



## The Role of Information and Communications Technologies in Agricultural Risk Management in Owerri Agricultural Zone, Imo State, Nigeria

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### Abstract

The aim of the study was to describe the role of information and communications technologies on agricultural risk management in Owerri Agricultural Zone. The objectives of the study were to describe the socio-economic characteristics of the respondents in the study area, identify agricultural risks faced by the farmers, describe the role of information and communications technologies in managing farm risks, identify the constraints to use of information and communications technologies by farmers in managing agricultural risks and to identify agricultural risk management strategies used by farmers in the study area. The data were collected through questionnaire distributed to 120 respondents, where eight farmers were randomly selected from the fifteen villages that make up the area. Percentages, frequency distribution tables, mean scores, Likert scale and ranking were used to analyze the data. Results showed that most of the farmers (80 percent) face pests and diseases outbreaks in their agricultural activity. Other major agricultural risks faced by the farmers in the area are fluctuating market prices, soil erosion and bad weather. The main role of information and communications technologies in managing the farmers' agricultural risks is to channel information to the farmers who are difficult to reach. The major constraint to the use of information and communications technology by the farmers in managing their farm risks was the unavailability and inaccessibility of the information and communications technology tools. Some of the strategies used by the farmers to manage their agricultural risks were; use of diversifying crop varieties, diversification of their enterprises and planting at optimal time. Some recommendations made include; that government should coordinate management and provision of information to the farmers, services should be rendered to the farmers at a relatively low cost, government should provide information and communications technology devices for the farmers and make the devices more accessible.

**Key words:** ICTs, risk, agriculture, shock, crop damage.

### Introduction

Agriculture is a sector of economic activity that provides humans with some of their based needs. Its outputs are food and raw materials. The importance of agriculture can not be over-emphasized in Africa, particularly, in Nigeria. Agriculture has contributed to the growth of the economy and also has provided employment opportunities for teeming population, as well as eradicating poverty in the economy (Edoumiekumo and Audu, 2009). Tombofa (2004) pointed out that agriculture provides the basis for the world's great civilization in the past and the increase in agricultural productivity laid the basis for, and sustained the first industrial revolution. The agricultural sector is known to employ over 75 percent of the labour force in developing countries and provide the purchasing power over industrial goods (Edoumiekumo and Audu, 2009; UNDP, 2012).

Agricultural production is subject to many uncertainties. Any farm production decision plan is typically associated with multiple potential outcomes with different probabilities. Weather, market developments and other events cannot be controlled by the farmer, but have a direct incidence on the returns from farming. In this context, the farmer has to manage risk in farming as part of the general management of the farming business. Hazards and unforeseen events occur in all economic and business activities and are not specific to agriculture. However, farming risk and risk management instruments in the sector may have a certain number of specificities (OECD, 2009; Da Silva and Ratnadiwakara, 2008).

Information and Communications Technologies (ICTs) have proven highly cost effective instruments for collecting, storing, processing and disseminating information about risks. While there have been few applications of ICTs to cope with agricultural risks, those that exist are proving important and potentially transformative. In the event of a shock, Information and Communications Technologies (ICTs) facilitate transfers and remittances to farmers from state and relief agencies as well as from farmers' extended social networks. Finally, disaster management is using more sophisticated applications to collect and synthesize information from the field. In the future, these disaster management applications might be applied to respond to agricultural shocks (World Bank, 2011). Until now, a comprehensive analysis of the role of information and communications technologies in agriculture is yet to be accomplished in Nigeria. Farmers will pay for risk management services, particularly, information services customized to their needs. Highly developed software programming skills and technical expertise are also critical for deploying ICTs. Many risk management services are able to leverage the significant human resources of larger organizations. This capacity is unavailable in Nigeria. Women and other vulnerable groups do not have equal access to risk management tools. Traditional culture norms in many societies restrict women's mobility, education, assertiveness and awareness, all of which affect their ability to acquire information or advisory services to help manage. Farmers are also more likely to trust and act on information they receive from a person standing in front of them, than from somebody on the phone or an automated phone message (Baquet et al., 1997; Cole et al., 2008). Knowledge gap exists in the study area in using ICTs to mitigate, manage and adapt to risk situations affecting agriculture and farmers in the study area. Because of these, it is difficult to draw quantitatively sound casual relationships between ICTs for risk management interventions and gains in risk reduction.

The broad objective of the study is to analyze the role of ICTs in agricultural risk management with a view to developing agriculture in Imo State.

Specifically, the study will.

- i. Describe the socio-economic characteristics of respondents.
- ii. Identify ICT devices used by respondents in the study area.
- iii. Identify the agricultural risks faced by farmers in the study area.
- iv. Describe the perceived role of ICT in managing farm risks.
- v. Identify constraints to use of ICTs by farmers in managing agricultural risks.
- vi. Identify agricultural risk management strategies used by farmers in the study area.

## Methodology

Specifically, this study was conducted in Owerri Agricultural Zone made up of Ezinihitte, Aboh, Ahiazu, Ikeduru, Mbaitolu, Owerri North, Owerri West, Owerri Municipal, Ngor-Okpala Local Government Areas. Owerri Agricultural Zone has 18 extension blocks with 139 extension circles. From the circles, a list of all ICT user farmers was obtained from the agent covering the area. All ICT user farmers in the zone constitute the population of the study. A list of all registered ICT user farmers in the zone was obtained from the ADP office in the zonal headquarters. The list has a total number of 1,200 ICT user farmers and 10% was selected which gives a total sample size of 120 ICT user farmers. The data for the study was sourced from primary and secondary sources. The former was gotten from field investigation or survey using structured questionnaires and interview schedule, while the latter was extracted from documented facts in existing literature, reports, books, journals, publications, bulletins, etc. Enumerators were trained and used. Data was analyzed using descriptive statistical tools such as percentages, mean presented in tabular forms. This was used to analyze objectives 1, 2, 3, 4 and 6. Objective 5, however, was analyzed using ranking. A 4-point Likert type scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) assigned scores of 4, 3, 2 and 1 was used to analyze objective 4. Any mean response below 2.5 was not accepted.

## Results and Discussions

### Socioeconomic Characteristics of Respondents

Table 1 shows that 50.8 percent of the respondents are males while 49.2 percent of them are females, which means that the male respondents are mostly farmers than the females and they are household heads and landowners. The table also reveals that 30 percent of the respondents are between the ages of 50-59, 25.8 percent of the respondents fall between the ages of 40-49, and that 22.5 percent of the respondents are between the ages of 60-69. The respondents whose ages fall between 30-39, 70 and above, constitute 17.5 percent, and 4.2 percent of the respondents respectively. This finding implies that the respondents in Owerri Agricultural Zone are mostly of the middle age. This indicates therefore that information and communications technology and its use in agricultural risk management in Owerri Agricultural Zone would be more among energetic people considering the average age. Again, the table reveals that 35 percent of the respondents has primary school level, 25.8 percent of the respondents attended secondary school, 24.2 percent completed the university and 15 percent of the respondents went to school as they are already adults. The implication of this is that on average, the respondents are not illiterates as such, since they can decipher signs and also read and know how to manage farm risks. This means that whether the respondent is educated or not, he/she can effectively run the farm and devise strategies to manage farm risks on his/her own. Table 1 shows that majority (65.8%) of the respondents are married. Also 17.5 percent of the respondent are widowed, while 8.3 percent are single. Respondents that are divorced are 8.3%. The implication of the majority being married is favorable to information generation on management of farm risks. The married majority tend to manage risks in the farm more effectively, as information can be passed between them without restrictions as opposed to the stigma attached to the divorced or separated lot because of the socio-cultural burden dominant in the Igbo society. Again, majority (53.3 percent) of the respondents own farms with 0.5-1 hectare, 29.2 percent of the respondents have farm size of 1.5 – 2 hectares. Also, respondents with farm size 2.5 – 3 hectares and 3.5 and above hectares constitute 15% and 2.5% of the respondents respectively. This implies that the respondents are mostly small-scale farmers with little cultivable lands which are mostly gotten through inheritance. Table 1 shows also that most (72.5 percent) of the respondents maintain a family (household size) of 4-7 (or average of 5) people, 15.8 percent of the household of the respondents has between 1-3 people. Only 11.7 percent of the respondents are from households of 8-11 people. The implication for the household of 4-7 members is that there will be more hands to help in agricultural activities and home works as well as the family being properly catered for.

**Table 1: Socio – Economic Characteristics of the Respondents**

Characteristics	Frequency	Percentage
<b>Sex</b>		
Male	61	50.8
Female	59	49.2
<b>Age</b>		
30-39	21	17.5
40-49	31	25.8
50-59	36	30
60-69	27	22.5
70 and above	5	4.2
<b>Marital Status</b>		
Single	10	8.3
Married	79	65.8
Divorced	10	8.3
Widow	21	17.
<b>Household size</b>		
1-3	19	15.8
4-6	87	72.5
7 and above	14	11.7
<b>Educational Level</b>		
Adult school	18	15
Primary	42	35
Secondary	31	25.8
Tertiary	29	24.2
<b>Farm size</b>		
0.5- 1	64	53.3
1.5-2	35	29.2
2.5-3	18	15
3.5 & above	3	2.5

**Information and Communication Devices used by Respondents**

Table 2 shows that most (89 percent) of the respondents own and make use of mobile phones to transfer information. A vast majority (93.3 percent) of the respondents own radios, and respondents which make use of television and newspapers and magazine represent 77.6 percent and 58.3 percent of the respondents respectively. It can also be seen that laptops, internet and CD-ROMs are not widely used by the respondents in the area, as only 18 percent, 20 percent and 3 percent of the respondents are aware of such information and communications technology devices. This implies that agricultural risk strategies can easily be transferred among the respondents, as the information and communications technology devices are common in the area. The above finding is in line Asenso-Okyere and Mekonnen (2012), who said that one promising area to do agricultural extension to reach number of farmers is using information communication technologies (ICTs): mobile telephony, innovative community radio and television programs, mobile phones in combination with radio, video shows, information kiosks, web portals, rural tele-centers, farmer call centres, video-conferences, offline multimedia CDs, open distance learning, etc. ICT-based agricultural extension brings incredible opportunities and has the potentials of enabling the empowerment of farming communities. With the availability of ICTs the proposition for an increasing number of extension staff may no longer be wholly valid. Moreover, the use of ICTs to improve information flow and to connect people within the rural areas has proved that illiteracy of farming communities may no longer be an excuse to deny some form of extension system.

**Table 2: Information and Communications Technology Devices used**

ICT device used	*Frequency	Percentage (%)
Mobile phone	107	89.2
Television	92	76.6
Radio	112	93.3
Internet	24	20
Newspapers and Magazine	70	58.3
Digital camera	11	9.2
CD-ROMs	3	3
Laptop	22	18

\* - Multiple responses

**Risks Faced by Respondents in Study Area**

Table 3 shows that pest and disease outbreaks affect most respondents (80 percent), as well as fluctuating market prices, which affect about 65 percent of the respondents. Soil erosion bad weather and low yields are risks faced in agriculture by 56 percent, 55 percent and 50 percent of the respondents respectively. Theft and violent conflicts affects 42 percent and 46 percent of the respondents respectively. However, loss of labour has been observed to be a risk not too faced by the respondents, as only 16 percent of the respondents are affected. This implies that as the respondents are into farming, risks in agriculture are inevitable. No matter how careful the farmer tries to be, some risks would still be faced from the time of planting, harvesting and storage right down to processing and marketing of agricultural products. This

finding goes in line with World Bank (2009) who said that farmers face many important risks that they can do little to mitigate through better agronomic practices or the use of early warning information.

**Table 3: Various forms of Risks faced by Respondents**

<b>Risk</b>	<b>*Frequency</b>	<b>Percentage (%)</b>
Floods	37	31
Pest and Diseases outbreaks	96	80
Soil erosion	67	56
Fire	41	34
Theft	50	42
Bad weather	66	55
Violent conflicts	55	46
Fluctuating market prices	78	65
Loss of labour	19	16
Low yields	60	50

\* - Multiple responses

### **Role of ICTs in Managing Risk**

Table 4 reveals the roles of information and communications technologies in farm risks management. High mean response of 3.6 each indicates that ICTs channel information to farmers who are difficult to reach, predict and dictate natural disasters, forecast weather for farmers to prepare and respond, broadcast disaster early warning and alerts. Other roles are to collect information from the field to assess damage or monitor outbreaks (mean 3.4), to enable two-way communication with agricultural experts (mean 3.3), to help farmers avoid default risks (3.2), to reduce the costs for organizations to provide risk management services (mean 3.1), electronic assessment of crop damages (mean 3.1), to improve coverage of environmental monitoring system (mean 2.9), to deliver information without breaking any traditional stereotypes or gender norms (mean 2.8), rapid data gathering during emergency response (mean 2.8), mobilize and monitor reconstruction efforts (mean 2.8), to include small holders in supply chains (mean 2.7). However, the respondents did not agree that information and communications technologies help to transfer funds to beneficiaries without access to financial institutions. This is because they are not used to the practice of money transfer. This finding is in line with World Bank (2009) who said that a survey of current applications of ICTs to manage agricultural risk suggests that they are valuable for two primary reasons. First, ICTs channel information, advice, and finance to farmers who are difficult to reach using conventional channels. Second, ICTs reduce the costs for organizations to provide risk management services, because they can greatly reduce the costs of collecting, storing, processing, and disseminating information.

**Table 4. Roles of ICTs in Risk Management**

<b>Roles of ICTs</b>	<b>Mean</b>
To disseminate information to farmers are difficult to reach	3.60
To reduce the costs for organization to provide management services	3.10
To enable two-way communication with agricultural experts	3.30
To include small holder farmers in supply checks	2.70
To help farmers avoid default risks	3.20
To transfer funds beneficiaries without access to banks	2.30
To collect information from the field to assess damage or monitor outbreaks	3.40
Improve coverage of environmental monitoring system	2.90
Predict and dictate natural disasters	3.60
Electronic assessment of crop damages	3.10
Weather forecasting for farmer response and preparedness	3.60
Broadcast disaster early warnings and alerts	3.60
ICTs enable rapid data gathering during emergency response	2.80
Mobilize and monitor reconstruction efforts	2.80
To deliver information without breaking traditional stereotype	2.80

### **Constraints to ICTs use for managing farm risks**

Table 5 above shows that availability and accessibility to information and communications technology devices is the constraint faced by most respondents to the use of information and communications technologies in managing farm risks. However, the low standard of education level of the respondents is considered the least constraints to the use of information communication technologies by the respondents, and this is because the respondents are not all stark illiterates. This finding can be said to be in line with World Bank (2009) who said that rural areas, where risk management services are so desperately needed, also lack education services, financial services, and even agricultural services. Many aspects of human capacity-such as financial literacy, knowledge of best agricultural practices, and familiarity with technology are prerequisites for using risk management tools successfully.

**Table 5: Constraints to use of ICTs to manage farm risks**

Constraints	Frequency	Percentage	Rank
1. Availability and accessibility to ICT devices	106	88%	1st
2. Lack of opportunities to acquire knowledge	105	87%	2nd
3. High cost of maintenance services of devices	104	87%	3rd
4. Relatively high cost of services	88	73%	4th
5. Limited financial resources of farmer	87	72%	5th
6. Beliefs relating to traditional methods	85	71%	6th
7. Political and institutional leadership	69	57%	7th
8. Lack of coordination in the management and provision of information	66	55%	8th
9. Low standard of education level	60	50%	9th

### Strategies Used by Respondents in Farm Risk Management

Table 6 shows that most respondents (86%) use diversifying crop varieties as a strategy to manage risks in their farm, while few of them (30%) leave marketing of their agricultural products to experts in order to manage agricultural risks. Planting at optimal time and adopting moisture-conserving farming practices are strategies used by 72 percent of the respondents to manage farm risks. This finding goes in line with OECD (2009) who said that a farmer diversifies when he uses his resources in different activities and/or assets instead of concentrating them on a single one. If returns of these activities or assets are not perfectly correlated, the variance of the overall returns is reduced and, therefore, the costs associated with risk are also reduced. There can also be diversification strategies in the input sides of production. For instance in developing countries small holders typically have developed methods to diversify the gene pool of crops in order to be able to cope with adverse shocks.

**Table 6 Strategies Used to Manage Farm Risk**

Constraints	Frequency	Percentage(%)
a. Planting at optimal time	87	72
b. Diversification of enterprise.	89	74
c. Use of diversifying crop varieties	103	86
4. Investing off-farm.	75	62
5. Selling part of the farm's produce once	39	32
6. Moisture-conserving farming practices.	87	72
7. Leaving marketing to experts.	36	30
8. Adopting minimum tillage farming practices.	76	63

\* -Multiple Responses

### Conclusion

The results show that the farmers can ascertain the role of information and communications technologies in managing agricultural risks. Risks in agriculture are inevitable and as such, information and communications technologies help to channel information about such risks to others, mitigate and reduce these risks. These information and communications technologies created for the farmers to acquire more knowledge about information and communications technology. Also there is a high cost of maintenance services of the devices by those farmers who own them, and so, the farmers resolve back to traditional methods or strategies to manage their farm risks. The following recommendations were made; The government should make efforts in providing information and communications technology devices in rural areas and making them more accessible; Extension agent should advise farmers to take up opportunities they come across in order to increase their educational standard; There should be co-ordination in the management and provision of information to the farmers; Maintenance services of the information and communications technology devices should be provided for the farmers at an affordable rate.

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