WTP) is the maximum sum of money (assuming money as the numeraire good) the individual would be willing to pay rather than do without an increase in some good such as access to rural telephone services. This sum is the amount of money that would make the individual indifferent between paying for and having the access to phone and not having access while keeping the money to spend in other goods (Torero, et al., 2002).

Willingness to pay surveys measure potential demand for products or services by asking consumers, “Would you purchase this product if it were offered at this price?” They are frequently used in health, social, and environmental programs for price setting and cost-benefit analyses. Analyses

of WTP survey data permit program managers to estimate the number of clients who will pay a given price, the amount of revenue that will be generated by that price, and if the appropriate questions are included in the questionnaire, the characteristics of individuals who will or will not pay that price. The basic WTP survey is quick to administer and requires relatively modest sample sizes. WTP is transitive downwards. Clients who are willing to pay a given price for a product or service are willing to pay any lower price for that product or service. The higher the WTP the lower the price (amount) willing to pay and vice versa (Foreit and Foreit 2004).

Nigeria used to have only 700,000 telephone lines as at 1999, which translated to one telephone line to about 700 people. This ratio was grossly inadequate in the new millennium (Umeh, 2000). By 2001 the federal government liberalized the telephone system leading to the introduction of Global System on Mobile (GSM) telecommunications in addition to privatizing the only national carrier – the Nigerian Telecommunications Limited (NITEL). It must be noted that when NITEL was the only telephone provider in Nigeria, the urban telephone consumers were underserved, while the rural areas were almost totally excluded from service.

Telephone is essential for both administrative, agricultural and rural communications. Some benefits associated with rural households' access to telephone service include contact with relatives, rural and urban market information, information on prices of agricultural products and attention to

health emergencies. In effect, information technology might dynamize the rural households, thus reducing poverty levels and increasing welfare (Torero, *et al.,* 2002). Information technology will necessitate the installation of communication infrastructure which will enhance access to information flow. When the rural people become well informed about latest packages of agricultural technology and prices of products in other areas, then decision on how, where and when to produce and sell their products can be taken. Invariably, agricultural productivity and income will increase.

The Agricultural Development Programme (ADP) in Nigeria is the main agency for agricultural technology transfer to farmers in rural areas who constitute about 75% of the Nigerian population. ADPs in the 36 states are mandated to carry out state mandate as well as some rural development programmes such as rural nutrition extension, and other enlightenment programmes aimed at poverty reduction. The head offices of ADPs are usually located at the state capital and linked to modern telecommunication system; but the rural areas they are meant to serve lack such facilities. This has tended to create problems for information delivery from the urban headquarters of the ADPs and the extension agents in the rural areas down to rural clientele.

Universal service is based on the fundamental principle of “the right of every inhabitant to access at least the basic telecommunications service” (Torero, *et al.,* 2002). In that sense, the universal service is aimed at

providing telecommunication services to all individual residences, including those in rural, remote and high cost locations. It aims at reducing the isolation of the rural communities and decreasing the migration to cities. It can also contribute to a better education and provides access to information systems all translating to reduction of poverty especially in the rural areas. Hence, the universal access policy can be defined as “the existence of at least one basic service of telecommunications in a community with a minimum number of inhabitants”. Typically, the policy promotes the installation of one public payphone or public call offices in a rural or remote village to provide basic connection to the telecommunications network (Torero, et al., 2002). Importantly, universal access of telephone services seem to be an appropriate technology for rural population considering the current conditions for information and communication technology (ICT) deployment (Song, 2003).

1.2 Problem Statement

There is a limit in reliance on private investment to extend telecom coverage to the rural areas. This is applicable to even those countries that have successfully reformed their telecom sector. For example, in Nigeria, since the reform of 2001, which brought about the GSM providers, the rate of extension of telephone services to rural areas by the private telecommunication companies is low. This is because it is unlikely that any private investors will engage in any very risky or unprofitable venture (as they

consider rural telephone provision) without being compensated. The traditional explanation for lack of universal access has to do with the lack of funds from rural poor people to afford the services. As a response, several subsidy mechanisms have been implemented (by some developing countries) trying to assure that poor people will pay the same for telecom access that better off people in urban areas where implementing the service is cheaper.

The main problem with the scheme has been its sustainability (Torero, *et al.,* 2002; Richardson, 2002). Nigeria has not at any time attempted providing telecom access to rural areas based on subsidy. Also, studies on the feasibility of rural telephone provision with or without subsidy seem to be grossly lacking.

However, based on the experiences of some studies (Vaughan, et al., 1999 and Torero, *et al.,* 2000) reveal that rural inhabitants are willing to pay much more than urban consumers for telecom services and these schemes are more sustainable overtime. If that is the case, the lack of resources is not a valid argument to support subsidy schemes neither is it valid to support the unwillingness of the telephone providers to extend to rural areas. In fact, several authors and researchers have challenged the fact that it is "unprofitable" to provide rural telecom services, and they blame regulatory agencies (such as Nigerian Communications Commission (NCC), for their lack of ability to correctly estimate the willingness to pay for rural inhabitants. It is a fact that no such attempt to estimate the willingness to pay for telecom

services has been embarked on either by the NCC or any of the telephone providers. Therefore, any study which attempts to estimate this at this reform period in Nigeria should be a welcome development. Currently, Nigerian government is negotiating with the Chinese government on rural telephony and yet willingness to pay by the people not been determined. There is need to test the idea that the willingness to pay is higher or lower in rural areas of Nigeria through a systematic study as a way to giving additional information to help design more self-sustaining scheme.

However, for willingness to pay study to be well focused and conceptualized, the research must seek to ask and answer these pertinent questions; 1. What are the socio-economic attributes of the rural people of Southeast Nigeria which would affect their willingness to pay for telephone service?, 2. Are the rural people willing to pay more or less than their urban counterparts?, 3. If the rural people are less willing to pay what urban consumers are paying, what level of subsidy could make them pay?, and 4. What amount are they actually willing to pay?, 5. What type of telephone services do rural people need – the landline phone as provided by NITEL or the mobile phone (GSM) as provided by the private phone providers? Other questions that may follow are: 6. What amount are the rural people willing to pay for the various types of calls; local call, trunk call and international call?, 7. What is the opportunity cost of telephone use?, 8. What are the perceived advantages of telephone to the rural people? and 9. What are the advantages

other modes of communications? 10. Finally what are the perceived disadvantages of use of public telephone?

Answers to these and more questions will be sought in the course of this study.

1.3 Objectives of the Study

The broad objective of the study is to determine the willingness to pay for telephone services and the implications for agricultural technology transfer and poverty reduction in Southeast Nigeria.

The specific objectives are to:

i. determine the socio-economic characteristics of the respondents in relation to their Willingness to Pay;

ii. determine the level of willingness of the rural people to pay for telephone services;

iii. find out the potential roles of the telephone services on agricultural and rural economic activities;

iv. determine the effects of telephone services on rural poverty reduction; and

v. determine the economic cost and possible cost adjustment of rural telephone services in the study areas.

1.4 Research Hypothesis

The null hypothesis to be tested in this study is:

H_o: There is no significant relationship between willingness to pay (WTP) and the socio-economic characteristics of the respondents.

1.5 Justification for the Study

As Nigerian government is currently negotiating with Chinese government for rural telephony, it therefore becomes necessary to determine the willingness to pay. This will automatically form the basis for such negotiation. The telecommunications reform will offer new opportunities and create incentives to serve rural areas thereby bridging the information gap between the urban and rural areas. By so doing, the rural people of Southeast Nigeria will become well informed of the society (Hudson, 1994).

One popular, and important, rationale for expanding access to communication technology to under-served populations for public investment is based on equity. The reasoning is that access to communication technology facilitates access to information. Those who have information and access to technology have an advantage. In tandem with the above reasoning it becomes justifiable that this research should be welcome in order to guarantee universal access to the rural people of the southeast Nigeria. This will particularly facilitate contact with relatives both at home and abroad, rural and urban market information on prices of agricultural products especially cassava and attention in time of health emergencies. Information itself is a

“public good in economic parlance, which has intrinsic value”. As a general rule, public goods are subject to investment as their use benefits many in society (Bowman, 2002).

Majority of the farmers in Nigeria have not yet attained the level of vigilantly searching for agricultural information to address their needs, although when asked they do express these needs. But there is the overriding need for tangible needs such as credit, agricultural inputs, and seeds. Forging partnership or encouraging the private sector to provide some of the tangible services such as input supply, seed distribution outlets, animal clinic and demonstration plots, can only be facilitated if there is efficient telecommunication centres in the rural areas as found in the urban.

Finally, the study may provide information needed for the rural telephony programme in the entire country and serve as a stepping stone to further studies on the subject.

CHAPTER TWO

2.0 LITERATURE REVIEW

Issues to be reviewed include willingness of rural people to pay for telephone services, impact of telephone services on poverty reduction, impact of telephone services on agricultural technology transfer, socio-economic characteristics of telephone users, cost of rural telephone services and theoretical techniques.

2.1 Willingness of Rural People to Pay for Telephone Services

Willingness to pay is the maximum sum of money (assuming money as the numeraire good) the individual would be willing to pay rather than do without an increase in some good such as access to rural telephone services. This sum is the amount of money that would make the individual indifferent between paying for and having the access to phone and not having access while keeping the money to spend in other goods. Willingness to pay takes as reference point the absence of the specific good (i.e. telephone in our specific case and therefore without markets and prices there is a need to fall back on various indirect methods of calculating it. In this sense, through the creation of hypothetical markets, information about consumer preferences can be obtained from free – response questions or using bounded-response question (Torero, *et al.,* 2000).

Willingness to pay surveys measure potential demand for products or services by asking consumers, “Would you purchase this product if it were offered at this price?” They are frequently used in health, social, and environmental programs for price setting and cost-benefit analyses. Analyses of WTP survey data permit program managers to estimate the number of clients who will pay a given price, the amount of revenue that will be generated by that price, and if the appropriate questions are included in the questionnaire, the characteristics of individuals who will or will not pay that price. The basic WTP survey is quick to administer and requires relatively modest sample sizes. WTP is transitive downwards. Clients who are willing to pay a given price for a product or service are willing to pay any lower price for that product or service. The higher the WTP the lower the price (amount) willing to pay and vice versa (Foreit and Foreit 2004).

One of the most popular survey designs to select the willingness to pay is the dichotomous choice (simple referendum). In this particular case respondents to the survey are asked whether they are determined to pay a certain amount of money. The question is simple and easy to answer. However, it supplies a limited quality of information. In this perspective, a sequential referendum would increase the valuation efficiency but at the expense of a greater difficulty in the estimation of the distribution and also endogeneity in the follow-up question.

The estimation of the distribution of the WTP is tackled in the literature through parametric and non-parametric approximations. The parametric approximation, widely used in the contingent valuation analysis, specifies a parametric model in which a relation between the WTP and the consumer intrinsic characteristics is stated. The non-parametric approximation estimates the distribution of the WTP without assuming any parametric specification of the preferences distribution (Torero, *et al.,* 2000).

There is willingness to pay for certain services such as telephone, photocopy, fax, e-mail, secretarial services and training in computer packages services. But this is yet to be tested for agricultural information which is free by government policy (Electronic Delivery of Agricultural Information to Rural Communities in Uganda, 2001).

Telephones are facilities that the communities have come to see as their own. They have realized the benefits of having them. For instance they are gradually turning to use the services, as well as sending their children to learn how to use computers. They pay for most of the services used (rendered). Nakaseke telecentre is partnering with some schools to have pupils taught ICTS (Electronic Delivery of Agricultural Information to Rural Communities in Uganda, 2001).

2.2 Impact of Telephone Services on Poverty Reduction

Song (2003) measured the positive impact of Information and Communication Technologies (ICTs) on rural households through a holistic approach integrating national project and target group level analyses. With a case of rural telecommunications projects of LAO PDR, the impact of telephone, the most basic ICT, was investigated at three different levels. The project level analysis reveals the (RURTER) services is efficient and sustainable, and has benefits for rural residents comparable to other infrastructures. The target group level analysis applied propensity score matching and regression analysis, and the result confirm the positive and pro-poor impact of telephone use on households welfare.

Benefits associated with rural households access to telephone service include contact with relatives, possibility of purchase or sales, information on prices of agricultural products, knowledge of the market situation before the delivery of the product to the city, contact with carriers and attention to health emergencies. In effect, information technology access generates externalities that might dynamize the rural households, thus reducing poverty levels and increasing welfare (Torero, *et al.,* 2002).

Information services may help farmers negotiate higher prices with resulting higher revenues than previously. For example, information on market opportunities apparently resulted in $3 million in additional revenue for watermelon growers in Florida (Schmandt, *et al.,* 1990). Parker, *et al.*,

(1989) also reported examples of farmers adjusting production and finding overseas markets as a result of consulting on line databases.

Hudson (1984) lists the following benefits of telecommunications (telephone) for improving efficiency and productivity:

* Price information; producers such as farmers can compare prices in various markets, allowing them to get the highest prices for their produce. This will eliminate dependency on local middlemen and/or will modify their products (types of crops raised or fish caught) thereby responding to market demand;
* Reduction of downtime; timely ordering of spare parts and immediate contact with technicians can reduce time lost due to broken machinery such as pumps, tractors, generators, etc.
* Reduction of inventory; businesses can reduce the inventories they need to keep on hand if replacements can be ordered and delivered as needed.
* Timely delivery of products to market; contact between producers and shippers to arrange scheduling for delivery of products to market can result in reduced spoilage (for example, of fish, fresh fruits), more efficient processing and higher prices for produce.

Agricultural extension systems in most developing countries are under funded and have had mixed effects. Much of the extension information have been found to be out of date, irrelevant and not applicable to small farmers'

needs, leaving such farmers with very little information or resources to improve their productivity. ICT (telephone) helps the extension system in re-orienting itself towards the overall agricultural development of small production systems. The rural farmers can contact the extension agents on agricultural issues and problems and get expert advice. With appropriate knowledge small-scale producers can even have a competitive edge over large operations. When knowledge is harnessed by strong organizations of small producers, strategic planning can be used to provide members with least cost inputs, better storage facilities, improved transportation links and collectivize negotiations with buyers (Meera, *et al.,* 2004).

Moreover, there are examples of profitable use of market information in developing regions ranging from Brazilian Coffee growers contacting the Chicago futures exchange, to farmers in the Nile Delta taking orders from merchants in Alexandria by telephone to Sri Lankan farmers obtaining market information from Colombo (Hudson, 1992; Saunders, *et al.,* 1994). Hudson (1984) states that in the Cook Islands, two ways radio was used to arrange the itinerary of ships dispatched to pick up fruits. This was done so that crops already picked would not be overripe, thereby fetching much lower prices. In Northern Canada, she also notes that Indian lake fishermen use radios to alert float plane operators when their catch is ready to be flown to urban markets. In the past, pre-arranged flights were wasted if the catch was too small or the fish were no longer fresh.

Furthermore, telecommunication offers important benefit in overcoming delay in business activities and service providers in rural and remote areas. Research on this topic generally focuses on travel/transport substitution. That is, the ability to obtain or transmit information electronically, rather than through personal travel or through the postal services. Benefits are measured in terms of time saved, and sometimes converted to monetary terms using estimates of the value of time in terms of wage estimates. Another approach is to estimate the value of energy saved if the number of trips could be reduced. For example, the ITU funded studies found out that potential energy saving in developing countries was high. Telecommunications was used to coordinate logistics in those countries so that trips were reduced (cited by pierce and Jequier, 1983; ITU, 1986; ITU, 1988). Other case studies such as those by Chu, *et al.,* (1985) and Mayo, *et al.,* (1992) estimated time saved by rural telephone users and compared it to other modes of communications. Hudson (1992) found that rural users also took into consideration time wasted by lack of information, such as shopkeepers and pharmacist making trips to town for supplies, only to find out that the goods were not available or field workers finding that rural clients such as health aides or farmers were not there when they arrived

2.3 Impact of Telephone Services on Agricultural Technology Transfer

The main focus of ICT (telephone services) in agriculture is meeting the farmers' needs for information. Each of the projects studied in India was designed to meet these needs in their target population, according to the individual mandates and agenda they had established (Meera, *et al.,* 2004).

The following are agricultural development information the farmers really considered relevant to their needs.

1. Question – and –answer services: The service, called 'Ask the Expert', consists of a group of specialists on agriculture and animal husbanding answering farmers' questions about the latest techniques in their area of expertise, and giving advice on various problems.
2. Weather forecasting: Information on rainfall, temperature and humidity of the area was appropriate. Proper understanding of these climatic factors would make a particular technology effective. This is because farmers would know the best time to plant, observe other cultural practices and harvest theirproducts.
3. Latest packages of technologies: The farmers need information on the best technologies for cultivating soybean and wheat as well as on drought-resistant varieties.
4. Post-harvest technology: Information on post-harvest technology particularly storage was considered appropriate. This would enable

sustainability of agricultural products thereby ruling off the phenomenon of agricultural products being abundant in on-season and scarce during off-season.

5. Early warning and management of disease and pest: Averagely, early warning system about outbreaks of disease and pest infestation, and information about how to manage such outbreaks were felt appropriate. Since some disease like rice gall medge are endemic in southeast Nigeria, timely information on control measure would check further spread. In view of this agricultural productivity can still be increased.

2.4 Socio-economic Characteristics of Telephone Users

Hudson (1992) cites evidence from field interviews in Northern Canada, China, the south pacific, and Africa that rural telecommunications users can often articulate precisely the benefits and/or savings in time and effort derived from access to a telephone. Hudson notes that people who need to communicate quickly or frequently for their work include entrepreneurs, project managers, and health care providers. In Egypt, it was found that better educated individuals were more likely to make calls to major cities and administrative centres, whereas those with little education tended to call only nearby villages and towns (Pierce and Jequier, 1983) and in the U.S. Schmandt, *et al.,* (1990) suggest that large farmers and agric-business benefit

most from online agriculture data. Saunders, *et al.,* (1994) cited several studies examining characteristics of telephone users and purposes of use. For examples, a Costa Rican study for rural public call offices (PCOs) found that villages that benefited most from the PCOs tended to be larger and better off economically, with relatively better educated populations engaged in more progressive agricultural techniques. The PCOs users themselves tended to be employed but their incomes were not higher than average. In fact, telephone users included a substantial number of low-income residents, although the most frequent callers had higher than average incomes.

Hudson (1992) states that the most important characteristics of telephone users is thirst for information. She cites examples from Northern Canada of village chiefs without formal education who may use the telephone to talk to other chiefs. Villagers who do not speak the national language or have limited education may rely on intermediaries to obtain information, such as an extension agent, co-operative manager, or other officials who in turn will use the telephone to obtain the information they need. Thus, Hudson concludes, although telephone users tend to be better educated and more involved in market economy than non-users, literacy and “modernity” are not prerequisites for telecommunication use. Information seekers may be traditional people concerned about their families, their work, or problem in their community. They are likely to use whatever tools that are available from two-way radios to satellite circuits-to find the information they need.

In developing countries, Hardy (1980) found that residential telephones appear to contribute more to economic development than business telephones. The reason may be that residential phones are often used for business activities, and are available 24 hours per day, whereas business phones are available only during work hours. There may also be a difference between public and private sector use, with many businesses using their proprietor's home telephones.

2.5 Cost of Rural telephone Services

The cost of ICT provision to rural areas tend to be higher than to more densely populated urban areas, and the ability to pay of potential subscribers lower. In recent years, a number of interesting experiments has been initiated to extend low-cost telephone and, in some cases, internet access to low-income rural communities. This paper reviews some of these, with a particularly emphasis on whether they are likely to prove financially sustainable (Organization for Economic Co-operation and Development 2003)

Surveys of rural households' willingness to pay for telephone service point to its potential commercial viability. Franchise models of shared access provision would appear to have most favourable economics. Through standardization and demand aggregation, they offer the prospects of reaping economies of scale in hardware and software procurement as well as in provision of technical support. They enhanced bargaining power in negotiating

interconnection fees and leased line prices. Such models equally provide opportunities to small entrepreneurs, at the same time creating incentives to both cost containment and rigorous financial management.

While rural economies may be less complex technologically than the highly urbanized economies of the developed world, the value of timely information can just be as high, if not higher, in relative terms. Beside the strictly economic benefits of maintaining long-distance contact with family members working abroad or in the city. The experience of Bangladeshi women who made up the majority of village phone operators for the Grameen network suggests that social status can be enhanced by virtue of control over a valuable resource information (Organization for Economic Co-operation and Development 2003).

2.6 Theoretical Framework

Two basic approaches to measuring benefits are indirect approach, which draws conclusion from actual behaviour, and direct approach (or the contingent valuation method), which draws conclusion from responses to hypothetical question (Griffin, et al., 1995). Contingency valuation is particularly useful when relevant market behaviour is not observable or when markets do not exist for the commodity to be valued (Munasinghe, 1993; Guasch and Hahn, 1999). Contingency valuation method (CVM) puts direct question to individual to determine how much they might be willing to pay for

the good in question. Contingency valuation methods are subject to hypothetical bias, strategic bias and compliance bias (Griffin *et al.,* 1995). Hypothetical bias can be reduced if the sample is well aware of the nature of the good. Munasinghe (1993) observed that the CVM is more effective when the respondents are familiar with the good or service in question and have adequate information on which to base their preferences. Strategic bias is reduced if the sample has little or nothing to gain by undervaluing the good. Respondents may undervalue the good to guard against a situation that may arise if the hypothetical question posed were somehow to become a reality. Compliance bias can be reduced through a careful development of the survey, training and supervision of fieldwork.

All these biases are a result of uncertainty envisaged by respondents. It has been argued that uncertainty is an inherent characteristic of peoples' economic valuation process for both market and non-market commodities and can never be fully resolved, and that individuals valuations should be characterized as a random variable with an associated distribution (Wang, 1997 a and b). Wang (1997) noted that there are several sources of uncertainty associated with an individual valuation process for non-market goods and services. First uncertainty may exist with respect to the commodity in question that is with respect to the nature and quality of the good. Second, an individual may be uncertain about how to use the good or service in question. Third, uncertainty exist in a market, that is, the value to an

individual of a commodity is influenced by prices of both substitute and complementary goods or services. Fourth, uncertainty may also exist with respect to an individual's own characteristics and preferences; individuals are sometimes uncertain about future income.

The problem of uncertainty and hence biases can somehow be resolved by using the concept of an individual's valuation distribution. The notion that an individual's value of a good or service is stochastic, and is best characterized as a random variable with an associated valuation distribution, is consistent with daily observations on the ways people talk about their willingness to pay for a commodity (Wang and Whithington, 2001). Many people use two ways to express their willingness to pay for a good. One is to say that they are willing to pay about X naira, which may be interpreted as the mean value of a valuation distribution; the other is by giving a range from Y to Z naira, which can also be interpreted as information about a valuation distribution.

To measure individual's valuation distribution, Wang (1997) proposed a new value elicitation format termed the stochastic payment card approach. In stochastic payment card, numeric likelihood values are presented with verbal likelihood references. Respondents are directly asked how likely they would be to agree to pay certain amounts of money for the commodity. A card showing different prices is presented to respondents and they are asked how likely they would be to agree to pay each of the amounts shown. Respondents

are asked to select a number as the likelihood or probability that they will agree to pay a specific price. If the respondent answers a series of such questions, a likelihood matrix can be observed. The likelihood matrix obtained with stochastic payment card is a record of an individual's probabilities of accepting different proffered payments.

The likelihood matrix can be interpreted as a record of the individual's valuation cumulative distribution function (CDF) so that the probability that a utility maximizer (respondent) with a CDF {F(.)} would accept the offer presented in the dichotomous choice questions would be

Pr (Yes) = Pr{V(V – t, P,E1,Z,Eo) > V(Y,P,E1,Z,Eo)}

= Pr V(Y – t, P, E1, Z,Eo) > V(Y – WTP, P,E1,Z,Eo)

= Pr {WTP > t}

= 1 – f (t)

Where V is indirect utility function; Y is income; P is a price vector; Z is vector of individual's socio-economic characteristics; Eo is the initial quality of agricultural technology information which would be improved to E1 if the cost sharing arrangement works (subsidy); t is the price offered to obtain improvement in agricultural technology transfer and WTP is the willingness to pay. The CDF {F(.)}, the valuation probability density function, the mean and the variance of the probability function can be estimated with the likelihood matrix data. To estimate the valuation distribution, $P_y = 1 – f_i (t_j)$ where P is individual's probability (the number circled by respondent i on the stochastic

payment card) of voting or the cost sharing at the jth payment point tj; F(.) is the person i's CDF. By assuming a specific function form, for example, in normal distribution, one can estimate the parameter in F(.) and the mean, μ, and standard variance, δi, of the individuals i's valuation distribution. Hence, assuming a normal distribution for F(.) then

$$Pi = 1 - \phi \frac{(\mu - ti)}{\delta}$$

$$t_i = \mu + \delta^{-1} \phi (1 - P_i)$$

therefore with an individual's set of ti's and Pi's; a simple regression can be used to estimate μ and δ

For cases where numeric likelihood values cannot be obtained for estimating a valuation distribution, it might be possible to estimate an upper bound; a lower bound and a mean value with some reasonable assumptions about the meaning of the verbal likelihood data.

Moreover, multiple regression analysis can be used to estimate the factors that influence the individual's valuation distribution. In this study stochastic payment card approach to contingent valuation will be used. Furthermore, logistic regression will be used to determine how the logarithm of the odds of willingness to pay for telephone services rather than not willing to pay varies with the values of the predictor variables (vector of socio-economic attributes). The logistic regression may be given in the additive or multiplicative form thus

i. Additive form =

Log $P/(1 – P) = a + B_1X_1 + B_2X_2$ ……. BnXn

ii. Multiplication form

$P/(1 – p) = \exp(a) X \exp(B_1X_1) x \exp(B_2X_2)$ (BnXn(

P is the willingness to pay (WTP); a is a constant; B_1, B_2 are coefficients and X_1,X_2 are predictor variables, log P/(I – P) is known as log of odds while P/(I – P) as odds.

2.6.1 Modeling the Willingness to Pay (Theoretical Model)

The households to be interviewed will answer the contingent valuation questions based on the utility that it represents for the consumption of rural telephone services. The household utility is defined as a function that depends on the consumption of a compound good, Z, and on the consumption of rural telephone service, TR, given by:

1. $U = U(Z, TR)$ $U_z > O$ and $U_{TR} > O$

In this case the utility is increasing in Z and TR. Solving the consumer problem, one can obtain the indirect utility of an individual who consumes a rural telephone services given by:

2. $V_1 = V_1(Y – WTP| TR > o, x, \varepsilon)$

Where Y is the household income, WTP is a money amount that makes TR not zero, X is a vector of the household's observable characteristics and ε is a vector of non-observable characteristics. Therefore, the optimal willingness to

pay by the household is WTP* which makes the following indirect utility functions equivalent;

3. $V_o(Y|TR = O, X, \varepsilon) = V_1(Y - WTP^*|TR > O, X, \varepsilon)$

Then, assuming that $V1(\lambda, P|TR > O, X, \varepsilon)$ is increasing in λ, there exist an inverse function $\psi(V,Z, \varepsilon)$ which make $\psi(V1(\lambda,P|TR > O,X, \varepsilon), X, \varepsilon = \lambda$. Therefore, the willingness to pay can be expressed as:

4. $WTP^* = Y - \psi(Vo\ (Y|TR = O,X,\varepsilon)\ x, \varepsilon \equiv WTP^*\ (Y,X, \varepsilon)$

This definition of the willingness to pay has some interesting implications and one of them is that being ε a non-observable variable, WTP is a random variable, which has a conditional distribution of the individual characteristics that depends on the distribution followed by ε.

2.6.2 Parametric Approximations

2.6.2.1 Logit Model

The parametric estimation of WTP using a logit model consists of the following stages: Estimation of logit model, with a dependent variable with a value of 1 if the offer (bid) is accepted and O if it is not. The explanatory variables will include the value of the bid and socio-economic characteristics of households.

Formally, the idea is that the respondent has to answer whether he is willing to pay for a change in access to the telephone from O to TR if it cost ₦B. If one assumes that the indirect utility function is V(Y,TR,X) where x is

the vector of the individual characteristics, then the answer would be an affirmation if;

5. $V(Y - B, TR, X) - V(Y, X) \geq O$

and a negative one if to the contrary. In this way, following Cameron and James (1987) and Bowker and Stoll (1988), a logistic model can be used. The probabilities of an affirmative response to a bid of ₦B when the consumer has a vector of X of explanatory variable is given by:

6. $P(yes/X) = \frac{e^{B'x}}{1 + e^{B'x}}$

2.6.2.2 Bounded Probit Model

Following Haab and McConnel (1997), it is assumed that the willingness to pay for rural telephone services comprises a range that varies from zero to an amount, A, which might be the total income or a fraction of it. Then, assuming that $E \sim N(O, O^2)$ WTP* is defined as a stochastic function of the vector of characteristics which considers constraints imposed before hand. This can be written as:

7. $WTP = \frac{A1}{1 + e\, x_i^{B+E}}$

Considering that the respondents to be interviewed will answer the question "..... are you willing to pay the amount of t for the rural public telephone service?" One can model the probability response of each respondent as:

8. $P(WTPi^* < t) \quad P\left(\frac{Ai}{1 + e^{x}\ 1^{x+\varepsilon_i}}\right) \subseteq t = P\left(\frac{\sum i}{\delta} \subseteq \frac{X_i\beta - Ln(Ai - t)}{\delta}\right)$

Next, the logarithmic likelihood function for the case of a probit model is

9. $$Ln(L) = \sum_{i=1}^{n} (I - \pi i)\theta \, \mathrm{P}\left(\frac{\sum i}{\delta} \subseteq \frac{X_i\beta - \mathrm{Ln}\frac{(\mathrm{Ai - t})}{\mathrm{t}}}{\delta} \right) + {}_{\pi}\left[1 - \theta \left(\frac{\sum i}{\delta} \not\subset \frac{X_i\beta - \mathrm{Ln}\left(\frac{\mathrm{Ai - t}}{\mathrm{t}} \right)}{\delta} \right) \right]$$

Where πi = 1, if ith respondent says yes to the question and O otherwise. In this case the parameters to be estimated by an ordinary probit are $\frac{\beta}{\delta}$, linked to X regression, and $\frac{1}{\delta}$ associated to regression - $Ln\left(\frac{Ai - t}{t} \right)$ one can recover B coefficients, present in the willingness to pay function WTPA*, through simple division of these estimated coefficients.

CHAPTER THREE

3.0 METHODOLOGY

3.1 The Study Area

The study area was southeast Nigeria. Southeast Nigeria comprises five states, namely: Abia State, Anambra State, Ebonyi State, Enugu State and Imo state. The area has an approximate land area of 58,214.7sq/km and lies between longitudes 6º50' and 8º30'E and latitudes 4º30' and 7º15'N (Mamman, *et al.,* 2000). It has a total population of about 11.2 million people. The people are mainly of Igbo tribe. The major traditional economic activity of the people is farming which is combined with other non-farm activities to varying degrees. Dominant arable crops of the area include rice, yam, cassava, maize, cocoyam and vegetables. Backyard poultry keeping and small-scale livestock production pervade most of the households in the area. Goat and sheep production dominates the livestock industry in the area while cattle (muturu) rearing was an exception, and limited mainly to parts of Ebonyi and Enugu State.

The area is within the rain forest and derived savannah regions of Nigeria. It has a tropical humid climate with two distinct seasons of the year. The seasons are rainy season and dry season. Each season spans for about six months. Rainy season lasts from April to November and is marked by regular and consistent rainfall pattern with consequent drop in ambient temperature. The dry season covers the months of December to March and is

characterized by a hot dry spell that makes both man and livestock uncomfortable. Within the two seasons the temperature range from about 18^{o}C to 34^{o}C. Tree crops are also observable landscape features of the area and play various roles in the lives and economic well-being of the people.

3.2 Sampling Technique

A multi-stage purposive sampling techniques were adopted for this study. In the first stage, three states, Abia, Ebonyi and Enugu were purposively selected from the five states of southeast Nigeria. This was because the major providers of agricultural technology transfer services namely the extension staff and agro-based entrepreneurs were well represented in the three states. The second stage involved purposive selection of three local government areas from the three states as follows: Abia State – Bendel local government area, Ebonyi State – Afikpo North local government area, Enugu State – Ezeagu local government area. The choice of local government areas and communities was purposive based on their popularity in agricultural technology use. Also, the local government areas ranged from peri-urban to urban where there was total or partial telephone coverage. In the third stage, from each local government area, the headquarters were purposively selected while another community without access/or partial access was equally purposively selected. The six communities were Alayi, Amaeke, Mgbom, Ozizza, Aguobuowa and Umumba Ndiagu.

In the fourth stage, a list of agro-based entrepreneurs was compiled in each community, out of which 40 respondents were randomly selected. Also 20 extension staff per state were randomly chosen. The choice of the extension staff was based on their perception of importance of telephone in agricultural technology transfer. In all 240-agro-based entrepreneurs and 60 extension staff were used for the study. However, out of 240 questionnaires administered to agro-based entrepreneurs only 216 were well – completed and returned and were used for the analysis. An agro-based entrepreneur was here defined as a person who spends 60% of his working time in farming or agro-processing in the rural area.

3.3 Data Collection

A reconnaissance survey was carried out to give the researcher an overview of the nature of the rural communities and enterprises. Thereafter, a final survey was conducted to collect primary data using structured interview schedules and well-structured questionnaires. The interview schedules and questionnaires elicited information to cover the objectives of the study. In the stochastic payment card the agro-based entrepreneurs selected from each price, the probability value which measured their willingness to pay the given price.

The questionnaires were validated by specialists both academics and practitioners in the area of agricultural economics and extension before field

administration. Trained enumerators from each community assisted in the collection of the cross-section data. Secondary data were sourced from records of ADPs in each state.

The nature of data collected related to the socio-economic attributes of the respondents and other variables associated with rural telephone and agricultural technology transfer and poverty reduction.

Table 1: An Example of the Stochastic Payment Card Design

Price (₦)	Definitely Yes		Probably Yes		Not sure		Probably No		Definitely No	
0	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
10	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
15	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
20	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
25	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
30	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
35	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
40	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
45	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
50	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
55	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
60	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
65	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
70	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1

What would you be willing to pay for universal access of telephone services?

3.4 Analytical Framework

Willingness to pay (WTP), a dependent categorical variable is dichotomous in nature and hence can be represented by a dummy variable. To measure some effects of the characteristics of consumers over the mean WTP, the parametric approximation is convenient. The parametric approximation consists of the logit and bounded probit models.

Logits provide a convenient means to transform data consisting of counts of a dichotomous variable. Hence, we can show the connection between proportions (or percentages), odds and logits and alternative summaries of observed counts of a dichotomous variable (Mukherjee, *et al.,* 1998).

In general, if N is the total number of observations and n is the number of observations which have the required property, the proportion, P, is obtained as follows:

$$P = \frac{n}{N} \quad \text{----------(I)}$$

The odds, O, is the ratio of the number of observations with the required characteristics to the number of observations which do not have this characteristics

$$O = \frac{n}{N - n} \quad \text{----------(II)}$$

$$= \frac{P}{(1 - P)} \quad \text{----------(III)}$$

A logit, L, is obtained by taking the logarithm of the odds. Hence:

$$L = \text{Log}(o) \quad \text{---------- (IV)}$$

$$= \text{Log } P/(1 - P) \quad \text{---------- (V)}$$

$$= \text{Log } P - \text{Log}(1 - P) \quad \text{---------- (VI)}$$

Turkey (1977) stated that logits are “first – aid bandages when working with counted fractions since, on balance, they allow us to bring out patterns in the data which may be observed when using proportions or percentages”. For this reason, logits are useful explanatory choices for data analysis with counted fractions of categorical variables.

In general, if L is the logit, the corresponding odds, O, is obtained as follows:

$$O = e^{L} \quad \text{---------- (VII)}$$

To obtain the corresponding proportion, P, we proceed as follows:

$$O = \frac{P}{1 - P}$$

It follows that

$$P = \frac{O}{1 + O} \quad \text{---------- (VIII)}$$

Substitute (VII) in (VIII), we obtain

$$P = \frac{e^{L}}{1 + e^{L}}$$

Finally, dividing both the numerator and denominator by e^L, we obtain the following logistic function:

$$P = \frac{I}{1 + e^L}$$

Logistic regression will be used to determine how the logarithm of the odds of willingness to pay for telephone services rather than not willing to pay varies with the values of the predictor variables (vector of socio-economic attributes). The logistic regression may be given in the additive or multiplicative form thus

i. Additive form =

$$\text{Log } P/(1 - P) = a + B_1X_1 + B_2X_2 \ldots\ldots\ldots B_nX_n$$

ii. Multiplication form

$$P/(1 - p) = \exp(a) \text{ X } \exp(B_1X_1) \text{ x } \exp(B_2X_2) (B_nX_n)$$

P is the willingness to pay (WTP); a is a constant; B_1, B_2 are coefficients and X_1,X_2 are predictor variables; log P/(I – P) is known as log of odds while P/(I – P) as odds.

3.5 Data Analysis

Objectives i, iii, iv and v were realized using descriptive statistics such as means, percentages, standard deviations, cross-tabulations and frequencies. Objective ii was realized using stochastic payment card and logit analysis. Stochastic payment card was used to measure the individual agro-based entrepreneur's valuation distribution, while the logit result determined

the variables that influenced the mean and standard variance of individual's valuation distribution.

Research hypothesis was tested using t-statistic. The variables included in the logit regression were:

P = 1 for willingness to pay for telephone services; O otherwise

X_1 = Gender 1 for male; 0 otherwise

X_2 = Age

X_3 = Household size

X_4 = Years of schooling

X_5 = Extension contact

X_6 = Annual farm income of household head

X_7 = Annual non-farm income of household head

X_8 = Farm size in hectares

X_9 = Access to Telephone, 1 for access 0 otherwise

X_{10} = Occupation: 1 if farming is major occupation; 0 otherwise

Thus, the logit model: Log $p/(I - p) = a + B_1X_1 + B_2X_2 + B3X_3 + B_4X_4$ ..... $B_{10}X_{10}$

CHAPTER FOUR

4.0 RESULTS

4.1 Socio-economic and Demographic Characteristics of Respondents

The variables considered include gender, age, marital status, head of household, education, occupation, annual number of contact with extension agents, annual farm and non-farm income. Others are sources of information, community justice systems, hectares of land cultivated and agro-based processing activities.

4.1.1 Gender of the Respondents

The respondents according to gender were classified into males and females and the results obtained are presented in table 2.

Table 2: Distribution of Respondents by Gender

Gender	Frequency	Percent
Male	130	60.2
Female	86	39.8
Total	216	100.00

Source: Field Survey, 2005

Table 2 shows that 60.2% of the respondents were males while 39.8% were females.

4.1.2 Age of the Respondents

Respondents were categorized using age range expressed in years. The results obtained are presented in table 3.

Table 3: Distribution of Respondents by Age

Age	Frequency	Percent
Below 20 years	9	4.2
20 – 30 years	69	31.9
31 – 40 years	71	32.9
41 – 50 years	46	21.3
51 and above	21	9.7
Total	216	100.00

Source: Field Survey, 2005

Respondents in the age bracket of 31 – 40 years had the highest frequency with 32.9% while those below 20 years had the least frequency with 4.2%. Those in the age bracket of 20 – 30 years had 31.9%. Other respondents in the age bracket of 41 – 50 years had 21.3% while 51 years and above had 9.7%.

4.1.3 Marital Status and Household Head

The analysis of the marital status considered the percentage of the respondents that were either married, single, widowed or divorced. Similarly, household heads were classified into father, mother, eldest child and others. The results obtained are presented in table 4.

Table 4: Distribution of Respondents by Marital Status and Household Head

Marital status	Frequency	Percent	Household head	Frequency	Percent
Married	129	59.7	Father	136	63.0
Single	70	32.4	Mother	21	9.7
Widowed	11	5.1	Eldest child	17	7.9
Divorced	6	2.8	Others	42	19.4
Total	216	100.0		216	100.0

Source: Field Survey, 2005

The married respondents were the majority with 59.7% while divorced had the least with 2.8%. Single and widowed had 32.4% and 5.1% respectively. About 63.0% of head of the households was the father while others comprising uncles and in-laws had 19.4%. Mother and the eldest child had 9.7% and 7.9% respectively.

4.1.4 Household Size

The analysis of household size was by persons living together. Results obtained are contained in table 5.

Table 5: Distribution of Respondents by Household Size

Size (persons)	Frequency	Percent
1 –5	60	27.7
6 – 10	138	63.8
11 –15	14	6.6
16 – 20	4	1.9
Total	216	100.0

Source: Field Survey, 2005

Household size of 1 – 5 persons had 27.7% and those with 6 – 10 persons represented 63.8%. Household sized of 11 – 15 persons and 16 – 20 persons had 6.6% and 1.9% respectively.

4.1.5 Religion

The respondents were classified as either Christians, Moslem or traditionalists. The results obtained are presented in table 6.

Table 6: Distribution of Respondents by Religion

Religion	Frequency	Percent
Christianity	197	91.2
Islam	6	2.8
Traditional	13	6.0
Total	216	100.0

Source: Field Survey, 2005

This show that 91.2% of the respondents were Christians, 2.8% were Moslems while 6% were traditionalists. The result shows that the respondents were predominantly Christians.

4.1.6 Primary Occupation

The respondents were found to be engaged in various occupations. These included farming, agro-based processing, civil service and others. Results obtained are presented in table 7.

Table 7: Distribution of Respondents by Primary Occupation

Occupation	Frequency	Percent
Farming	116	55.0
Agro-based processing	14	7.0
Civil service	65	30.0
Others (e.g. petty trading)	17	8.0
Total	212	100.0

Source: Field Survey, 2005

Farming had 55.0% of the respondents while civil service had 30.0%. Agro-based processing and others had 7.0% and 8.0% respectively. Food crops like rice, yam, cassava, maize, okra and others were the main farm products of southeast Nigeria.

4.1.7 Years of Schooling

Years of schooling refers to the number of years spent to acquire formal education. Results obtained are shown in table 8.

Table 8: Distribution of Respondents by Years of Schooling

Years	Frequency	Percent
< 1	12	5.6
1 – 6	47	21.8
7 – 13	65	30.0
14 and above	92	42.6
Total	216	100.0

Source: Field Survey, 2005.

Respondent who did not have any formal education had 5.6%. Those that spent 1 – 6 years and 7 – 13 years in school had 21.8% and 30% respectively. Others that spent 14 years and above had 42.6%.

4.1.8 Annual Number of contact with Extension Agents.

Annual number of contact with extension agents refers to the annual number of times the farmers/entrepreneurs met with agricultural officers to receive agricultural information from them. Results obtained are presented in table 9

Table 9: Distribution of Respondents by Annual Number of Contact with Extension Agents

Contact	Frequency	Percent
0	77	35.7
1 – 5	21	9.7
6 – 10	34	15.7
11 – 15	35	16.2
Above 15	49	22.7
Total	216	100.0

Source: Field Survey, 2005

Respondents who had no contact with extension agents represented 35.7% while those that had 1 – 5 contact represented 9.7%. Respondents that had 6 – 10 and 11 – 15 contacts were represented by 15.7% and 16.2% respectively. Also those that had above 15 contacts scored 22.7%.

4.1.9 Annual Farm Income of Household Heads

This refers to the yearly revenue generated from the sales of farm produce or farm services offered and paid for. The annual farm income of the respondents were expressed in naira (₦). Results obtained are presented in table 10.

Table 10: Distribution of Respondents by Annual Farm Income of Household Heads

Income (₦)	Frequency	Percent
Less than 30000	84	38.9
31000 – 60000	49	22.6
61000 – 90000	26	12.0
91000 – 120000	27	12.5
121000 – 150000	29	13.5
Above 150000	1	0.5
Total	216	100.0

Source: Field Survey, 2005.

Respondents who made less than ₦30000 were the majority with 38.9% while those making above ₦150000 were the least with 0.5%. Others in the income brackets of ₦31000 – ₦60000, ₦61000 – ₦90000, ₦91000 – ₦120000 and ₦121000 – ₦150000 represented 22.6%, 12%, 12.5% and 13.5% respectively.

4.1.10 Annual Non-farm Income of Household Heads

This refers to revenue earned from non-farm sources like civil service, trading, public service etc. The respondents were classified according to their income bracket expressed in naria (₦). The results obtained are presented in table 11.

Table 11: Distribution of Respondents by Annual Non-farm Income of Household Heads

Income (₦)	Frequency	Percent
Less than 50000	47	21.8
51000 – 100000	72	33.3
101000 – 150000	26	12.0
151000 – 200000	12	5.6
201000 – 250000	3	1.4
Above 250000	56	25.9
Total	216	100.0

Source: Field Survey, 2005

About 25.9% of the respondents earned above ₦250000 while 21.8% earned less than ₦50000. Those in the income brackets of ₦51000 – ₦100000, ₦101000 – ₦150000 and ₦151000 – ₦ 20000 had 33.3%, 12.0% and 5.6% respectively. The rest in the income bracket of ₦201000 – ₦250000 had 1.4%.

4.1.11 Sources of Information

The various sources of information on agricultural technology and poverty reduction programme that the respondents received include telephone, town crier, radio, television, print media and others. The results obtained are shown in table 12.

Table 12: Distribution of Respondents by Sources of Information on Agricultural Technology Transfer and Poverty Reduction Programmes.

Sources	Frequency
Telephone	106
Town crier	157
Radio	171
Television	108
Print media	32
Other (internet)	20
Total	594*

Source: Field Survey, 2005

* Multiple Responses

Radio was the highest source of information on agricultural technology transfer and poverty reduction programmes and was represented by 171 respondents. While town crier was represented by 157 respondents. Other sources like telephone, television and print media were represented by 106, 108 and 32 respondents respectively.

4.1.12 Community Justice Systems

Community justice systems were classified according to the type of court of law through which the rural people obtained justice in legal matters. These include traditional, customary, high courts and others Table 13 shows the results obtained.

Table 13: Distribution of Respondents by the Type of Justice Systems used for Settling Disputes.

Justice systems	Frequency
Traditional court	137
Customary court	136
High court	70
Others	5
Total	348*

Source: Field Survey, 2005

* Multiple Responses

Respondents who got justice through traditional courts scored 137 while through customary courts scored 136. The high court and others were represented 70 and 5 respondents respectively.

4.1.13 Hectares of Land Owned and Cultivated Previous Cropping Season

Responses on hectares of land owned and cultivated Previous cropping season were as classified (table 14).

Table 14: Distribution of Respondents by Hectares of Land Owned and Cultivated Previous Cropping Season

Hectare (Ha)	Ownership frequency	Percent	Cultivation	Percent
Less than 1	91	42.2	113	52.6
1 – 2	51	23.6	60	27.8
2.1 –3	31	14.4	21	9.8
3.1 – 4	12	5.5	8	3.7
Above 4	31	14.3	13	6.1
Total	216	100.0	215	100.0

Source: Field Survey, 2005

Respondents who owned less than 1 Ha of land were represented by 42.2% while 1 – 2 Ha, 3.1 – 4Ha and above 4Ha of land represented 14.4%, 5.5% and 14.3 respectively. Moreover, respondents who cultivated less than 1 Ha previous cropping season had 52.6% while 1 – 2 Ha was cultivated by 27.8%. Also, 2.1 – 3 Ha, 3.1 – 4 Ha and above 4 Ha were cultivated by 9.8%, 3.7% and 6.1% respectively.

4.1.14 Rural Non-farm Activities

The non-farm productive activities performed by the people include processing of cassava into garri, palm wine tapping, weaving of baskets/mats, and others as contained in table 15.

Table 15: Distribution of Respondents by Rural Non-farm Activities

Activities	Frequency	Percent
Processing of cassava into garri	170	85.4
Palm wine tapping	12	6.0
Weaving of baskets/mats	6	3.0
Other (e.g. blacksmithing)	11	5.6
Total	199	100.0

Source: Field Survey, 2005

Processing of cassava into garri was the highest rural non-farm economic activity performed with 85.4%. Palm wine tapping had 6%, weaving of baskets/mats had 3% while others had 5.6%. Others included blacksmithing, hair dressing, and tailoring.

4.2 Willingness to Pay (WTP) for Telephone Services

In assessing willingness to pay we considered access to telephone services, choice of telephone services provider and mean amount willing to pay per minute of national calls.

4.2.1 Access to Telephone Services

Respondents were classified based on their access to telephone services.

Table 16: Distribution of Respondents by Access to Telephone Services

Response	Frequency	Percent
Access	38	17.7
No access	177	82.3
Total	215	100.0

Source: Field Survey, 2005

This reveals that 17.7% of the respondents had access to telephone services while 82.3% had no access to telephone services. Access here means having telephone services in the area while no access means not been served with telephone services.

4.2.2 Choice of Telephone Service Provider

The analysis on the choice of telephone service provider was according to telephone types. These include landline, mobile and a combination of the two. Results obtained are shown in table 17.

Table 17: Distribution of Respondents by Telephone Types

Telephone Type	Frequency	Percent
Landline	16	8.3
Mobile	115	59.2
Land line and Mobile	63	32.5
Total	194	100.0

Source: Field Survey, 2005

Respondents who preferred to communicate with landline phone were represented by 8.3% while those that preferred mobile phones were represented by 59.2%. About 32.5% of the respondents preferred to communicate using both landline and mobile phones.

4.2.3 Mean Amount Willing to Pay (WTP) Per Minute of National Calls

Respondents mean amount willing to pay per minute of national calls were classified using mean range. Results obtained are presented in table 18.

Table 18: Distribution of Respondents by Mean Amount Willing to Pay Per Minute of National Calls.

Amount (₦)	Frequency	Percent
5 - 10	52	24.1
11 – 20	113	51.5
21 – 30	44	21.1
31 – 40	7	3.3
Total	216	100.0

Source: Field Survey, 2005

Table 18 shows that respondents willing to pay ₦5 – ₦10 accounted for 24.1% while ₦11 – ₦20 accounted for 51.5%. others willing to pay ₦21 – ₦30 and ₦31 – ₦40 represented 21.1% and 3.3% respectively. Moreover, appendix A shows that the respondents' minimum and maximum mean

amounts willing to pay per minute of national calls were about ₦7 and ₦38 respectively with a standard deviation of 6.5179.

4.3 Perceive Impact of Telephone Service on Agricultural and Rural Economic Activities.

The various ways in which telephone services help the farmers and others, roles of telephone services on agricultural technology transfer and problems of agricultural technology transfer using telephone were sought and analyzed.

4.3.1 Ways in which Telephone Services help the Farmers and Others

Responses on the various ways were analyzed using a four point likert scale. The cut-off mark was taken as 2.5 of mean to determine the acceptance or rejection of any response. Results obtained are presented in table 19.

Table 19: Likert Scale Analysis of the Importance of Telephone Services.

Issues/benefits	SA 4	A 3	DA 2	DK 1	N	$\overline{X}$	SD	Remark
To contact relatives both at home and overseas	149	67	-	-	216	3.88	2.78	Accept
To overcome delay in business	112	91	6	7	216	3.43	0.70	Accept
Help the extension agents contact their farmer clientele	66	97	26	27	216	2.98	1.10	Accept
Help farmers negotiate higher prices with resulting higher revenues	59	104	36	17	216	2.95	0.87	Accept
Help the farmers to gain knowledge of he market situation before the delivery of their products to the city	97	96	8	15	216	3.46	2.87	Accept
Help in transport/travel substitution	120	82	3	11	216	3.44	0.76	Accept
Enhance contact with medical personnel in health emergencies	71	87	48	10	216	3.20	2.92	Accept

Legends:

SA = Strong Agree

A = Agree

DA = Don't Agree

DK = Don't know

N = Sample size

$\overline{X}$ = mean

SD = Standard Deviation

Analysis of table 19 reveals that telephone services was perceived to be important in contacting relatives both at home and overseas as it had a mean of 3.88. The same opinions were expressed on helping the people to gain knowledge of the market situation before the delivery of their products to the city, helping in transport/travel substitution leading to saving of time and cost of transportation and overcoming delay in business. The issues had means of 3.46, 3.44 and 3.43 respectively. Also enhancing contact with medical personnel in health emergencies had a mean of 3.20. Helping the extension agents contact their farmer clientele and helping farmers negotiate higher prices resulting to higher revenues had significant scores of 2.98 and 2.95 respectively.

4.3.2 Potential Roles of Telephone Services on Agricultural Technology Transfer

Analysis of the roles of telephone services on agricultural technology transfer was based on some issues. These and the obtained results are contained in table 20.

Table 20: Distribution of Extension Agents by the Roles of Telephone Services on Agricultural Technology Transfer

	Issue	Frequency
i.	Farmers' problems are solved because of question-and-answer services	36
ii.	Information on latest packages of agricultural technology	99
iii.	Information on weather forecasting	70
iv.	Early warning and management of pests and diseases	94
	Total	299*

Source; Field Survey, 2005.

* Multiple Responses

Extension agents' responses reveal that information on latest packages of agricultural technology and early warning and management of pests and diseases were 99 and 94 respectively. Moreover, farmers' problems are solved because of question-and-answer service scored 36 while information on weather forecasting scored 70.

4.3.3 Perceived Problems of Agricultural Technology Transfer using Telephone

Responses on the problems of agricultural technology transfer using telephone were analyzed on a four point likert scale. A mean of 2.5 was taken

as the cut-off mark and this helped in ranking the problems. Results obtained are shown in Table 21.

Table 21: Likert Scale Analysis of the Perceived Problems of Agricultural Technology Transfer Using Telephone.

Issues/benefits	SA	A	DA	DK			Remark
	4	3	2	1	$\overline{X}$	SD	
Limiting practical demonstration of technology	48	9	2	1	3.7	0.61	1
No reliable communication network in the rural areas.	41	15	4	-	3.6	0.60	2
Many farmers cannot be communicated to at the same time	36	18	6	-	3.5	0.68	3
Telephone cost increases cost of production	24	32	1	3	3.2	0.74	4
Under utilization of telephone because of poor power supply for recharging batteries.	26	17	10	7	3.0	1.04	5
High cost of telephone tariff	11	28	15	6	2.7	0.88	6

Source: Field survey, 2005.

Major problems perceived by the farmers militating against agricultural technology transfer using telephone were identified to include limiting practical demonstration of technology, no reliable communication network in rural areas and inability to communicate with many farmers at the same time. These were represented by means of 3.7, 3.6 and 3.5 respectively. Identified minor problems include increased cost of production, under utilization of

telephone because of poor power supply to recharge batteries and high cost of telephone tariff represented by means of 3.2, 3.0 and 2.7 respectively.

4.4 Effects of Telephone on Rural Poverty Reduction

Respondents' assessment of effects of telephone on rural poverty reduction was done using a four point likert scale analysis. A mean of 2.50 was taken as the cut-off mark. Results obtained are presented in table 22.

Table 22: Analysis of Effects of Telephone on Rural Poverty Reduction

Issues/benefits	SA 4	A 3	DA 2	DK 1	N	$\overline{X}$	SD	Remark
Cost saving as transport/travel substitution	123	77	9	7	216	3.46	0.73	Accept
Rural telephony will provide communication infrastructure	107	94	7	8	216	3.38	0.73	Accept
Telephone services provide employment opportunity for the jobless youths	101	97	8	18	216	3.33	0.76	Accept
Enhance profitability by overcoming business delays	112	80	11	13	216	3.32	0.86	Accept
Enhance social status	70	88	49	9	216	3.02	0.85	Accept

Source: Field Survey, 2005

This shows that cost saving as transport/travel substitution had a mean of 3.46 while rural telephony which provides communication infrastructure also had a mean of 3.38. It equally shows that provision of employment

opportunity for the jobless had a mean of 3.33, enhancing profitability by overcoming business delay had a mean of 3.32 while enhancing social status had a mean of 3.02.

4.5 Cost of Procuring the Handset and line, and Possible Cost Adjustment of Rural Telephone Services.

The analysis was based on the price range of different handsets, available lines in the market, amount willing to be spent in a week on calls and possible cost adjustment.

4.5.1 Price Range of Different Handsets

Respondents who preferred mobile phones were categorized by the price range of different handsets of their choice. Results obtained are presented in table 23.

Table 23: Distribution of Price Range of Different Telephone Handsets Respondents were Willing to Pay for.

Price Range (₦)	Frequency	Percent
< 5000	20	17.4
5000 – 10000	53	46.1
11000 – 16000	26	22.6
17000 – 22000	6	5.2
23000 – 28000	7	6.1
> 28000	3	2.6
Total	115	100.0

Source: Field Survey, 2005

Respondents who were willing to pay less than ₦5000 represented 17.4%. Also respondents that were willing to pay between ₦5000 – ₦10000, ₦11000 – ₦16000, and ₦17000 – ₦22000 represented 46.1%, 22.6% and 5.2% respectively. Those willing to pay between ₦23000 – ₦28000 and more than ₦28000 were 6.1% and 2.6% respectively.

4.5.2 Available Lines in the Market

Analysis of the respondents was based on their willingness to purchase any of the available lines. Results obtained are presented in table 24.

Table 24: Distribution of the Available Lines Respondents were Willing to Pay for.

Lines	Amount (₦)	Frequency
M-Tel sim Pack	2500	24
MTN Sim Pack	980	113
GLO Sim Pack	850	99
V-Mobile Sim Pack	1000	20
Total		256*

Source: Field Survey, 2005

* Multiple Responses

This indicates that people who may be willing to purchase M-Tel and MTN Sim Packs were 24 and 113 respectively. Also, those willing to purchase GLO and V-mobile Sim Packs were 99 and 20 respectively.

4.5.3 Amount Willing to be Spent in a Week on Calls

Respondents were classified by the amount range they were willing to spend on calls weekly (table 25).

Table 25: Distribution of Respondents by the Amounts they were Willing to Spend in a Week on Calls.

Amount (₦)	Frequency	Percent
Less than 100	32	14.8
100 – 500	152	70.4
501 – 1000	24	11.1
Above 1000	8	3.7
Total	216	100.0

Source: Field Survey, 2005

Table 25 shows that 14.8% of the people were willing to spend less than ₦100, 70.4% were willing to spend between ₦100 – ₦500 on calls weekly. About 11.1% of them were willing to spend between ₦501 – ₦1000 while only 3.7% of the people were willing to spend above ₦1000 on calls weekly.

4.5.4 Preferred Possible Cost Adjustment on Handsets and Lines.

Classification of respondents was by their choice on cost adjustment on handsets and communication network lines. Results obtained are presented in tables 26 and 27.

Table 26: Distribution of Respondents by Preferred Possible Cost Adjustment on Handsets.

Cost of handsets (₦)	Adjusted cost (₦)	Frequency	Percent
5000 – 10000	2000 – 7000	115	53.2
11000 – 16000	8000 – 13000	70	32.5
17000 – 22000	14000 – 19000	14	6.5
23000 – 28000	20000 – 25000	10	4.5
29000 – 34000	26000 – 31000	7	3.3
Total		216	100.0

Source: Field Survey, 2005

Respondents who indicated interest in low-cost handsets of ₦5000 – ₦10000 to be sold for ₦2000 – ₦7000 and ₦11000 – ₦16000 to be sold for ₦8000 – ₦13000 scored 53.2% and 32.5% respectively. Those that were interested in handsets of ₦17000 – ₦22000 going for ₦14000 – ₦19000, ₦23000 – ₦28000 going for ₦20000 – ₦25000 and ₦29000 – 34000 adjusted to ₦26000 – ₦31000 scored 6.5%, 4.5% and 3.3% respectively.

Table 27: Distribution of Respondents by Possible Cost Adjustment on Communication Network Lines

Cost of lines (₦)		Adjusted costs (₦)	Frequency	Percent
M-Tel Sim Pack	2500	400	35	16.2
MTN Sim pack	980	250	92	42.6
GLO Sim Pack	850	200	70	32.4
V.Mobile Sim Pack	1000	300	19	8.8
Total			216	100.00

Source: Field Survey, 2005

Respondents who opted that M-Tel sim Pack of ₦2500 be sold for ₦400 represented 16.2% while MTN Sim Pack of ₦980 going for ₦250 scored 42.6%. Also the GLO Sim Pack of ₦850 be sold for ₦200 represented 32.4% while V-mobile Sim Pack of ₦1000 going for ₦3000 scored 8.8%.

4.6 Cross-tabulations

The following variables: gender, age, household size, years of schooling, annual farm income, farm size cultivated and access to telephone were cross-tabulated with the mean amount willing to pay.

Table 28: Cross-tabulation Result Relating Gender with Mean Amount Willing to Pay

Amount Willing to Pay (₦)	Gender		Total
	Male	Female	
6 – 10	24(58.54)	17(41.46)	41(100.00)
11 – 15	24(60.00)	16(40.00)	40(100.00)
16 – 20	29(53.70)	25(46.30)	54(100.00)
21 – 25	30(65.22)	16(34.78)	46(100.00)
26 – 30	18(69.23)	8(30.77)	26(100.00)
31 – 35	3(75.00)	1(25.00)	4(100.00)
36 – 40	4(80.00)	1(20.00)	5(100.00)

Numbers In parentheses are the percentages

Table 28 shows that 58.54% of males and 41.46% of females were willing to pay between ₦6 – ₦10. About 80% of males and 20% of females out of 5 respondents were willing to pay between ₦36 – ₦40. This indicates that males were more willing to pay for telephone services than females.

Table 29: Cross-tabulation Result Relating Age with Mean Amount Willing to Pay.

Amount willing to pay (₦)	Age range					Total
	< 20	20 – 30	31-40	41-50	51 & above	
6 – 10	-	11(28.20)	17(43.58)	7(17.95)	4(10.27)	39(100.00)
11 – 15	1(2.56)	16(41.05)	14(35.88)	6(15.38)	2(5.13)	39(100.00)
16 – 20	5(8.77)	16(28.07)	16(28.07)	16(28.07)	4(7.02)	57(100.00)
21 – 25	3(6.52)	18(39.13)	10(21.74)	9(19.57)	6(13.04)	46(100.00)
26 – 30	-	5(19.24)	13(50.00)	4(15.38)	4(15.38)	26(100.00)
31 – 35	-	1(25.00)	2(50.00)	1(25.00)	-	4(100.00)
36 – 40	-	1(20.00)	2(40.00)	1(20.00)	1(20.00)	5(100.00)

Numbers in parentheses are the percentages

Table 29 indicates that 28.20%, 43.58%, 17.95% and 10.27% of respondents in the age range of 20 – 30 years, 31 – 40 years, 41 – 50 years and 51 years and above respectively were willing to pay between ₦6 – ₦10. Also 20%, 40%, 20% and 20% of them in the age brackets of 20 – 30 years, 31 – 40 years, 41 – 50 years and 51 years and above respectively were willing to pay between ₦36 – ₦40 per minute of telephone services. Results show that younger people between the age of 20 – 40 years had higher willingness to pay than older people from 41 years and above.

Table 30: Cross-tabulation Result Relating Household Size with Mean Amount Willing to Pay

Amount willing to pay (₦)	Household Size				Total
	1 – 5	6 – 10	11 – 15	16 – 20	
6 – 10	11(26.83)	28(68.29)	2(4.88)	-	41(100.00)
11 – 15	14(35.00)	22(55.00)	4(10.00)	-	40(100.00)
16 – 20	15(27.77)	33(61.11)	3(5.56)	3(5.56)	54(100.00)
21 – 25	12(26.67)	28(62.22)	4(8.89)	1(2.22)	45(100.00)
26 – 30	6(22.22)	29(74.08)	1(3.70)	-	27(100.00)
31 – 35	1(25.00)	2(50.00)	1(25.00)	-	4(100.00)
36 – 40	1(20.00)	4(80.00)	-	-	5(100.00)

Numbers in parentheses are the percentages

Table 30 indicates that 26.83%, 68.29% and 4.88% of household sizes 1 – 5, 6 – 10 and 11 – 15 respectively were willing to pay between ₦6 – ₦10. Also 20% and 80% of household sizes of 1 – 5, 6 – 10 respectively were willing to pay between ₦36 – ₦40. This shows that household size of 6 – 10 persons had the highest willingness to pay for telephone services.

Table 31: Cross-tabulation Result Relating Number of Years of Schooling and Mean Amount Willing to Pay.

Amount willing to pay (₦)	Number of years of Schooling			Total
	1 – 6	7 – 13	14 & above	
6 – 10	6(15.00)	16(40.00)	18(45.00)	40(100.00)
11 – 15	6(15.38)	11(28.21)	22(56.41)	39(100.00)
16 – 20	15(26.79)	20(35.71)	21(37.50)	56(100.00)
21 – 25	9(20.00)	13(28.89)	23(51.11)	45(100.00)
26 – 30	6(25.00)	7(29.17)	11(45.83)	24(100.00)
31 – 35	-	2(28.57)	5(71.43)	7(100.00)
36 – 40	-	2(40.00)	3(60.00)	5(100.00)

Numbers in parentheses are the percentages.

This shows that respondents who spent 1 – 6 years, 7 – 13 years and 14 years and above in school represented 15%, 40% and 45% respectively were willing to pay between ₦6 – ₦10. Also, respondents who spent 7 – 13 years and 14 years and above represented 40% and 60% respectively were willing to pay between ₦36 – ₦40. This result (Table 31) implies that the higher the number of years spent in education the higher the amount willing to pay.

Table 32: Cross-tabulation Result Relating Annual Farm Income and Mean Amount Willing to Pay

Amount willing to pay (₦)	Annual Farm Income (₦)				Total
	Less than 30000	31000-60000	61000 – 90000	Above 90000	
6 – 10	10(24.39)	15(36.59)	9(21.95)	7(17.07)	41(100.00)
11 – 15	18(45.00)	13(32.50)	7(17.50)	2(5.00)	40(100.00)
16 – 20	22(40.74)	19(35.19)	6(11.11)	7(12.96)	54(100.00)
21 – 25	20(43.48)	15(32.61)	2(4.35)	9(19.56)	46(100.00)
26 – 30	7(26.92)	11(42.31)	5(19.23)	3(11.54)	26(100.00)
31 – 35	2(50.00)	2(50.00)	-	-	4(100.00)
36 – 40	1(20.00)	2(40.00)	1(20.00)	1(20.00)	5(100.00)

Numbers in parentheses are the percentages

Table 32 reveals that farmers who earned less than ₦30000, ₦31000 – ₦60000, ₦61000 – ₦90000 and above ₦90000 represented 24.39%, 36.59%, 21.95% and 17.07% respectively were willing to pay between ₦6 – ₦10. Also 20%, 40%, 20% and 20% of the same category of farmers were willing to pay ₦36 – ₦40. This result equally reveals that the farmers are low-income earners implying that willingness to pay decreases as the amount willing to pay increases.

Table 33: Cross-tabulation Result Relating Farm Size Cultivated and Mean Amount Willing to Pay

Amount willing to pay (₦)	Farm Size Cultivated (Ha)					Total
	Less than 1	1 – 2	2.1-3	3.1-4	Above 4	
6 – 10	26(65.00)	9(22.50)	4(10.00)	-	1(2.50)	40(100.00)
11 – 15	19(43.18)	11(25.00)	7(15.91)	2(4.55)	5(11.36)	44(100.00)
16 – 20	31(57.41)	15(27.78)	5(9.26)	2(3.70)	1(1.85)	54(100.00)
21 – 25	20(45.46)	16(36.36)	1(2.27)	4(9.09)	3(6.82)	44(100.00)
26 – 30	15(62.50)	5(20.83)	3(12.50)	1(4.17)	-	24(100.00)
31 – 35	2(50.00)	1(25.00)	-	1(25.00)	-	4(100.00)
36 – 40	3(60.00)	-	2(40.00)	-	-	5(100.00)

Number in parentheses are the percentages

Respondents who cultivated less than 1 Ha, 1 – 2 Ha, 2.1 – 3 Ha and above 4 Ha represented by 65%, 22.50%, 10% and 2.50% respectively were willing to pay ₦6 – ₦10. Also those who cultivated less than 1 Ha and 2.1 – 3 Ha represented by 60% and 40% respectively were willing to pay ₦36 – ₦40. This indicates that respondents who cultivated less than 1 Ha were more willing to pay than others.

Table 34: Cross-tabulation Result Relating Access to Telephone Services with Amount Willing to Pay

Amount willing to pay (₦)	Access	No access	Total
6 – 10	9(21.95)	82(78.05)	41(100.00)
11 – 15	3(7.50)	37(92.50)	40(100.00)
16 – 20	9(16.98)	44(83.02)	53(100.00)
21 – 25	11(23.91)	35(76.09)	46(100.00)
26 – 30	3(11.54)	23(88.46)	26(100.00)
31 – 35	1(25.00)	3(75.00)	4(100.00)
36 – 40	2(40.00)	3(60.00)	5(100.00)

Numbers in parentheses are percentages

Table 34 shows that of the 41 respondents that were willing to pay ₦6 – ₦10, 78.05% of them had no access while 21.95% had access to telephone services. Also of the 5 respondents willing to pay ₦36 – ₦40, 60% had no access while 40% had access. This result indicates that respondents who had not been served and had no access showed high WTP for telephone services. It therefore strengthens the need for extension of telephone services to rural areas of southeast Nigeria.

4.7 Effects of Socio-economic Characteristics of the Respondents on Willingness to Pay for Telephone Services Using Logit Result

In logit result, we are interested in the individual relationship between the dependent (dummy) and independent variables on one to one basis rather than the joint impact.

The variables considered here were gender, age household size, number of years of schooling, extension contact, annual farm income, annual non-farm income, farm size, access to telephone and occupation. Results obtained using logit result are presented in table 35.

Table 35: Logit Result of the Influence of some Socio-economic Variables on WTP

Explanatory variables	Coefficients	Standard error	t-statistic	Sig.t
Gender	.714**	.320	2.231	.026
Age	-.026*	.015	1.733	.096
Household Size	.042	.053	0.792	.424
Years of Schooling	0.089***	.031	2.871	.005
Extension Contact	-.032*	.018	-1.778	.074
Annual Farm Income	0.030	.022	1.364	.173
Annual Non-farm Income	-3.35E-06	9.88E-06	-0.34E-06	.734
Farm Size	-.116	.120	-0.967	.332
Access to Telephone	1.397***	.484	2.886	.004
Occupation	.290	.329	0.881	.378
Constant	-4.113	1.015	-4.052	.000
-2 log likelihood = 255.065				
Number of observations = 216				

***, **, *: significant at 1% 5% and 10% respectively.

Logit result shows that gender, age, years of schooling, extension contact and access to telephone were the significant independent variables.

Gender

Gender was significant at 5% and had a positive coefficient of 0.714. Being a dummy variable, it indicates that either male or female respondents were positively willing to pay for telephone services.

Age

The result indicates a negative but significant relationship between WTP for telephone services and age. This finding shows that, older respondents were less willing to pay for telephone services. This relationship was in line with a-priori expectation that older people tend to be conservative. They would wish the younger ones to call them and pay for the telephone services.

Years of schooling

Years of schooling were highly significant at 1% and had positive relationship with WTP. This result was in line with a-priori expectation in which increase in the years of schooling may increase WTP for telephone services.

Extension contact

The result shows that extension contact was significant at 10% but had a negative sign. This negative sign indicates a negative relationship with WTP. It therefore means that WTP for telephone services may reduce if contact between the extension agents and their clientele was increased.

Access to Telephone

Access to telephone was highly significant at 1% with a regression coefficient of 1.397. The coefficient had a positive sign indicating a positive relationship with WTP. The result implies that WTP increases as access to telephone services increases.

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socio-economic Characteristics of the Respondents and their Willingness to pay for Telephone Services.

In respect of gender 60.2% of the respondent were males. Table 28 shows that 58.54% of males and 41.46% of females were willing to pay between ₦6 – ₦10. About 80% of males and 20% of females were willing to pay between ₦36 – ₦40. This finding indicates that males had higher willingness to pay for telephone services than females. Table 35 shows that the marginal rate of change in willingness to pay (WTP) with respect to gender was 0.714 with a standard error of 0.320. It equally shows that gender had a positive relationship with WTP and was significant at 5%. The result obtained from this study re-affirmed earlier findings by Wang and Whittington (2001) that older respondents and women had lower WTP in their willingness to pay air quality study in Sofia, Bulgaria.

Table 29 shows that 31 – 40 years old respondents were most willing to pay for telephone services and that older people had lower willingness to pay. Age had regression coefficient of 0.026 with a standard error of 0.015. It had a negative sign and was significant at 10%. It tends to confirm the findings of Wang and Whittington (2001) in WTP study in Sofia that age had a significant and negative effect on the likelihood of voting for the air quality improvement plan.

Household size of 6 – 10 persons indicated the highest willingness to pay for telephone service as 68.29% and 80% of the respondents were willing to pay ₦6 – ₦10 and ₦36 – ₦40 respectively (Table 30). Table 34 show that a unit change in household size will change WTP for telephone services by 0.042 with a standard error of 0.053. This shows that increase in Household size increased willingness to pay to an extent.

Table 31 indicates that minimum education attainment of about 6 years was needed to enhance willingness to pay for telephone services. Also the marginal rate of change in WTP with respect to educational attainment was 0.089 with a standard error of 0.031. This had a positive sign and was highly significant at 1%. It reveals that the higher the number of years spent in school the higher the WTP. This was in agreement with the findings of Wang and Whittington (2001) in willingness to pay for air quality improvement in Sofia, Bulgaria, that household income and education of the respondents had significant effect on the likelihood of voting for air quality improvement plan with the expected positive signs.

Results of table 35 reveals that extension contact has a regression coefficient of -0.032 and a standard error of 0.018. It shows that extension contact had a negative sign and was significant at 10%. This indicates that willingness to pay for telephone services decreases as extension contact between agric officers and clientele increases.

Table 10 shows that majority of the respondents represented by 38.9% earned an annual farm income of about ₦30,000. This was an indication that they were low-income earners. Table 35 shows that the annual farm income has a coefficient of 0.030 and a standard error of 0.022. Although annual farm income was not significant result implies that willingness to pay for telephone services increases as farm income increases. This result was in line with the a-priori expectation stating that WTP increases as income increases. Wang and Whittington (2001) showed that respondents with higher household income had higher mean WTP's and larger variances.

About 52.6% of the respondents predominantly cultivated less than 1 hectare of land in the planting season (table 14). Result of table 35 indicates that farm size had a regression coefficient of -0.116 with a standard error of 0.120. It equally indicates a negative influence on willingness to pay but was not significant. This shows that the higher the farm size the lower the WTP which contradicts the a-priori expectation of the bigger the farm size the higher the WTP.

Up to 82.3% of the respondents had no access to telephone services. The marginal rate of change in willingness to pay with respect to access was 1.397 with a standard error of 0.484. Access to telephone service had positive effect on willingness to pay for telephone services and was highly significant

at 1%. This indicates that the more access people had to telephone services the higher their WTP for the services.

About 55% of the respondents were farmers. Occupation had a coefficient of 0.290 that was positively signed and a standard error of 0.329. This shows a positive relationship with willingness to pay for telephone services. This result was in line with the finding of Torero, et al., (2002) where the occupation of the head of household had a regression coefficient of 0.252 and a standard error of 0.327 in WTP for the local rural public telephone in Bangladesh.

Finally, appendix A indicates that the maximum, minimum and mean amounts the respondents were willing to pay per minute of national calls were ₦38, ₦7 and ₦17 respectively. This means that respondents can pay as low as ₦7 and as much as ₦38 per minute to enjoy telephone services if extended to the rural areas. This equally means that respondents can pay much more than their urban counterparts who only pay ₦15 – ₦20 per minute for telephone services.

5.2 Perceived Impact of Telephone Services on Agricultural and Rural Economic Activities.

Results revealed that respondents may gain knowledge of the market situation before the delivery of their products to the city. Contact between producers and shippers through telephone to arrange scheduling for delivery of their products to market can result in reduced spoilage (for example, of fish

and fresh fruits), more efficient processing and higher prices for produce. Producers such as farmers can compare prices in various markets, allowing them to get the highest prices for their produce. This may eliminate dependency on local middlemen and/or may modify their products (types of crops raised or fish caught) thereby responding to market demand.

They may contact one another both at home and overseas. Relative living in different states of the country or different countries of the world may easily be contacted for discussion on family and other issues without physically meeting face to face. Also, a medical personnel on call duty for instance may easily be accessed on telephone in case of emergency thereby saving the life of the patient in rural areas. Respondents through telephone can reach the extension agents in respect of appropriate agricultural technology, available least cost inputs, and better storage facilities.

5.3 Effect of Telephone Services on Rural Poverty Reduction

Telephone services offer travel/transport substitution consequently leading to savings in time and transportation cost as it had a mean of 3.46. This mean value was far higher than the cut-off mark mean of 2.5 used in determining acceptance or rejection of a stated effect. This implies that rural poverty would be reduced if the time saved was translated to monetary value and if the value of energy saved was estimated through reduced trips.

Provision of communication infrastructure for free flow of information had a mean of 3.38. This mean value indicates that rural poverty would be reduced when the people are empowered through universal access to free information flow. In effect, information technology access generates externalities that might dynamize the rural household, thus reducing poverty levels and increasing welfare (Torero, *et al.,* 2002).

Provision of employment opportunities for the jobless youths had a mean of 3.33. This mean value implies that rural poverty would be reduced through employment opportunities offered by telephone services for the jobless youths.

Enhancing profitability by overcoming business delay had a mean of 3.32. This mean value being higher than the cut-off mark of 2.5 indicates that the statement may be an effect of telephone services on rural poverty reduction. For instance, (Hudson, 1984) states that in the cook Island, two ways radio was used to arrange the itinerary of ships dispatched to pick up fruits. This was done so that crops already picked would not be overripe, thereby fetching much lower price. In Northern Canada, she also notes that Indian lake fishermen use radios to alert floatplane operators when their catch was ready to be flown to urban markets. In the past, pre-arranged flight were wasted if the catch was too small or the fish were no longer fresh.

Enhancing social status had a mean of 3.02 which was 0.52 higher than the cut-off of 2.5. This implies that telephone services reduce rural poverty by boosting individual's social status. There is usually self-ego associated with the possession of a handset and making of calls with a personal phone in the rural areas. No wonder Hudson (1992) states that the most important characteristics of telephone users was thirst for information. She cites examples from Northern Canada of village chief without formal education who may use the telephone to talk to other chiefs.

5.4 Cost of Procuring Handsets and Lines and Possible Cost Adjustment of Rural Telephone Services.

Handsets that are worth ₦5000 – ₦10000 had the highest frequency of possible use and scored 52.3% while those that worth ₦29000 – ₦34000 had the least frequency of possible use and scored 1.8%. These results show that majority of the people will go for handsets that are easily affordable to enhance access to telephone services.

MTN Sim pack that cost ₦980 had the highest frequency of possible use and scored 44.1% while V-mobile Sim Pack that cost ₦1000 had the least frequency of possible use and scored 7.8%. This indicates a higher preference for MTN with less cost than others in the study area.

It was shown that 70.4% of the people were willing to spend between ₦100 – ₦500 on calls weekly while only 3.7% were willing to spend above ₦1000 on calls weekly. This implies a steady patronage on those in telephone

business and a demonstration of high WTP for telephone services if extended to the rural areas even though they are low- income communities.

Result showed that respondents indicated interest in low-cost handsets of ₦5000 – ₦10000 to be sold for ₦2000 – ₦7000 and ₦11000 – ₦16000 to be sold for ₦8000 – ₦13000 scored 53.2% and 32.5% respectively. Those who opted that M-Tel Sim pack of ₦3500 be sold for ₦400 represented 16.2% while MTN Sim Pack of ₦980 going for ₦250 scored 42.6%. Also the GLO Sim Pack of ₦850 be sold for ₦200 represented 32.4% while V-mobile Sim Pack of ₦1000 going for ₦300 scored 8.8%. These results imply that the adjusted costs of handsets and lines would make them affordable as majority of the respondents may be willing to pay for personal handsets and lines thereby increasing their willingness to pay for telephone services.

5.5 Implications for Agricultural Technology Transfer and Poverty Reduction.

In Southeast Nigeria, about 90% of the rural people are poor. Extension of telephone services to the rural areas and its adoption will lead to agricultural technology transfer, increased food production, reduce poverty and contribute generally to achieving the Millennium Development Goals (MDGs). The goals include eradication of extreme poverty and hunger, achieve universal education, promote gender equality and empower women, improvement in maternal health and reduction of child mortality, combat

HIV/AIDs, malaria and other disease, ensure environmental sustainability and provision of employment opportunities.

First, it assists in the current strive by government to eradicate extreme poverty and hunger. The study finding shows that 35.7% of the farmers never had contact with extension agents. This communication gap was attributed to poor road network and other logistics. Adoption of telephone in the study area will keep the farmers abreast with information on the latest packages of agricultural technology, weather forecasting and management of pests and diseases. When knowledge was harnessed by these farmers, strategic planning can provide them with least cost inputs, better storage facilities and collective negotiation with buyers. This will make more food available to the people, increase the income of the rural producers, increase their agricultural productivity thereby reducing hunger and poverty.

Access to telephone in rural areas may help to achieve universal education. Result shows that about 5.6% of the respondents did not have formal education and this could be a barrier to the adoption of agricultural technologies. Agricultural education could be passed to the children of the rural farmers through the telephone by the extension officers who may be ill equipped to personally visit the farming households. When the children of these farmers are educated and become well informed of modern agricultural practices, they will help in convincing their illiterate parents to accept

agricultural technologies in order to achieve greater farm output and higher profit.

Rural telephone may promote gender equality and empower women. Studies have shown the existence of gender disparity and bias in agricultural extension contacts in favour of men. This affects agricultural technology transfer. Majority of the extension agents are males who naturally get inclined to male heads of agricultural household represented by 60.2%. Adoption of telephone will eliminate gender disparity as female farmers can easily call extension agents for necessary agricultural technology information.

Improvement in maternal health. In the four point likert scale analysis of the importance of telephone, result shows that contact with medical personnel in health emergencies had a mean of 3.20. Over 60% of the rural women farmers are in their reproductive state. They combine agriculture with child bearing. With telephone there would be increased maternal care and reduced rural maternal mortality ratio. Healthy mothers can go to the farm and produce thereby increasing income and productivity. Also Child mortality would be reduced with rural telephone services. The rural woman in her farm can call her home in order to know how the baby is faring. In case of any emergency she can call her family doctor for medical attention/treatment. Telephone adoption will help to reduce infant mortality rate and increase agricultural productivity.

Result shows that about 55% of the respondents had farming as the primary occupation. Some of them may be HIV positive, prone to malaria and other diseases. Telephone services may combat HIV/AIDS, malaria and other diseases. The greatest problems of the rural farmers is the problem of the killer diseases. In southeast Nigeria, there is high prevalence of malaria and other diseases like tuberculosis. A sick person in the rural area can still be productive by use of telephone to contact his/her medical personnel in the urban area. This will reduce high prevalence and death rates of farmers associated with malaria and tuberculosis by using effective prevention and treatment measures. People living with HIV/AIDS placed on antiretroviral drugs can still be productive farmers by contacting extension agents for necessary technology without physically meeting them.

Environmental sustainability could be ensured through rural telephony. This may be viewed in relation to agricultural right use of technology. Wrong use of the farmland by the farmers could cause environmental problems. Sustainable use of technology which could reduce erosion and flooding may be enhanced by farmers' contact with extension agents by the use of telephone. Result indicated that about 33% of the extension agent may pass information on latest packages of agricultural technology to their rural clientele. Also farmer can report any incidence of pest and disease, or a negative effect of new technology and get emergency advice.

Research finding indicates that telephone services provide employment opportunity for the jobless with a mean of 3.33. if rural jobless youths in southeast Nigeria may be in public pay phones and marketing of telephone accessories as in the urban area, it may reduce rural-urban drift. They may earn income which would affect their economic status positively.

Rural poverty would likely be reduced when the people are empowered through universal access to free information flow. In effect, information technology access generates positive externalities (as enumerated above) that may dynamize the rural households of southeast Nigeria, thus reducing poverty level and increasing welfare.

Rural telephony if achieved in southeast of Nigeria in particular and Nigeria in general may aid in achieving the Millennium Development goals as targeted by the National Economic Empowerment and Development Strategy (NEEDS).

CHAPTER SIX

6.0 SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 Summary

The study aimed at determining the willingness to pay for rural telephone services and the implications for agricultural technology transfer and poverty reduction in Southeast Nigeria. This was achieved by determining the socio-economic characteristics of the respondents and willingness of the rural people to pay for telephone services. It was equally achieved by finding out the perceived roles of telephone services on agricultural and rural economic activities, effects of telephone services on rural poverty reduction and determining the economic cost and possible cost adjustment of rural telephone services in the study area.

Results showed that 60.2% of the respondents were males and that males had higher willingness to pay than females. Majority were within the age bracket of 31 – 40 years. Up to 59.7% were married while 63% of them had father as the head of household. Household size of 6 – 10 persons indicated the highest willingness to pay for telephone services as 68.29% and 80% of the respondents were willing to pay ₦6 - ₦10 and ₦36 – ₦40 respectively. About 5.6% of the respondents had no formal education. Farming was the predominant occupation where majority made an annual farm income of about ₦30,000. About 52.6% of respondents cultivated less than one hectare of land while 35.7% of the farmers admitted not having

contact with extension agents. Cassava processing was the commonest rural non-farm activity with 85.4%, while radio was the major source of information gathering representing 28.8%. Community justice system was mainly through the traditional court with 39.4%.

Only about 17.7% of the respondents had access to telephone services while 59.2% had preference for mobile telephones. The maximum, minimum and mean amounts the respondents were willing to pay per minute were ₦38, ₦7 and ₦17 respectively. This means that respondents can pay as low as ₦7 and as much as ₦38 per minute to enjoy telephone services if extended to the rural areas. This implies that some respondents can pay much more than their urban counterparts who pay ₦20 per minute for telephone services on the average.

Respondents accepted that rural telephone, where available would help them to get information on latest packages on agricultural technology, early warning and management of diseases and pests, information on weather forecasting and that farmers' problems are solved because of question –and – answer services. The perceived problems of agricultural technology transfer, using telephone would include inability to communicate to many farmers at the same time, no reliable communication network in the rural areas, lack of practical demonstration of technology and increased cost of production.

Respondents affirmed and attested that telephone service reduces rural poverty as access to it generates externalities that dynamize the income

earning ability of the rural household thereby increasing their welfare. Rural poverty was indicated as reduced through travel/transport substitution consequently leading to savings in time and cost, provision of employment opportunities for the jobless youths, benefit of overcoming delay in business activities and enhancing social status.

Furthermore, results showed that respondents indicated interest in low-cost handsets of ₦2000 – ₦7000 and ₦8000 – ₦13000 that represented 53.2% and 32.5% respectively. About 42.6% and 16.2% of the respondents wanted MTN and M-Tel Sim pack costs to be reduced and sold at ₦250 and ₦400 respectively. About 32.4% and 8.8% of them equally wanted GLO and V-Mobile Sim Packs to be reduced and sold at ₦200 and ₦300 respectively.

Finally, the null hypothesis was tested using t-statistic. It was indicated that five socio-economic variables influenced WTP for telephone services. These were gender, age, years of schooling, extension contact and access to telephone.

6.2 Conclusion

The study has attempted to assess the effects of the availability of telephones on rural households, and then measured the households willingness to pay. The study has relied on a contingent valuation method and used a simple referendum method in a dictomous setting and stochastic payment card design to reveal the household willingness to pay.

This result may be of extreme importance for the design of projects to extend telephone to rural areas in Nigeria as an attempt to achieve universal access. It is important that telephone providers make use of WTP study in order to be properly guided concerning extending services to rural areas. The findings of this study have shown that extending telephone services to rural areas in Southeast Nigeria may not be an unprofitable venture, especially, if the tariff was related to what the people are willing to pay based on a WTP study.

Rural telecommunication was found to be vital in all attempts at rural development especially in relation to realizing the Millennium Development Goals (MDGs).

6.3 Recommendations

Based on the study the following recommendations were made:

1. Both the federal and state government should equip the agricultural officers especially the extension agents with modern communication technology to enhance their extension activity. This, if done will boost farmers productivity thereby raising them from low-income earners to high-income earners.
2. Private telecom providers and government agencies should extend telephone services to rural areas because of their high willingness to pay for the services. The tariff to be charged should be about ₦17 per

minute. This will make rural telephony a profitable venture for telecom providers as well as enhancing benefit and universal access of telephone services to the rural people.

3. Low-cost handsets and Sim Packs ranging from ₦2000 – ₦5000 and ₦200 – ₦400 respectively should be produced and made available in the market. This will make them affordable for the low-income rural people.
4. Regulatory agencies such as NCC should ensure that job specifications are met by private telecom providers in rural telephony to avoid regular network problems. This, if done will enhance the quality of network services in the rural areas.

6.4 Suggested Areas for Further Study

The following areas are suggested for further study

1. Cost of rural telephony and returns to telecom providers and users.
2. The way and manner rural telephony are provided and delivered to the people.
3. Determination of the quantity of telephone services being consumed in the study area.

REFERENCES

Bowker, J. and J. Stoll. 1988. "Use of Dichotomous Choice. Non-market Method to Value the Whooping Crane Resource". *American Journal of Agricultural Economics*. 70:372 – 81.

Bowman, W.M. 2002. Connecting Rural Communities: Lesson about Public Access from the American Experience. *Annual Conference and Workshop* Abuja, Nigeria.

Comeron, T. and M. James. 1987. Efficient Estimate Methods for Use with Closed Ended" Contingent Valuation Survey Data. *Review of Economics and Statistics* 69:267-27.

Chowdhury, S.K. 2002. Institutional and Welfare Aspects of the Provision and Use of Information and Communication Technology in the Rural Areas of Bangladesh and Peru. *Development Economics and Polices* Vol. 3.

Electronic Delivery of Agricultural Information to Rural Communities in Uganda 2001.

Foreit, K.G.F and J.R. Foreit. 2004. Willingness to Pay Surveys: For Setting Prices, For Reproductive Health Products and Services. A User's Manual. Revised 2004. The Population Council. Pp 1-26

Griffin, C.C. J. Briscoe, R. Singh, R. Ranasubban, and R. Bhatia. 1995. Contingent Valuation and Actual Behaviour. Predicting Connection to New Water System in the state of kerala, India. *The World Bank Economic Review* Vol. 9:(3) P. 373 – 396.

Guasch, L.J. and R.W. Hahn. 1999. The Costs and Benefits Regulation; Implications for Developing Countries. *The World Bank Research Observer* Vol. 14(1) p. 137 – 158.

Haab, Timoth, and Kenneth McConnell. 1997. A Simple Method for Bounding Willingness to Pay. Using a Probit or Logit Model. University of Maryland. College Park. Working paper.

Hardy, P. Andrew 1980. "The Role of Telephone in Economic Development". *Telecommunications Policy*. Vol. 4 No. 4 December p. 178 – 286.

Hudson, E. Heath 1984. When Telephone Reach the Village: The Role of Telecommunications in Rural Development. Norwood, N.J. Ablex.

Hudson, H. E. 1992. "Developing Countries' Communications: Overcoming the Barriers of Distance". Forhilick/Kent *Encydopedia of Tele-communications*. Vol. 4, p. 377 – 368.

Hudson, H.E. 1995. Economics and Social Benefits of Rural Telecommunication: A Report to the World Bank.

Mamman, A.B., J.O. Oyebanji and S.W. Peters. (eds) 2000. Nigeria: A People United, A Future Assured, Vol. 2. Survey of States. *Federal Ministry of Information,* Abuja.

Meera, Shack N., J. Amita, and D.U. M. Rac. 2004. Information and communication Technology in Agricultural Development: A comparative Analysis of three Projects from India. *Agricultural Research and Extension Network.* Network paper N. 135.

Mukherjee, C. H. White, and M. Wuyts. 1998. Econometrics and Data Analysis for Developing Countries. Routhedge, London.

Munasighe, M. 1993. Environmental Economics and Sustainable Development. World Bank Washington D.C.

National Research Council Board or Science and Technology for International Development 1990. Science and Technology's Information Services and Systems in Africa. National Academy Press, Washington D.C.

Organization for Economic Co-operation and Development 2003. Dev. Centre WP 229: Providing Low Cost ICT Access to Low-Income Communities in Developing Countries – What Works? What Pays?

Parker, Edwin B. H.E. Hudson, D.A. Dillman and A.D. Roscoe. 1989. Rural America in the Information age: *Telecommunications Policy for Rural Development.* Lanhan, M.D: University Press of America.

Pierce, William B. and N. Jequier. 1983. Telecommunications for Development. *International Telecommunication Union*, Geneva.

Saunders, R. J. Warford, and B. Wellenus. 1994. Telecommunications and Economic Development, 2nd Edition John Hopkins University Press, Baltimore.

Song, G. 2003. The Impact of Information and Communication Technology (ICTs) on Rural Households: A Holistic Approach Applied to the Case of LAO people's Democratic Republic. *Development Economics and Policy* Vol. 35.

Torero, M. and V. Galdo, 2000. Willingness to Pay for Rural Telephone Services. Mimeo, Grade, Lima.

Torero, M., S.K. Chowdhury, and V. Galdo. 2002. Willingness to Pay for the Rural Telephone Services in Bangladesh and Peru. *Discussion Papers on Development Policy.*

Umeh, C.C. 2000. Information and Communication Technology Revolution and the Challenge to Accountancy Profession in Nigeria in the 21st Century. *A paper presented to Institute of National Accountants of Nigeria Seminar*. Jos April 2000.

Vaughan, W.J., C.S. Russell, D.J. Rodriguez, and A.H. Darling. 1999. Willingness to Pay: Referendum Contingent Valuation and Uncertain Benefits. Sustainable Development Department Technical Papers Series, Inter-American Development Bank, Washington D.C.

Wang, H. and D. Whittington, 2001. Willingness to Pay for Air Quality Improvement in Sofia, Bulgaria. *World Bank Policy Research Paper.*

Wang, H. 1997a. Treatment of Don't-know Response in Contingent Valuation Surveys, a Random Valuation Model. *Journal of Environmental Economics and Management* 32, 219 – 232.

Wang, H. 1997b. Contingent Valuation of Environment Resource: A Stochastic Perspective, a Ph.D Dissertation, Department of Environmental Science and Engineering, School of Public Health, University of N. Carolina at Chapel Hill.

APPENDIX A

Table A1: Summary of Descriptive Statistics

	N	Minimum	Maximum	Mean	Standard deviation
Mean Amount Willing to Pay	216	6.27	38.37	17.4179	6.5179
Willingness to Pay	216	.00	1.00	.4444	.4981
Gender	216	.00	1.00	.602037	.4907
Age	216	20.00	60.00	7.1620	10.2451
Household Size	216	2.00	20.00	11.6019	2.9722
Years of Schooling	216	.00	25.00	12.8056	5.3915
Extension Contact	216	.00	104.00	37853.491	18.6799
Annual Farm Income	216	.00	100600.00	102706.02	30671.0884
Annual Non-farm Income	216	.00	340000.00	1.6698	75624.5431
Farm Size	215	.00	6.00	.8233	1.3177
Access to Telephone	215	.00	1.00	.4528	.3823
Occupation	212	.00	1.00	51.0244	.4989
Standard Variance	216	34.15	84.02		6.7353

APPENDIX B

DEPARTMENT OF AGRIC ECONOMICS, MANAGEMENT AND EXTENSION FACULTY OF AGRICULTURE AND NATURAL RESOURCES MANAGEMENT EBONYI STATE UNIVERSITY, ABAKALIKI.

Research Questionnaire:

Topic: Willingness to pay for Rural Telephone Services: Implications for Agricultural Technology Transfer and Poverty Reduction in Southeast Nigeria.

Tick (√) in the box where appropriate and list freely in others.

SECTION A

SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF THE PEOPLE IN THE STUDY AREA

1. Sex (a) Male ☐ (b) Female ☐
2. Age (a) Below 20 years ☐ (b) 21 – 30 years ☐
   (c) 31 – 40years ☐ (d) 41 – 50 years ☐ (e) 51 and above ☐
3. Marital status (a) Married ☐ (b) Single ☐ (c) Widowed ☐
   (d) Divorced ☐
4. Who is the head of your household?
   (a) Father ☐ (b) Mother ☐ (c) Eldest child ☐
   (d) Others (specify) ……
5. What is the size of your household? ……
6. How many years did you spend in formal education? ……
7. Religion: (a) Christianity ☐ (b) Islam ☐ (c) tradition ☐

8. What is your primary occupation?

(a) Farming ☐ (b) Agro-based processing ☐

(c) Civil service ☐ (d) Others (specify) .....

9. Which of these crops do you do you produce? Tick freely

(a) Rice ☐ (b) Yam ☐ (c) Cassava ☐ (d) Maize ☐

(e) Okra ☐ (f) Others (specify) .....

10. What is your annual number of contact with Extension Agents?

.....

11. Can you estimate your annual income from farming?

(a) Less than ₦30000 ☐ (b) ₦31000 – ₦60000 ☐

(c) ₦61000 – ₦90000 ☐ (d) ₦91000– ₦150000 (specify) .....

12. What is your annual non-farm income? .....

13. Tick any sources of information in your locality

(a) Telephone ☐ (b) Town crier ☐ (c) Radio ☐

(d) Television ☐ (e) Print media ☐

(f) Others (specify) .....

14. What are the community justice systems in your area? Tick freely

(a) Traditional court ☐ (b) Customary court ☐

(c) High court ☐ (d) Others (specify) .....

15. How many hectares of land do you own?

(a) Below 1 hectare ☐ (b) 1 – 2 hectares ☐

(c) 2.1 – 3 hectares ☐ (d) 3.1 – 4 hectares ☐

(e) Above 5 hectares (specify) .....

16. How many hectares did you cultivate last cropping season?

(a) Below 1 hectare ☐ (b) 1 – 2 hectares ☐

(c) 2.1 – 3 hectares ☐ (d) 3.1 – 4 hectares ☐

(e) Above 5 hectares (specify) .....

17. Which of these rural non-farm activities do you undertake?

(a) Processing of cassava into garri ☐ (b) Palm wine tapping ☐

(c) Weaving of baskets/mats ☐ (d) Others (specify) .....

SECTION B

DETERMINING THE LEVEL OF WILLINGNESS OF THE PEOPLE TO PAY FOR TELEPHONE SERVICES

1. Are you aware of the different modern communication systems available? (a)Yes ☐ (b) No ☐
2. What is your level of desire to have them?

   (a) Low ☐ (b) High ☐
3. Have your ever used telephone to communicate?

   (a) Yes ☐ (b) No ☐
4. If yes is the answer to Q.3 above, what type do you use? Tick freely

   (a) Landline phone ☐ (b) Mobile phone ☐

   (c) Radio message ☐
5. What type of telephone do you have? .....

6. Are you aware that telephone services help the farmers and other people in the following ways:

	Issue	Agree	Strongly agree	Don't agree	Don't agree
i.	To contact relatives both at home and overseas?				
ii.	To overcome delay in business?				
iii.	Help the extension system in re-orienting itself towards the overall agricultural development of small production system?				
iv.	May help framers negotiate higher price with resulting higher revenues?				
v.	May help the people to gain knowledge of the market situation before the delivering of their products to the city?				
vi.	Help in travel /transport substitution consequently leading to saving in time and reduction in cost?				
vii.	Enhance social status?				

7. How much are you willing to pay per minute for National calls?

.....

SECTION C

ASCERTAINING THE PERCEIVED IMPACT OF TELEPHONE SERVICE ON AGRICULTURAL TECHNOLOGY

1 Do you think that telephone service has affected the economic activities of your area? (a) Yes ☐ (b) No ☐

2. If the answer to Q.1 is Yes, how?

.....

.....

.....

3. Are you aware that telephone services have a positive impact on Agricultural technology transfer? (a) Yes ☐ (b) No ☐

4. If the answer to Q.3 is Yes, tick freely what you think are the roles on agricultural technology transfer?

(a) Farmers problems are solved because of question-and-answer services ☐

(b) Information on weather forecasting ☐

(c) Information on latest packages of technology ☐

(d) Early warning and management I of disease and pest. ☐

5. Tick freely the advantages of telephone to your locality

(a) Availability of information on prices of agricultural products ☐

(b) There is knowledge of the market situation before the delivery of the product to the city ☐

(c) Timely delivery of products to the market ☐

(d) Information service may help farmers negotiate higher prices with resulting higher revenues. ☐

(e) Contact with relatives both home and abroad. ☐

SECTION D

DETERMINING THE EFFECTS OF TELEPHONE SERVICE ON RURAL POVERTY REDUCTION

1. Are you into telephone business? (a) Yes ☐ (b) No ☐
2. If the answer to Q.1 is Yes, is it your own? (a) Yes ☐ (b) No ☐
3. How much are you paid if the business is not your own? .....
4. Do you know that telephone services reduce rural poverty?
   (a) Yes ☐ (b) No ☐
5. If the answer to Q.4 is Yes, then tick accordingly

	Issue	Agree	Strongly agree	Don't agree	Don't know
i.	That telephone services provide employment opportunity for the jobless.				
ii.	Provide communication infrastructure and network				
iii.	There is travel/transport substitution consequently leading to saving in time and reduction in costs.				
iv	There is benefit of overcoming delay in business activities				

SECTION E

DETERMINING THE COST OF PROCURING THE HANDSET AND LINE, AND POSSIBLE COST ADJUSTMENT OF RURAL TELEPHONE SERVICES.

1. The following are the price range of different handsets. Tick the one you will be willing to pay for

   (a) Less than ₦5000 ☐ (b) ₦5000 – ₦110000 ☐

   (c) ₦11000 – ₦16000 ☐ (d) ₦17000 – ₦22000 ☐

   (e) ₦23000 – ₦28000 ☐ (f) Above ₦28000 ☐

2. The following are the different lines available in the market. Tick freely the ones you will be willing to pay for

   (a) M-Tel Sim Pack ₦250 ☐ (b) MTN Sim Pack ₦980 ☐

   (c) GLO Sim Pack ₦850 ☐ (d) V-Mobile Sim Pack ₦1000 ☐

3. How much would you be willing to spend on making calls in a week?

   .....

4. What are your preferred possible cost adjustment on handset?

   (a) ₦2000 – ₦7000 ☐ (b) ₦8000 – ₦13000 ☐

   (c) ₦14000 – ₦19000 ☐ (d) ₦20000 – ₦25000 ☐

   (e) ₦26000 – ₦31000 ☐

5. What are your possible cost adjustment on communication network lines?

   (a) M-Tel Sim Pack ₦400 ☐ (b) MTN Sim Pack ₦250 ☐

   (c) Glo Sim Pack ₦ 200 ☐ (d) V-Mobile Sim Pack ₦300 ☐

SECTION F

FOR EXTENSION STAFF ONLY

1. Are you aware that telephone is important in transferring agricultural technology to farmers? (a) Yes ☐ (b) No ☐
2. If the answer to Q.1 is Yes, then tick freely the importance
   (a) Timely information and advice to farmers on problems ☐
   (b) Information on weather forecasting ☐
   (c) Latest packages of technologies ☐
   (d) Early warning and management of disease and pest
3. Are you aware that the number of contact with farmers improves their productivity? (a) Yes ☐ (b) No ☐
4. If the answer to Q.3 is yes, what is your number of contact with the farmers or agro-based entrepreneurs in your zone in a year?
   .....
5. How long have you been in the transfer of agricultural technology to farmers or agro-based entrepreneurs as an extension agent?
   .....
6. Do you use telephone in the course of your work as an extension officer? (a) Yes ☐ (b) No ☐
7. If yes is the answer to Q.6, could you list the agricultural technologies transferred to farmers using telephone?
   .....
   .....
8. If the answer to Q.6 is no, why? .....
   .....
   .....
9. Would you like to have a telephone for your work?
   (a) Yes ☐ (b) No ☐

10. What will be the problems of agricultural technology transfer in your area possibly using telephone?

    .....

11. How do you think that telephone can be used to fight against rural poverty? .....

    .....

    .....

SECTION G

HO: THERE IS NO SIGNIFICANT RELATIONSHIP BETWEEN WILLINGNESS TO PAY IN TERMS OF AMOUNT IN NAIRA AND SOCIO-ECONOMIC CHARACTERISTICS OF THE PEOPLE

STOCHASTIC PAYMENT CARD DESIGN

Price (₦)	Definitely Yes		Probably Yes		Not sure		Probably No		Definitely No	
0	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
10	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
15	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
20	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
25	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
30	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
35	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
40	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
45	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
50	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
55	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
60	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
65	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
70	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1

What would you be willing to pay per minute for universal access of telephone services? Tick against the option of the price of your willingness.