THE INFLUENCE OF INFORMATION AND COMMUNICATION TECHNOLOGY ON FARM INCOMES IN KATSINA STATE OF NIGERIA.

Adeolu B. Ayanwale

Department of Agricultural Economics, Obafemi Awolowo University, Ile-Ife, Nigeria. mail: aayanwa@yahoo.co.uk

and Adewale A. Adekunle

International Institute of Tropical Agriculture, Ibadan, Nigeria

ABSTRACT

Information is used increasingly in all aspects of human activity. The use of improved technologies is assisting in providing information in a timely manner. In spite of the fact that information has always been indispensable in political, economic and social development processes, the way that information is accessed and controlled is widely debated. The advent of the information and communication technologies (ICT) age has added another dimension to the debate. This study set out to examine the influence of Information and Communication Support for Agricultural Growth in Nigeria (ICS-Nigeria) project activities on the livelihood of farmers in the Katsina State of Nigeria. A multi-stage random sampling procedure was used to select 172 respondents made up of 85 participants and 87 non-participants in the programme. A qualitative method of analysis was used to analyse the data collected. Results suggest that participants become knowledgeable and thus adopt more improved farm practices. Consequently, they obtain more income than non-participant farmers, suggesting it will be useful to extend the frontiers of the programme to other rural farmers with a view to improving their livelihood generally.

KEY WORDS: Information and CommunicationTechnology, Rural/Agricultural Livelihood, Adoption, Farm Income, Rural Development Support Desk

INTRODUCTION

Information is used increasingly in all aspects of human activity. Many information technologies assist in providing data in a timely manner. Information is a collection of data that are relevant to a particular decision or problem. In fact, every aspect of farming operation depends on the successful collection, storage and application of information. Observed differences in farm decisions among farmers can be attributed to various factors such as differences in resources, levels of knowledge, environment and approaches to uncertainty, among others (Ma Corazon, Lawas & Luning, 1998). As agriculture is progressively being modernized, more and more of the managerial decisions of farmers are made within a cost-price-market context (Adesimi,1995), in

which case price and market information become very critical to vital farm management decisions.

In recent years, farmers in Nigeria are encouraged by the prevailing market-driven economic system to move from subsistence production towards commercial orientation. The commercialization of the economy has increased farmer's demand for information due to greater market instability and more complex production systems, among others (Patrick, Orhmam, Musser & Doster 1993).

Farming (large and small scale) relies on quality information for just about every operation on the farm. Information can be used by farmers to increase organizational efficiency; maintain competition; find new customers and keep current customers, as well as planning, organizing, leading and controlling farm operations. Farming business like many other profit-oriented firms should have good and timely market information requiring commodity sources, prices and markets. Those in the marketing sector should be in position to deliver products to consumers at a time, place and form that is acceptable.

In spite of the fact that information has always been indispensable in political, economic and social development processes, the way that information is accessed and controlled is widely debated (Odame, Hafkin, Wesseler & Boto, 2002). The advent of the information and communication technologies (ICT) has added another dimension to the debate.

The need to meet the information gap as well as encourage a higher level of adoption of relevant improved farm technologies inspired the establishment of the Information and Communication Support for Agricultural Growth in Nigeria Project (ICS-Nigeria). The main thrust of this study therefore is to examine the influence of ICTs on farmer income in Katsina State of Nigeria.

ICTs AND AGRICULTURAL DEVELOPMENT

The acronym ICT captures a multitude of equipment and services. These range from satellite communication systems, telephone booths in rural areas, the internet and electronic databases to e-commerce services via worldwide web. ICT is used to refer to the new technologies that have emerged from the integration of information technology (IT) and communication technology (CT).

ICT encompasses enormous variety of computer, telecommunication and network hardware and accompanying software. ICTs can be broadly interpreted as technologies that facilitate communication and processing and transmission of information by electronic means. This definition encompasses the full range of ICTs from radio and television to telephones (fixed and mobile), computers and the internet (CTA 2003). Heeks (1993) defines ICTs as electronic devices for capturing, processing, storing and communicating information. He categorized these devices into two: digital infor-

mation, held in ones and zeros comprising computer hardware, software and networks; and intermediate technology based largely on analogue information waves such as radio, television and telephones.

New ICTs are superior to the conventional method of communication, which sometimes requires the physical delivery of information from one place to another. Conventional communication methods can be painfully slow and costly. Earlier studies such as those by Baker (1992) and Batle et al (1990) showed that farmer age, educational level and farm size could affect farmer decision to use computer for farm business purposes.

Arokoyo(2000) noted that "a strong linkage complemented by flawless information flow enhanced by the effective use of information and communication technologies (ICTs) by the extension service, will significantly boost agricultural production and improve rural livelihoods in developing countries."

ICTs have a large potential in improving agricultural development and rural livelihood. For instance, ICTs enhance capacity to reach a large audience simultaneously via radio and TV. They could be effectively used for training and demonstration as well as manage information better through the use of databases for MIS and networking software. ICTs are useful for searching and packaging of information on demand and for exploring alternative production options and technologies. ICTs are useful for weather forecast and early warning systems for disease surveillance as well as for networking among and between key stakeholders. Furthermore, ICTS are useful for community mobilization among other uses.

ICS NIGERIA

The ICS-Nigeria project is a leading intervention strategy designed to enhance information flow to and from the agricultural sector, towards improving the livelihood of farm populations specifically and the rural people generally. Its goal is to improve food and livelihood security of rural farmers in Nigeria by facilitating access to information on food production, processing, marketing and rural enterprise development (IITA and NAERLS 2001).

The ICS-Nigeria aims to strengthen the capacity for farmer assistance organizations in Nigeria, by packaging and disseminating information to farmers in appropriate formats, thereby enhancing information flow. ICS-Nigeria has established pilot, multipurpose community information access points with basic ICT infrastructure and capacity that contribute to community learning through links to IITA's rural development support desk and other sources of information. Furthermore, Open and Distance Learning (ODL) materials have been developed for use in addressing the needs of farmers. By enhancing information flow through access to information, ICS-Nigeria hopes to increase farmer use of agricultural technologies, which will in turn increase their productive capacity (IITA 2002).

ICS-Nigeria has financial support from United States Agency for International Development (USAID). It focuses on six states in Nigeria (Abia, Adamawa, Kano, Katsina, Niger, and Oyo). It also concentrates on some selected agricultural technologies. Some of the major activities of ICS Nigeria are the:

- identification, packaging and dissemination of the best agricultural technologies for dissemination to farmers;
- establishment of farmers resource centers;
- development of materials for print, radio, video CD ROM and internet and;
- making available to farmers market information to enhance decision making.

In furtherance of these objectives, ICS-Nigeria produced a series of commercial crop production guide series and disseminated them to farmers through relevant agricultural development programs of the six states. It has also established farmer's resource centers in these states. The Katsina State Agricultural and Rural Development Authority (KTARDA) is one of the agencies that benefited from ICS activities in Katsina state.

In carrying out the assignment, KTARDA in conjunction with the Ahmadu Bello University (ABU) and ICS-Nigeria selected some model villages for the implementation of identified activities. The model villages were supposed to "demonstrate" the advantage(s) derivable from access to improved information support for farming activities.

AIMS AND OBJECTIVES

The broad aim of this paper, therefore, is to assess the influence of ICS-Nigeria's activities on the livelihood of farmers within the project area. Specifically, the objectives of the paper are to:

a. determine the level of knowledge of improved farm practices of selected crops in the study area;

b. ascertain the use of improved practices of selected crops and;

c. estimate and compare the income of the participants in the programme with those of non participants.

Results obtained from studies of this type provide insight into desirable benefits from enhanced information flow and serve as lessons for other developing countries as they strive to improve their food and agricultural sector.

METHODOLOGY

Area of Study

The study was carried out in the Katsina State of Nigeria. The state is one of the pilot sites of ICS-Nigeria. Katsina State lies between Latitudes 11° to 13° N and Longitude 07° to 8° 30oE (NARP, 1994). It lies in the semi-arid region of Nigeria. It does not have adequate quantity and duration of rainfall. The rainfall variability in terms of time of on-set and cessation often leads to crop failure. This rainfall pattern also gives rise to increased erosion and flooding problems. Furthermore, reduced rainfall heightens the desertification process. The desertification process compounds the grazing problem for livestock.

Arable land in the area is classified into upland "gona" and bottom valley land "fadama." The upland is used mainly for rain-fed agriculture while the valley bottom soils are cultivated mostly in the dry season using irrigation methods. (NARP, 1994). Katsina State covers three agroecological zones: Sahel, Sudan Savanna and Northern Guinea Savanna. The soil in the Sahel Zone is generally sandy and of low fertility. The soils are marginal for efficient arable crop production. Millet is the most important crop grown in the Sahel Zone while the most important crop mixture is millet/sorghum.

The soil of the Sudan Savanna Zone is mostly sandy and requires little tillage. Millet and Sorghum are the main food crops while the predominant food crop mixtures are sorghum/millet/cowpea and sorghum/millet/groundnut. Livestock is a major economic asset of this zone.

The Northern Guinea Savanna Zone is characterized by one peak rainfall of between 1000-4000mm/annum and a rainy period of between 130-190 days per annum. Predominant crops in the zone are sorghum, millet and cowpea while the common crop mixtures are sorghum/maize, maize/cotton, sorghum/cowpea, maize/rice and millet/sorghum. Livestock is not integrated properly into the cropping system of this zone.

The KTARDA operates through its zonal offices in each of these zones. The KTARDA in collaboration with the Ahmadu Bello University identified some model rural communities in each of the three agro ecological zones of the state. In each of these communities, farmers were registered and given support on improved agricultural farming practices. With the advent of ICS-Nigeria project, the latter provided substantial support to these model communities and rejuvenated the scheme. The support included the dissemination of extension packages and back up support for KTARDA staff.

The evaluation of the project was designed such that data for the assessment was obtained through the information supplied by both the participants and non-participants in the project area.

Sample and Sampling Procedure

The multistage random sampling procedure was used to select respondents for this study. First, a list of registered farmers from the model rural communities was obtained; from which 30 farmers were randomly selected from each community in each agro ecological zone. In essence, 90 farmer participants of the scheme were selected from the model communities as participants in the study.

In selecting the non-participants (with the help of the KTARDA), communities that were in similar agro-ecological zone with comparable demographic characteristics were used. Hence, from the list of farmers in these non-model communities, 30 farmers were selected from each of the three zones totaling 90 non-ICS participant farmers. Altogether, 180 respondents spread across the three agro-ecological zones of the state were selected for the survey. The distribution of the respondents is presented in Table 1 below.

Table 1: Distribution of Respondents in the Three Agro-ecological zones of Katsina state

Agro-ecological zone	Name of Community	Status of Community	Number of respondents
Sahel	Yan-Danimana Batagaranal LGA	Non-participating	30
Sahel	Barhum-Batagaranal LGA	Participating	30
Northern Guinea	Tundun wada Funtua LGA	Non Participating	30
Northern Guinea	Goya-Funtua LGA	Participating	30
Sudan savannah	Yan Mazare-Safena LGA	Non Participating	30
Sudan savannah	Bande safana LGA	Participating	30
Total			180

Source: Field Survey (2002)

Estimates from the national census of 1991 by the National Population Commission suggest that the communities were almost of equal farming populations (NPC, 1991).

Data Collection and Analysis

Structured interview guide was used to collect data from the respondents. The interview guide had been pre-tested amongst 30 other farmers in Katsina State that were not included in the study. The interview guide sought information on farmers' personal characteristics, farm practices, sources of information, knowledge and utilization of improved farm practices. Also, salient characteristics of the respondents vital to the acquisition, appreciation and utilization of information were explored in the data collection process.

Although, it was planned to collect data from 180 respondents, data from only 85 participants and 87 non-participants were useful for analysis, hence results from the 172 respondents are analysed. Furthermore, given the nature of the data collected, only simple statistical analysis, such as the students t-test and difference between two means, were used for the analysis.

In order to assess respondent knowledge of improved practices, farmers were requested to name four recommended improved practices of six predominant crops grown in the area (maize, millet, groundnut, cowpea cotton and soybean). The recommended practices are planting date, planting distance, recommended fertilizer and rate of fertilizer application.

Each correct mention of a recommended practice attracted a score of one point. Hence, a minimum knowledge level of zero and a maximum of 24 points were attainable.

To ascertain the use of improved practices; the farmers were requested to indicate which of the recommended practices they had used or were still using on their farm. For each practice a farmer had used, he/she was scored a point while any practice he/she was still using was cored 2 points. With this scoring method, the minimum adoption score was 1 point with a maximum of 48 points. The results obtained were tabulated.

ANALYSIS OF RESULTS

Socio-demographic characteristics of respondents

The socio-economic status of farmers definitely has an effect on their access to and utilization of improved productivity enhancing information. Major agricultural development goals, such as improvements in land productivity, establishment of secure cultivation rights and redistribution of land are believed to be influenced by demographic conditions (du Guerny, 1996). It is in light of this that an attempt was made

to investigate the socio-demographic characteristics of respondents of this study. Table 2 below shows the distribution of respondents by Age, Gender and Religion.

Table 2: Distribution of Respondents by their Age, Gender and Religion

Variable	Non-Participants		Participants	
	Frequency	Percentage	Frequency	Percentage
Gender: Male	85	97.7	82	96.5
Female	2	2.3	3	3.5
Age: 31-35	20	23.0	21	24.7
36-40	11	12.7	09	10.6
41-45	15	17.2	09	10.6
46-50	18	20.7	18	21.7
51-55	11	12.7	17	20.0
56-60	7	8.0	5	5.9
60+	5	5.7	6	7.1
Religion: Islam	8	100.0	83	97.6
Christianity	-	-	2	2.4
		100.0		100.0

Source: Field Survey 2002

Table 2 shows that most (97.7%) of non-participants farmers are male, in addition, most (86.3%) of non-participants are younger than 55years. Similarly, most (96.5%) participants are male with 87.9% younger than 55 years of age. However, about one-quarter of both categories of farmers are between 31 and 35 years. Furthermore, an overwhelming majority of the respondents (both participants and non-participants) are Muslim.

The preponderance of young able-bodied male in farming is an indication of a good potential to receive and adopt positive innovations readily. Young men adopt innovations more readily than older people (Adesimi 1995). The advantage of having a mono-religious system is the ability to use religious leaders/mode of communication to transmit needed information to the respondents

Table.3 Respondent's Socio-Demographic Characteristics

Primary Occupation	Non-Participants		Participants	
	Frequency	Percentage	Frequency	Percentage
Crop farming	15	17.3	13	15.3
Livestock farming	9	10.3	12	14.1
Crop and livestock	59	67.8	58	68.2
Trading	3	3.5	1	1.2
Civil Service	1	1.1	1	1.2
Marital Status				
Single	1	1.1	5	5.9
Married	84	96.7	80	94.1
Divorced	1	1.1	-	-
Widowed	1	1.1	-	-
Number of Children				
0	0	0	5	5.9
1-5	31	35.6	28	32.9
6-10	34	39.1	26	30.6
11-15	19	21.8	19	22.4
16+	3	3.5	7	8.2
Number in household				
1-10	4.4	50.6	44	51.8
11-20	31	35.6	26	30.6
21-30	11	12.7	8	9.4
31+	1	1.1	7	8.2

Source: Field Survey 2002

Table 3 shows also that the respondents are primarily farmers as 68% of both participants and non-participants were involved in mixed farming. Only very few respondents are traders and civil servants. However, there is no clear distinction between participants and non-participants in terms of primary occupation.

In terms of marital status, there are more singles (about 6%) among the participants than the non-participants. In small farm enterprise, household size including number of children has implications on farm operations in that they (children and dependants) provide the bulk of family labour.

From the table, it could be observed that while all the non-participants have children, about 6% of participant farmers do not have children. Interestingly, the participants have more children as about 8% have more than 15 children as opposed to 4% of participants in this category. This trend is also consistent with the result on number in households, as about 18% of participants have more than 20 people in their household as opposed to 14% non-participants.

Farming Operations

Table 4 below shows the distribution of respondents by their crop cultivation, from the table, it could be observed that the major crops cultivated are maize, sorghum, millet, groundnut and cowpea. The crop distribution is similar to result obtained by previous researches as contained in the National agricultural Research Program (NARP1994) report. The table shows that participants are more involved in the cultivation of maize (64.7%), sorghum (98.8%), cowpea (84.7%) and rice (25.9%), while non-participants are cultivating more sorghum (90.8%) and groundnuts (71.3%). Traditionally, maize, sorghum, cowpea and rice are cultivated for household consumption with excess stocks sold to small-scale entrepreneurs. However, given the current tendency towards market orientation and commercialization, these crops (maize, sorghum and cowpea) have emerged as commercial cash crops for farmers in the region. In addition, there has arisen a big market for grain in the region. Millet, on the other hand, is adaptable to the region but is cultivated only for its domestic utility. Given this background, the result presented in the table suggests that participants concentrate more on crops of high commercial value and of domestic relevance, than those with overriding domestic utility and little commercial value. The table also suggests that non-participant farmers tend to grow more environmentally suitable millet instead of other more commercially viable crops that marginally adapt to the prevailing environment of the region.

Table 3: Distribution of Respondents by Crops Grown

Crop*	Non-Participants			
	Frequency	Percentage	Frequency	Percentage
Maize	44	50.6	55	64.7
Sorghum	79	90.8	64	98.8
Millet	67	77.0	60	70.6

Groundnut	61	71.3	54	63.5
Cowpea	61	71.3	72	84.7
Cotton	41	47.1	26	30.6
Rice	15	17.2	22	25.9
Sugarcane	5	5.7	6	7.1
Cocoyam	6	6.9	7	8.2
Soyabean	35	40.2	26	30.6
Sweet Cassava	12	13.8	10	11.8
Tomato	21	24.1	26	30.6
Pepper	5	5.7	20	23.5
Cabbage	1	1.1	0	-
Onion	10	11.5	9	10.6
Okro	21	24.1	15	17.6

Source: Field Survey, 2002 * Multiple responses possible

Table 5 below shows the distribution of respondents by type of livestock raised. Livestock kept include cattle, sheep and goats, chickens and ducks. The data shows that more participants keep cattle than non-participants. Non-participants' herds range from one to 20 cattle as against one to 40 herds of cattle kept by participants. Only about 8% of non-participants have more than five herds of cattle as against 12% for participants. These results suggest that participants have more cattle on the average than their non-participant counterparts. The trend is similar for all the other livestock.

Apart from serving as a source of additional income, livestock are kept for manure. The larger the acreage cultivated, the larger the amount of manure required and the larger the amount of livestock required to produce the manure

Table 5: Distribution of Respondents by Types and Number of Livestock Kept

	Non-Participants			
	Frequency	Percent	Frequency	Percent
Cattle: 0	42	48.3	23	27.1
1-5	41	47.1	56	65.9
6-10	5	5.7	8	9.4
11+	2	2.3	3	3.5

Sheep: 0	20	22.9	11	12.9
1-5	33	37.9	39	45.9
6-10	26	29.9	22	25.9
11+	11	12.6	18	21.2
Goats: 0	20	22.9	15	17.6
1-5	28	32.2	31	36.5
6-10	30	34.5	30	35.9
1+	12	13.8	14	16.9
Chickens: 0	32	36.8	29	34.1
1-5	13	14.9	13	15.3
6-10	12	13.8	9	10.6
11+	32	36.8	38	44.7
Ducks: 0	66	75.7	64	75.3
1-5	12	13.8	14	16.5
6-10	11	12.6	15	17.6
11+	1	1.1	2	2.4

Source: Field Survey 2002

Table 6: Distribution of Respondents by Farm Size, Land Ownership Status and Sources of Labour

Variable	Non-Participants		Participants	
	Frequency	Percent	Frequency	Percent
Farm size (ha)				
<1.0				-
1.0-5.0	8	9.2	-	18.8
5.1-10.0	24	27.6	16	25.4
10.1-15.0	22	25.3	22	18.8
15.1-20.0	18	20.7	16	22.4
>20	9	10.3	19	20.0
	8	9.2	17	X =13.4
		X =8.4ha		

Land Ownership status *				
Purchase				
Rented/hired	59	67.8	78	91.8
Inherited	24	27.6	19	22.4
	71	81.6	68	80.0
Sources of labour *				
Hired				
Family	68	78.2	77	90.6
Exchange	70	80.5	78	91.8
	2	2.3	6	7.1

Source: Field Survey, 2000 *Multiple Responses possible.

The size of a farmer's farm tends to suggest the volume and quality of information that needed by the farmer. This is in addition to other factors such as the number of crops planted by the farmer. Smaller farm size may not need frequent qualitative information unlike a large sized farm that will need information about inputs and outputs. Table 6 shows that the average farm size of participants is about 13ha as against 8ha for non-participants. Many more of non-participants (37%) have farm sizes of less than 5ha, as against (19%) of participants. Similarly, many more participants (20%) have farm sizes of more than 20ha as against (9%) for non-participants.

Increase in farm holding is one of the indices of market orientation. As farmers decide to cross the threshold of subsistence agriculture, they tend to increase their farm sizes. The result presented on land ownership revealed that purchase is the most predominant form of ownership (91.8%) among participants as against (67.8%) among non-participants. Inheritance is the most predominant form of ownership among non-participants (81.6%) as against (80.0%) among participants. The most striking revelation is that ownership by rent is not common among the respondents. They obtain farm land through either purchase or inheritance.

The two most important sources of labour for the respondents are family (91.8% for participants and 80.5% for non-participants) and hired labour (90.6% for participants and 78.2% non participant)

Sources of Information

Research has established that farmers have an array of formal and informal sources of information (Ogunwale and Laogun 1997) (George, Gerald, Meslay and Doster 1993) noted that for large-scale farmers for instance, both print and electronic media,

extension, concentrate and farm service firms are potential providers of information; on production practices, marketing strategies and financial analysis.

Table 7 below shows that the most commonly used sources of information by the respondents are ADP agents, radio, friends and farmers groups. As expected, all the participants identified the farmer resource centers of the ICS Nigeria project as their major source of information, as against an average of 20% of non-participants for all crops cultivated. For all crops, non-participants tend to use ADP agents more than any other source, indicating the potential of these agents to bring about the needed change in farm productivity among respondents.

Table 7: Distribution of Respondents by Sources of Information for Selected Crops

INFORMATION SOURCES	MAIZE		SOYBEAN		GROUNDNUT		COWPEA		MILLET		SORGHUM	
Friends	24.4	23.2	20.0	13.3	26.7	21.0	27.8	23.3	26.7	15.6	36.7	27.8
Village Head	13.3	20.0	16.7	13.3	13.3	11.1	10.0	20.0	12.2	13.3	21.1	23.3
Farmer's Group	21.1	17.8	16.7	17.8	20.0	20.0	16.7	22.2	16.7	17.8	28.9	31.1
ADP Agents	42.2	52.2	35.6	40.0	30.0	58.9	35.6	67.8	34.4	54.4	46.7	75.7
NGO Agents	4.4	12.2	3.3	6.7	3.3	6.7	3.3	8.9	3.3	4.4	11.1	10.0
Radio	42.2	41.1	32.2	32.2	34.4	35..6	31.1	41.1	30.0	32.2	48.9	46.7
TV	1.1	2.2	2.2	-	1.1	-	1.1	1.1	1.1	-	1.1	-
Ext. Leaflets	1.1	4.4	-	2.2	3.3	1.1	3.3	2.2	2.2	2.2	1.1	-
Newspapers	1.1	-	-	-	-	-	-	-	-	-	-	1.1
Mobile films	-	-	-	-	-	1.1	-	1.1	-	1.1	2.2	1.1
Research Institute	2.2	-	3.3	-	4.4	2.2	3.3	1.1	3.3	1.1	3.3	1.1
Farmer's Resource Centre	100.0	20.0	100.0	26.0	100.0	12.0	100.0	24.0	100.0	17.0	100.0	23.0

Source: Field Survey (2002)

Table 8: Distribution of Farmer's by Knowledge Scores

Knowledge Score	Non-Participants		Participants	
	Frequency	Percent	Frequency	Percent
<1	10	11.5	-	-
1-5	64	73.6	39	45.9
6-10	12	13.8	21	24.7
>10	1	1.1	25	29.4
Mean X = 4.27 Mean X = 6.75				

Source: Field Survey, 2002

Table 9: Distribution of Farmers by Use of Improved Knowledge of (Adoption)

Total Use Score	Non-Participants		Participants	
	Frequency	Percent	Frequency	Percent
0	1	1.1	-	-
1-10	16	18.41	1	1.2
11-20	27	31.0	26	30.6
21-30	19	21.8	23	27.1
31.40	22	24.1	25	29.4
40	2	2.3	10	11.8
XNP = 20.80 XP = 26.41				

Source: Field Survey, 2002

Table 8 shows that the participants are more knowledgeable of improved farm technologies than their non-participant counterparts. For instance, while most (85%) of the non-participant scored less than five in the knowledge score chart, more than half (54%) of the participants scored above 6 points with more than a quarter (29%) scoring above 10 points. The average score of the participants (6.75) is more than those of the non-participants (4.27).

Results in Table 9 show the extent of use of knowledge by respondents. A close study of Table 9 shows that non-participants are more skewed towards zero adoption with almost half (50.5%) scoring 20 points and below, whereas (68.4%) of the participants scored above 20 points. In other words, participants do not only have more knowledge of improved agricultural practices, they have used this knowledge

more than non-participants. The overall average use score for respondents showed the average score for participants (26.4) being more than that of the non-participants (20.80)

Table 10: Distribution of Respondents by Farm Income

Total Income (Naira) (annual)	Non-Participants		Participants	
	Frequency	Percent	Frequency	Percent
<100,000	4	4.6	3	3.5
100,001-200,000	14	16.1	8	9.4
200,001-300,000	12	13.8	9	10.6
300,001-400,000	13	14.9	8	9.4
400,001-500,000	7	8.0	4	4.7
500,001-600,000	6	6.9	6	7.1
600,001-700,000	4	4.6	9	10.6
700,001-800,000	6	6.9	6	7.1
800,001-900,000	3	3.4	4	4.7
900,001-1000,000	3	3.4	5	5.9
>1000,000	15	17.2	23	27.1
		X = N505,747.1		X =N625,294.1

Source: Field Survey, 2002

It is expected, a priori, that the use of improved knowledge by farmers will translate into increased income for the adopters. The farm income was obtained from the estimate of the crop yield and livestock production and sales. The estimated amount of livestock sold and crop output put for sale were multiplied by their appropriate prices.

Table 10 shows the distribution of the respondents by their farm income. The participants have a higher average farm income of N625,294.10 compared to their non-participant counterparts with a average N505,747.10. A closer look at the Table shows that almost half (44.8%) of the participants earn more than N700,000.00 compared with one third (30.9%) of non-participants.

In order to validate these results, it was subjected to inferential structural analysis. The student t-test was used to test the difference between the observed means of the participants and non-participants. Table 11 shows the summary of the student's t-test of the statistics of the results obtained.

Table 11: Summary of Student's t-test statistics

	Non-Participants	Participants	T-test	P
Variable	Mean	Mean	Level	
Income	505,747.10	625.294.10	2.41	0.10**
Knowledge score	4.27	6.75	-2.75	0.05*
Adoption (Use) score	20.8	26.4	2.17	0.04
Source: Analysis of field survey data (2002)				
Note ** Significant at 10%		* Significant at 5%		

Source: Field Survey

Results in Table 11 show that there are statistically significant differences between the means of the key variables of interest between the participants and non-participants. The participants have more knowledge on improved practices and use the knowledge more than the non-participants due to which they obtain higher incomes.

The statistical significance of these results lends credence to the effectiveness of the ICS-Nigeria project in getting relevant information to farmers to increase their knowledge, adoption and income. That participants have larger farm sizes and keep more livestock could have assisted them in obtaining better performance than their non-participant farmers. These factors also suggest shift from subsistence level of production towards commercial-market oriented production. When farmers shift from subsistence to commercial production, they tend to expand their farm size, produce more, acquire more land so they can have better control over the use of their land, and use more hired labor to handle the expanding work on the farm. Timely access to production and market information is a necessary precursor to successful achievement of tasks.

CONCLUSION

The need for timely information for farm decision making to enhance farm production and productivity motivated the establishment of the ICS-Nigeria project. This study was aimed at assessing the influence of the ICS-Nigeria project on the acquisition and use of improved farming knowledge and the consequence on their incomes of farmers in the Katsina State of Nigeria.

Results from the analysis suggests that participant farmers have more knowledge, use the knowledge more in terms of adoption of improved farm practices and consequently obtains more income than the non-participant farmers.

Subject to the limitations of the study, we can safely assert that the ICS-Nigeria project attained its major objective in the study area.

RECOMMENDATIONS

Following from the findings that increase in knowledge, adoption, and income of participant farmers have attended the ICS-Nigeria intervention, such efforts need not only be sustained, but should also be replicated in other states in Nigeria, and especially in other countries of the developing world.

The achievement of the project could also be reinforced with some suggestions. For instance, an interactive forum could be built into the program to provide immediate and delayed feedback mechanisms for necessary program adjustments.

Furthermore, the efforts of ICS-Nigeria should be complemented by other non-governmental and governmental organizations to harness both local and international expertise and resources. This will further facilitate local capacity building. Indeed, issues related to availability, accessibility and affordability of these improved farm practices should be addressed by these agencies.

Finally, ICS-Nigeria should provide extension materials on other livelihood activities. It is hoped that broadening the scope will also correspondingly expand the livelihood of participant farmers.

REFERENCES

Adesimi, A.A. (1995). Farm Management Analysis with Perspective through the development process. Tumos Publishing Company, Ibadan. 185pp.

Arokoyo, Tunji (2000) "ICTs Application in Agricultural Extension Service Delivery". Agricultural Extension in Nigeria Proceedings of the Agricultural Extension Society of Nigeria Conference. 2000

Baker, G. A. (1992) "Computer Adoption and Use by New Mexico Non-Farm Agribusinesses" American Journal of Agricultural Economics 74:737-744

Batte, M. T. ; Jones E.; and G. D.Schnitkey (1990) "Computer Use by Ohio Commercial Farmers" American Journal of Agricultural Economics 72: 935-945

Bejerlein, J. G. Schneeberger, K. C. and D. D. Osburn (1995) Principles of Agribusiness Management. 2nd Edition. Waveland press Inc. Illinois

CTA (2003): ICTs – Transforming Agricultural Extension? An e-discussion. 20th Aug – 29th Sept 2003

Ma Corazon, Mandoza Lawas and H.A. Luning (1998). GIS and multivariable analysis of farmer's spatial crop decision behaviour. Netherlands Journal of Agricultural Science 46(1998) 193-207.

International Institute for Tropical Agriculture (IITA) and National Agricultural. Extension and Liaison service (NAERIS) (2001). Information and Communication Support for Agricultural Growth in Nigeria (ICS-Nigeria). Project Document presented to the United States Agency for International Development (USAID) Nigeria 19p.

International Institute of Tropical Agriculture (IITA) (2002): ICS-Nigeria Publications. http//www.ics-nigeria. org.

National Agricultural Research Project (1994). National Agricultural Research Strategy Plan for Nigeria. Report on North-West Zone, Federal Ministry of agriculture and Natural Resources, Abuja 264p.

Du Guerny, Jacques, and Daphne Topouzis (1996) Gender, Land and Fertility-Women's Access to Land and Security of Tenure. SD dimensions. March 1996. Sustainable Development Department Food and Agriculture Organization of the United Nations.

Odame, H. H.; N Hafkin; G. Wesseler and I. Boto (2002): "Gender and Agriculture in the Information Society" International Service for National Agricultural Research. Briefing Paper 55 September 2002 The Hague.

Ogunwale, A.B. and E.A. Laogun (1997) Extension Agents avenues for information dissemination and other perception of farmers sources of information in Oyo state agricultural Development Programme in Olowu, T.A. (ed) Towards the Survival of agricultural Extension System in Nigeria. Proceedings of the Third Annual National Conference of the agricultural Extension Society of Nigeria, AESON, Ilorin, 111-118.

George, F. Patrick, Gerald F. Orhmam, Meslay G. Musser and D. Howard Doster (1993) Information Source of Large Scale Farmers. CHOICES. Third Quarter 40.41.