



Analysis of information seeking behavior of smallholder rice farmers on safe use of pesticides in Anambra State, Nigeria

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Abstract

Analysis of information seeking behaviour of rice farmers on safe use of pesticides in Anambra State, Nigeria was studied using one hundred and twenty respondents. The respondents were selected using multi-stage random sampling and purposive sampling techniques. The information used for this study was derived from primary and secondary sources. The primary data was obtained through structured questionnaire and oral interview, while, the secondary source were acquired from recent published and unpublished survey articles, journals, textbooks, the internet, proceedings and other periodicals. The objectives of the study were analyzed using percentage responses and multivariate Logit model analysis. The result of the sources of information to the farmers on safe pesticide use was from friends, input dealer, radio and extension agent. Also, most of the respondents had low information seeking behaviour. As well, the socioeconomic characteristics of rice farmers such as educational level, distance from the nearest market and extension services influenced positively their information seeking behaviours on safe use of pesticides, while radio ownership and mobile phone ownership were negative. The need to ensure farmers' access to credit, educational programmes and extension services were proffered.

Keywords: Information seeking behaviour, smallholder, rice farmers, safe use of pesticides, multivariate logit model analysis

Introduction

In courtesy to Green revolution, economic prosperity of most farmers in sub-Saharan African has been boosted immensely through transformation of their agrarian culture to newly industrialized society. This shift has enormously aids in curtailing maximally poverty, enhancing household food security and assisting rural development (Food Agriculture Organization, (FAO), 2013; Damalas, and Koutroubas, 2017)^[14]. This change from labour type practice to machine intensive agricultural practices is in part through intensive use of pesticides (FAO, 2013; Hossard, Guichard, Pelosi, and Makowski, 2017)^[22, 26]. Pesticide, as reported by Hashemi, Rostami, Kazem, and Damalas, (2012)^[25], a damage control input to protect from insects and other pests, is considered to increase food nutrition, and its application is presumed to be of economic, labour-saving, and efficient tool for pest management in crops such as rice. Moreover, Fan, Niu, H., Yang, Qin, Bento, Ritsema and Geissen, (2015)^[21] stated that pesticide is indispensable in holding current production and yield levels, and maintenance of better welfare for the farmers. However, the abuse and misuse of these pesticides as usually reported in literatures by farmers, specifically smallholder rice farmers, may perhaps be partly due to illiteracy, poor knowledge and low risk awareness lead to unacceptable consequences to public health and can create environmental pollution(air, water, soil) but also harm human health and have on undesirable effect on farmers' productivity (Denkyirah, Okoffo, Adu, Aziz, Ofori, and Denkyirah, 2016; Damalas and

Khan, 2017)^[17, 15]. Additionally, use of banned pesticides use (e.g. DDT, organ chlorine insecticides, organophosphate, carbamates, herbicides) in their country of production but found circulating in most Africa markets seem to assistance in complicating this ugly developing trend, as their effects are more lethal than other chemicals (Jin, Wang, He, and Gong, 2017; Hossard, Guichard, Pelosi and Makowski, 2017)^[29, 26]. Abating the problems of safe pesticides use, the use of information has gained prominence and widely documented in literatures (Ozowa, 2004; Mchombu; 2013; Bachhav, 2014, Dutta, 2014; Benard, Dulle and Ngalapa, 2014; Ume, Okoro, Ben- Chukwu, Nnaji, 2020)^[44, 36, 20, 13, 50]. The import of information as engine room for sustained development of human and society is well documented in works. For instance, Information as stated by Bachhav, (2014) and Jin, *et al.* (2017)^[29] aids in facilitating rural development, in equipping small holding farmers in taking informed decisions and appropriate action in bid of attainment of agricultural productivity and wholesome environment devoid of pollution compare to farm inputs. The propensity of information in attainment of the aforesaid functions, according to Denkyirah, *et al.* (2017)^[17] is high especially where such information is accurate, timely, understandable, factual and flow in steady basis, in order to curtail maximally ambiguity and enhance the value of decision made in resolving problems.

However, bearing in mind of the above regards and with changing world full of competitiveness of rivals business enterprises, Babu, Glendenning and Asenso, (2011)^[10] reported

that farmers continually make conscientious efforts in acquiring best management options in order to flourish efficiently in their businesses. Studies (Aina, 2011, Kaniki, 2011; Kurmar; 2014)^[15, 30] revealed that such options could be attained through adjustment of prevailing techniques and knowledge or by adopting improvements in pesticides uses in order abate the growing environmental and human contamination associated with the abuses and misuses of the resource. The technologies for this research included use of personal protection equipment (PPE), proper handling of pesticides, use of appropriate spraying equipment, use of pesticides with adequate label and among others. For the small scale farmers to increase their rice production and productivity without compromising to pesticides abuses with attendant consequences, they must have information-seeking behavior that could boost their adoptability of improved safe pesticides uses technologies (Oladeji and Oyesola, 2012)^[42]. The choice of the adoption of any of the pesticides technologies, as asserted by Dutta, (2013)^[20] depends entirely on those that will facilitate in actualization of farmers' goal and the profitability of the technology in question. Thus, when making such key decision on furthering of the farm enterprise, conscious efforts and sufficient time should be allotted in gathering info, consideration of options and in choosing the best option(s) (Kaniki, 2011)^[30]. The resolute in looking for facts which will act as guide in making a cogent decision is known as information-seeking behaviour (Gaber and Abdul-Latif; 2012).

Information seeking behavior as asserted by Aina, (2011)^[5] is how individuals articulate their information needs, seek, evaluate, select and use information. To Dinpanah and Laasharana, (2011)^[18], information seeking behavior is an avenue of collecting adequate facts to deal with apparent information gaps. The information seeking-behavior of an individual or group for instance arises in a quest to satisfy acknowledged aims and ascend from the level of uncertainty to the level of certainty (Afolabi, 2003)^[33]. Nevertheless, the prime aim of information source options as stated by Babu, *et al.* (2011)^[10] are due to closeness, guaranteed value, only accessible possibility and apt availability. It is obvious that some of this smallholder farmer may perhaps have enhanced access to these resources more than others, nevertheless, such access are often limited by socio-economic (level of income, farm size, age, geographical location and level of education.), socio-cultural and institutional conditions. (Oladeji and Oyesola, 2012; Ume, Okoro, Ben-Chukwu and Nnaji, 2020)^[42, 50]. For instance, in a situation where the farmers possess individualities traits like being introversion, dogmatic and immovability that are in contradiction to change, could impede innovation assimilation and pursuit for new methods of doing things. In the other hand, the progressive farmers could be very eagre to discover and evaluate the finest and utmost modern farming techniques. Furthermore, these liberal farmers adore the potential and real opportunities of the agricultural market centred on their resourcefulness, apparent info and management (Babu et al. 2011)^[10]. It is very important to state that information seeking behavior of smallholder farmer increases, as they (farmers) have access to needed information, as reverse

is the case where there is lack or low information needs (Kurmar, 2014).

In Anambra State, the government concerned agencies such as Agricultural Development Programme (ADP) and non-governmental Organization (NGO) have made tremendously efforts in making available timely and relevant agricultural information to farmers, particularly smallholder rice farmers in order to boost their farm productivity without endangering man and his environment with use of pesticides that aids in enhancing their productivity. Studies (Babu; et al; 2011; Gaber and Abdul-Latif; 2012; Ume, *et al* 2020)^[10, 50] showed that farmers have varied attitudes towards searching information available to them” Some show a high information seeking behavior, while some others do not. This differential in communication skills, applied resources and communicative channels may influence the information seeking search and the category of information being pursued and even their productivity, they added. This study aims to contribute to the prevailing body of knowledge on farmers' information-seeking behaviour in developing countries, in general, and in Anambra State, Nigeria in particular. The findings of this study will guide policymakers at the Ministry of Agriculture, as well for field-level extension agents, private organizations and non-governmental organizations (NGOs) for well-organized planning and functional information delivery. This study is conceived and materialized against the above background and setting. Specifically, the objectives of the study were to identify the sources of information available to the farmers, evaluating the level of information seeking behavior of the farmers, access the determinants of information seeking behavior of the farmers and identify the constraints to information seeking behavior in the study area.

Review of Related Literature

Information seeking behavior; Meaning and Processes

The basics of information seeking behavior also referred as information farming or information foraging is backed to the early hunter gatherer cultures (Bates, 2002)^[12]. Initially, family and friends have been avenue for information, but today grown to digital possibilities, a process where humans engage with each other to change their state of knowledge (Marchionini, 1995)^[34]. Several definitions of information seeking behavior, but the most generally accepted is that of Rice, McCreddie and Chang (2001)^[47] that states that ‘information seeking consists of activities between recognition of information need and the acquisition of relevant information. However according to Matusiak, (2006)^[35] because of challenges involved in defining information process, which included problems of classifying all assorted mechanisms of the process, as numerous arrangements exist, sources, categories of info, access points and search approaches, many scholars avoided or stay away from it.

Information seeking behaviour as a process, had caused several scientists to attempt to develop a process theory. Ellis (1989) was the first to model the process of information seeking behaviour. He stated the stages of the model as seeking process: starting, chaining, browsing, differentiating, monitoring and extracting. In 2003, Meho and Tibbo added networking as the seventh stage to Ellis information seeking behaviour; In

addition, they developed a model including the four overall search processes: searching, accessing, processing and ending (Meho and Tibbo, 2003). After Ellis (1989) and Wilson, Ford, Ellis and Foster (1999) [53] acknowledged information seeking as a sequences of uncertainties which, ultimately, resulting in solving a problem. In solving this problem, Wilson et al. (2002), developed a four stages model: problem identification, problem definition, problem resolution and solution statement. They decided that, additional information has to be collected to determine the ambiguity beforehand the scientist could change on to the subsequent stage. Furthermore, Wilson, et al, (2002) reported in the study that to increase the accurateness and magnitude of information obtained could entail directing the info searcher the pattern to follow. Kuhlthau (2004) [31] developed a six stage information search process, selection, exploration, formulation, collecting relevant sources of information and presentation, and concurred to the study of Wilson et al. (1999) that information seeking behaviour was due to doubts. It was presumed that, at every phase of the practice, additional info must be collected to eradicate the doubt involved in that stage in order to proceed to the succeeding one. The doubts of the searcher does decline as the closeness of the seeking practice is about to cease. (Kuhlthau, 2004) [31].

The conceptual framework of the information-seeking behavior

This research is centered on Wilson's (1997) model of user's information-seeking behaviour. This model comprises of constituents including user's information needs, their information seeking, the channels and sources they employ to acquire the information and the factors that inspire or hinder information use. Such conceptual frameworks are shown below. For instance, Mahindaratne, and Oinfei, (2017) [33] examined the information seeking behaviour (ISB) of vegetable farmers in Sri Lanka using 289 respondents. The regression analysis shown that information need and the channel characteristics affected vegetable farmers' ISB. The other factors affecting ISB were age, education, farming experience and training, operational factors such as land extent, land ownership and types of farming system, and personal and role-related factors such as perception of agri-information and information sharing behavior. Owolade and Arimi. (2012) [43] examined the information-seeking behavior and utilization among snail farmers in Oyo State with one hundred and twenty respondents out of three hundred and sixty-five registered members in Oyo state. Interview schedule was administered to elicit information relating to socio-economic characteristics, information seeking behaviour and utilization among snail farmers and the constraints faced by the snail farmers. Data were analyzed using frequency counts, mean, percentages, and correlation. Educational level of the farmers enhanced their capacities for seeking and utilizing agricultural information. Lack of credit facilities and inadequate information from extension agents were the major constraints identified by the farmers. Most of the respondents had high information-seeking behavior and utilization, which implies that farmers are willing to seek information that will improve their productivity.

Gebru, Yared and Gebremichael, (2017) [23] used 152 respondents selected randomly using simplified Yamane (1967) formula The primary data were collected through household survey and secondary data were collected by reviewing published and unpublished materials. The level of respondents information seeking behavior of farmers were analyzed by using mean and standard deviation and the determinants of information seeking behavior identified by ordered logit regression model. Information seeking behavior of farmers' was determined positively and significant by radio, mobile, extension contact, participating in any training, social participation, distance from the nearest market and farmers' perception. As well, Radad, I. Somayeh; Z. and Hassan B. (2016) [45] tried to compare information-seeking behaviour of ordinary and elite saffron farmers in Iran using 375 saffron farmers (295 ordinary and 80 elite saffron farmers) selected using the cluster sampling method. The results showed saffron onion, pesticides, cultivators and farmland worker were the main components of saffron farmers' information-seeking behaviour of both groups. The most important sources of information for both groups included reference to past experience, neighbouring saffron farmers, contact with informants and other family members. The main criteria which affected the behaviour of the two groups on the use of information sources were provided information in local language, native people, clear and intelligible information and low cost. Also, Malek-Mohammadi *et al.* (2008) examined the information seeking behaviour of strawberry farmers in the Kordestan province of Iran. The information-seeking behaviour, ere were affected by number of family members, area under cultivation, income, distance from farm to market, access to productive resources and need to obtain information.

Ume, *et al.* (2020) [50] did assessment of the information needs and information seeking behaviour of rice farmers in Enugu North Agricultural Zone of Enugu State, Nigeria. Using one hundred and twenty (120) sampled farmers. The information needs of the farmers were on agricultural marketing, improved seed (improved varieties), productive resources such as land, harvest management, fertilizer application, pesticides application, weed and disease control. The determinant factors to farmers' information searching behavior were farmers' .education level, poor access to power supply and poor access to communication Infrastructure affected farmers' seeking behavior. Additionally, the constraints to farmers' information seeking behaviour were poor access to information services, poor access to extension services, information not easily accessible and high cost of labour. In a study in South west, Nigeria on organic vegetable farmers, Adebayo and Oladele (2013) [41] revealed that the farmers' source of information needs were from progressive farmers, rs, neighbours, farmers' organizations and household members. As well, Benard *et al.* (2014) [13] in their study of rice farmers in Tanzania, found that their information needs were of the information on; marketing, weather condition, farming l credit, improved seeds, storage methods, planting methods, diseases and pest control and pesticide availability and its application. Furthermore, Okwu and Umoru (2009) studied agricultural information needs and accessibility by Nigeria women farmers. The result revealed

that the information needs of the sampled farmers were in areas of pesticides, fertilizer applications and improved farm implements, with their spouse, progressive farmers, farming organization and print media being their sources of information. The socioeconomic characteristics of the women farmers in Nigeria such as age, educational level and income of women farmers had positive correlation to information access.

Also, Ghiyasi and Paryab (2013) reported in their study on watermelon farmers in the Jovincounty in Iran, that the farmers' information seeking behavior were affected sources of information such as neighbouring farmers, other farmers and TV programmes. Additionally, Babu, et al. (2011) [10] used cluster analysis on access, frequency and use of information sources to identified four farmer information search behaviors – high, medium, semi-medium and low. in Tamil Nadu, India. Four information search behaviors to examine differences in information needs, sources were used and preferred sources. The result showed that rice production practices and credit information was more important for the low search group. High and medium searchers used a greater number of sources, which also included print media and TV. Besides, Sivabalan, Muralikrishnan, Muralikrishnan and Reghavendra Chowdary, (2017) [48] analyzed factors affecting the likelihood of adoption of mobile phones for getting agro market information by farmers in Tamil Nadu State, India using 2010 respondents. The multivariate ordered logit model was used to analyse the work and the result showed that more than two-third (67.80 %) of the users were found with medium level of m Readiness followed by 17.80 per cent with high level and 14.40 per cent low level of m Readiness towards mobile market advisory services. The mobile market advisories had a direct influence in selling of storable produce such as vegetables like cow pea cotton and onion.

Materials and Methods

Study Area

Anambra State of Nigeria was the study area. Anambra State is one of the five States in South east of Nigeria and located between latitude 5°38 'N and 6°47 'E of Equator and longitude 6°36 'N and 7°21 'E of Greenwich Meridian. The state has population estimates of population figure of 4.184 million people according to 2006 National Population Commission, (NPC), 2016). The state has annual rainfall range of 1600 mm – 1700 mm, mean temperature of 28 °C and average relative humidity of 64%. The state has 17 Local Government Areas with capital at Awka. The boundaries are formed by Delta State to the west, Imo State and Rivers State to the south, Enugu State to the east and Kogi State to the north. The inhabitants are mainly arable farmers cultivating crops like rice, yam, cassava, maize, sweet potato, vegetables, fruits and 'egusi' either as sole or mixed crops. As well, the people are into livestock rearing such as poultry production, goat and sheep rearing, piggyery and rabbit production. They still engage in other off farm income, included trading, vulcanizing, automobile mechanic, saloon and civil service

Sampling Procedure and Sample Size

A multi-stage random sampling technique was used to select Local Government Area (LGA), towns and processors. First, twelve LGAs were purposively selected out of seventeen. Second, ten towns were randomly selected from each LGAs. These brought to a total of one hundred and twenty towns. Third, one rice farmer each was randomly selected from each twenty towns. These brought to a total of one hundred and twenty farmers.

Method of Data Collection

Structured questionnaire and informal or oral interview was employed to collect primary data.

Data Analysis

Means, percentage responses and multivariate ordered logit model were used to address the objectives of the study.

Model Specification

Multivariate Ordered Logit

The influence of independent variables on information seeking behavior on safe pesticides was analysed using multivariate ordered logit. The Logit (and probit) models allot the dependent variable a probabilistic value between 0 and 1, which symbolizes a choice, or categories, from a set of mutually exclusive choices or categories (Grence, 2003). The logit distribution has lots of benefits over the others in the investigation of dichotomous result variable. Amongst, It is capable of being very elastic and simply used model from mathematical point of view and results in a significant interpretation. The binary logistic model has inability to postulate the assumption of linearity between dependent and independent variables and homoscedasticity as well. Hence, the logistic Herein, Y represents information seeking behaviour (low level, medium level and high level values) and Xi are the factors that influence the levels of information seeking behavior for safe pesticide use. A positive sign of a coefficient variable designates that the variable has a direct influence on the dependent variable and vice versa. The Ordered Logit model can be stated according to Sivabalan, *et al.* (2017) [48] as;

$$\text{Probability}(Y) = \frac{1}{1 + \exp(-\alpha - \sum_{i=1}^n \beta_i X_i)} \quad \dots(1)$$

$$\text{logit}(p_1) = \log \frac{p_1}{1 - p_1} = \alpha_1 + \beta'x \quad \dots(2)$$

$$\text{logit}(p_1 + p_2) = \log \frac{p_1 + p_2}{1 - p_1 - p_2} = \alpha_2 + \beta'x \quad \dots(3)$$

$$\text{logit}(p_1 + p_2 + \dots + p_k) = \log \frac{p_1 + p_2 + \dots + p_k}{1 - p_1 - p_2 - \dots - p_k} = \alpha_k + \beta'x$$

and $p_1 + p_2 + \dots + p_{k+1} = 1 \quad \dots(4)$

Marginal effect statistics were used to allow for interpretation of the size of the impact as coefficients; such statistics measure the unit change in the dependent variable (between 1 and 0) in

response to a unit change in the value of an independent variable, with other covariates held constant at their mean values. Higher marginal effect values imply a greater influence (Either positive or negative, depending on the sign) the dependent variable. The multivariate approach was employed to assess factors that affect cotton producers' adoption pattern of different information sources i.e. private, extension and media (Jenkins, Velandia, Lambert, Roberts, Larson, English, and Martin (2011) [28]. The adoption decision model using a multivariate logit permits for improvement in efficiency in estimation in the case of simultaneity of adoption. The advantage ordered logit has over other models is that individual coefficients can be verified. Hence, the steadiness of the model can be evaluated more efficiently compare to other models. The information seeking behavior, y variable can be estimated using the equation

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, \dots, X_n) + e \dots \dots \dots (5)$$

Where
 Y = information seeking behavior (High; Medium and Low)

- Where
 X₁ = Age in years
 X₂ = Gender (Dummy)
 X₃ = Educational Level in years
 X₄ = Farm Size in Hectare
 X₅ = Farming Experience in years
 X₆ = Membership of Organization (Member; 1 and otherwise; 0)
 X₇ = Access to Credit (Access; 1; otherwise; zero)
 X₈ = Access to extension Services (Access; 1; otherwise; zero).
 X₉ = Radio Ownership (Dummy; Ownership; yes; Otherwise; 0)

- X₁₀ = Mobile Phone Ownership (Dummy; Ownership; yes; Otherwise; 0)
 X₁₁ = Distance from the nearest market (Km)
 X₁₂ = Distance from the training centre (Km)
 X₁₃ = Participation in Training (Dummy (Yes; 1 and No; 0)
 e = error term

Results and Discussion

Table 1: The descriptive analysis of categorical variables.

Information seeking behavior								
Variables	Low		Medium		High		Total	
	No	%	No	%	No	%	No	%
Gender								
Males	21	70	38	76	24	60	83	69.17
Females	9	30	12	24	16	40	37	30.83
Educational level								
1 - 6	15	50	5	10	7	17.5	27	22.5
7 - 12	10	33.33	35	70	29	72.5	74	61.67
13 - 19	5	16.67	10	20	4	10	19	15.83
Radio								
Yes	26	86.67	42	84	34	85	102	85
No	4	13.33	8	16	8	6	15	12.5
Mobile Phone								
Yes	23	76.67	43	86	32	80	98	81.67
No	7	23.33	7	14	8	20	22	18.33

Source; Field Survey, 2020

Descriptive analysis of the categorical variables

The Table 1 above shows that the gender of the respondents that had low, medium and high information seeking behavior were 69.17% males, while 30.83% females. Moreso, the education levels of respondents shows that 22.5% had spent of 1 – 6 years in school, 61.67%; 7 – 12 and 30.83%; 15.83%. Also, from the 120 sampled farmers, 102 (85%) of them own radio and 15 (12.5%) did not own radio. The research reveals that about 98(81.67%) of them own mobile phone, while 18.33% had not own.

Table 2: Descriptive analysis of the continuous variables.

Information seeking behavior									
Variables	Low			Medium			High		
	No	Mean	STD	No	Mean	STD	No	Mean	STD
Age	30	43.34	13.446	50	44.25	13.825	40	46.31	13.090
FarmSize	30	1.5	2.098	50	1.3	1.33	40	1.28	1.086
Farming Experience	30	5.091	2.006	50	6.168	3.140	40	7.261	2.004
Organization	30	1.56	0.723	50	1.862	2.521	40	1.670	2.925
Access to credit	30	3.117	2.309	50	3.367	17.5	40	4.094	2.990
Access to extension services	30	5.033	3.110	50	7.022	0.725	40	9.090	3.079
Distance to Market	30	4.067	3.001	50	5.604	2.710	40	6.760	0.340
Distance to the Training Centre	30	4.760	0.673	50	4.773	1.087	40	4.980	2.004
Participation in Training	30	0.467	0.429	50	0.541	1.085	40	1.132	2.084

Source: Field Survey; 2020

Descriptive analysis of the continuous variables

Table 2 shows the descriptive information on the continuous variables used for the research. The minimum and maximum age of the sampled farmers was 26 and 82 years, respectively. The STD ages of low, medium and high information seeking behaviour of the sampled farmers were 13.446, 13.825 and 13.090, years, respectively. The minimum and maximum farm size of the respondents was 1.5ha and 3.2 ha respectively. The average land holding of the low, medium and high information seeker respondents were 1.5, 1.33, and 1.28 ha, respectively.

The minimum and maximum distant score from the resident's home were recorded as 1 and 14 km, respectively. Furthermore, the mean of low, medium and high information seeker categories on credit access either from informal or formal lending agencies was 3.117, 3.367 and 4.094 respectively. Moreover, the result of the study indicated the mean distant to market from the respondents' was 4.067, 5.604 and 6.760 for low, medium and high information seeker categories respectively.

The average extension contact of the low, medium and high information seeker respondents were 5.033, 7.022 and 9.090. The result of the study validates that the mean of years of farming experiences of the sampled farmers was 2.006, 6.168 and 7.261 for low, medium and high information seeking on safe use of pesticides. The minimum and maximum farming experiences of the respondents were 6 and 34 years. Additionally, the minimum and maximum of membership of farming organization of the respondents was 2 and 5 respectively. The average membership organization of the low,

medium and high information seeker respondents were 1.56, 1.862 and 1.670 respectively. The minimum and maximum distances to the training centre were 23 km and 42 km respectively. The mean of the distances to the training centre of the low, medium and high information seeker sampled farmers were 4.760, 4.773 and 4.980. The result demonstrated that mean of participation in training of the low, medium and high information seeker respondents were 0.467, 0.541 and 1.132 respectively.

Table 3: Distribution of Respondents According to Source of Information

Source	Frequency	Percentage (%)	Ranking
Radio	78	65	4 th
Television	54	45	7 th
Extension agents	76	63.33	3 rd
Friends	98	81.67	1 st
Conference	34	28.33	11 th
Cellphone	58	48.33	6 th
Input dealer	88	73.33	2 nd
Farming group	62	51.67	5 th
Newspapers	45	37.5	9 th
Farm Magazines	47	39.2	8 th
Workshops	38	31.67	10 th
Market	33	27.5	12 th
Internet	31	25.83	13 th
Community meeting	26	21.67	16 th
Community Leader	30	25	14 th
Research Institute	28	23.33	15 th
Fadama	24	20	17 th
International Agencies	20	16.67	18 th
Religious organization	18	15	19 th
Families	15	12.5	20 th
Workshop	12	10	21 th

*Multiple Responses

Source, Field Survey, 2021

Most of the respondents (81.67%) sourced their information on safe pesticide use from their friends and ranked first. This finding concurred with work of Ozowa, (2004) ^[44], who posited that this could be because their friends have gained much information on that through many years of experimentations and observations. This result confirms to popular statement that “poor knowledge-sharing culture is not severe constraint for farmers’ information seeking behaviour, since they gain information from fellow farmers with minimal restrictions”. Also, this was followed by input dealers’ information source (73.33%). Diomed and Nauges, (2016) ^[19] reported in their study that input dealers play prominent roles in distributing information to farmers as relates to disease and pest management, pesticide and fertilizer application. However, Babu, Glendenning, Asens, Okyere, and Govindarajan, (2011) ^[10] stated that the input dealer information source exploits farmers’ time pressure to purchase inputs by pushing certain products and as well, it (input dealers) operates best where the sources of information is limited.

Third in that order of importance, radio source was reported by 65% of the total sampled farmers. Several studies (Bachhav;

2012; Benard, Dulle and Ngolapa, 2014; Kurma, 2014) ^[11, 13] indicated that information seeking through radio is a very effective medium of disseminating new agricultural innovations and marketing information to farmers. This could be due to the fact that it is the cheapest and quickest means of passing information to farmers (Ahmed; *et al*, 2014). Fifth source of information of importance was extension services (63.33%). In agreement to the finding of Ume, *et al.* (2020) ^[50], they reported that change agent is prominent in information dissemination to the farmers primarily on seed varieties and best practices. However, Adebayo and Oladele; (2013) ^[1] work on sources of information to farmers reported that many of the farmers do not obtain information from extension, as many of them do not even know the change agent in their vicinity. The least of the sources of information considered was through workshop (10%). This may be linked to seldom involvement in workshop, as such opportunity is often hijacked by politician (Ume, *et al.* 2016) ^[49].

Information seeking behaviour of smallholder Rice farmers on Safe pesticides Use

Table 4: Smallholder farmers category based on their information seeking behaviour

Information seeking behavior	Score	Frequency No Percentage	
Low	24 – 27	24	20
Medium	28 – 37	60	50
High	38 – 46	36	30
Total		120	100

Source: Field Survey, 2020

Herein, the sampled farmers were informed to respond to their information seeking behavior in three options (low = 1, medium = 2 and high = 3) ordered based on the score gotten from the information sources. In Table 3, the real score calculated from the interview were 24 and 46 for minimum and maximum respectively. The total mean score of the information seeking behaviour was 34.46 with SD of 4.7.. The descriptive analysis shows that the respondents that low 24 (20%), medium 60 (50%) and high 36 (30 %) level of information seeking behavior.

The low information seeking behaviour of the rice farmers on safe pesticides use particularly the female ones may be attributed to some socio-economic and cultural constraints such as low

level of education, inadequate access to farmland and inadequate access to agricultural information from a variety of sources. These factors could affect their willingness to seek for agricultural information as relates to safe pesticide use in order to boost their output frontier. Studies (Dutta, 2013; Gaber and Abdul-Ratif, 2013; Mekonnen and Agonafir, 2013) [20] show that the information seeking behaviour of the rice farmers facilitates them to be more rational in safe pesticides use in order to guide against pesticides misuse and abuse and still maintain high farm outcome.

Rice Farmers Information Seeking Behaviours on Safe Use of Pesticides

Table 5: Maximum Likelihood Estimation of the Ordered Logit

ISB	Coefficient	Standard Error	Marginal Effect		
			Low	Medium	High
Age	-0.323	0.421	-0.0600	-0.0129	0.0857
Gender	0.253	0.135	-0.0317	-0.0236	0.0175
Educational Level	0.516***	0.007	-0.0316	-0.0248	0.0445
Farm Size	0.443	0.217	-0.0614	-0.0098	0.0387
Farming Experience	0.009	0.117	-0.0111	-0.07436	0.0663
Organization	0.542	0.109	-0.0308	-0.0016	0.095
Access to Credit	0.009	0.227	0.0501	0.1212	-0.0171
Extension services	0.338*	0.209	0.0216	0.0321	0.7280
Radio ownership	- 0.770**	0.278	0.0113	0.3412	-0.0389
Mobile phone Ownership	-0.019*	0.607	0.0077	0.0715	0.0321
Distance from Market	0.031***	0.195	0.1062	0.2210	0.6906
Distance from training Centre	0.800	0.619	0.0020	0.0013	-0.0027.
Participation in Training	0.004	0.224	0.7104	-0.0140	0.0047

Number of obs=120; LR chi2(16)= 114.87; Prob >chi2=0.000; Log likelihood=-96.07; Pseudo R2=0.3754. ** and ***, refers significant level at 1 and 5%, respectively.

Source: Field Survey, 2020.

The variance inflation factor (VIF) and contingency coefficient post estimation test reveal that all hypothesized variables factor have no multicollinearity and indignity problems. The above table showed that the model had a high likelihood ratio and is significant at less than 1% levels of significance, indicating that the ordered logistic model with 13 independent variables is more effective than an intercept-only at predicting cumulative probabilities for each level of the information seeking behavior. The LR of 114.87 with 16 degree of freedom in the model output also indicates that, the parameters included in the model were significantly different from zero. Also, the ordinal logit model result reveals that the coefficient of educational status of the farmer was significant and positively related to information seeking behavior. The marginal effect for the variable as indicated in Table 6 implies that holding other independent variables in the model constant, the educated sampled farmers showed increased information seeking behavior more possible with high level by 4.45%. This result is consistent with that of Ume et al. (2020) [50] and Aguolu, (1997) [4]. The positive sign identity of the coefficient as stated by Ume, et al. (2020) [50]

could be attributed to the fact that education catalyzes the process of information flow and leads the farmer to as wide as possible, the different pathways of getting information about a technology.

More so, the marginal effect of the result as contain in Table above shows that with other explanatory variables being constant around their mean value, a unit increase in extension contact could improve information seeking behavior of the sampled farmers by 72.80 % and more probable to be at high level. The positive sign identity of the coefficient extension services to safe pesticide use result is synonymous with a *priori* expectation and finding of Kurma, (2014). He opined that extension services aids in assisting farmers in gaining access to information on input availability and other demand based information in order to enhance their farm productivity However, the work of (Verma, et al; 2012) [51] did not synchronize with aforesaid positive sign identity of the coefficient. He revealed that the notion that information from the public sector extension system such as university, colleges of agriculture and research stations is described as being

“locked” and difficult to access, may perhaps be the reason for the sign identity of the coefficient.

Furthermore, the marginal effect of the ordered Logit shows that with other explanatory variables being constant around their mean value, a unit increase in ownership of radio could decrease information seeking behavior of the sampled farmers by 34.12 % more likely to the favour of high level. The negative sign identity of the coefficient is not synonymous with a *priori* expectation and finding of Starasts, (2014). He posited that lots of farmers in many rural areas of sub-Saharan Africa inasmuch as may have radio at their diverse homes, but seldom aware when such agricultural information is aired. As well, farmers may not have money to buy battery for the radio operation, especially where there is epileptic of power supply as witnessed in many rural areas, hence affecting information transfer. However, the work of Odini, (2014) ^[41] do not agree with the negative sign of the coefficient. They posited that not only do farmers seek and find information from radio useful, but such information seeking behaviour could enhance farmers’ understanding of improved agricultural practices, thus increasing positively their productivity.

Besides, access to mobile phone by farmers was negatively influenced information seeking behavior, against a priori knowledge and work of Afolabi, (2003) ^[3]. They reported that many farmers do not obtain information through mobile phone, and this may perhaps be attributed to high telephone tariff charge in Nigeria, thus deterring lots of farmers from using such service. The finding of Daniel, Umer and Jamal, (2015) ^[16] on marketing of farmers’ output showed positive sign identity of mobile phone and information seeking behavior of farmers on safe pesticides use. The marginal effect shows that keeping other variables constant, mobile phone ownership respondents showed increased in information seeking behavior more likely with high level by 3.21%.

Additionally, distance from farmers’ resident to the market had positive sign identity and significant at 5% alpha level. The finding of Babu, *et al*; (2011) ^[10] concurred to above positive relationship. They posited that farmers who reside very near to market have high propensity to access more information sources from reliable sender. In contrast, Dutta, (2013) ^[20] reported a negative sign of the coefficient and this could be associated to the fact that farmers residing far from the market, could cultivate habit of using traditional ICTs like radio in searching for information. The marginal effect on model result established that keeping other independent variables used in the model constant, a unit increase in distance from sampled farmers’ home to the nearest market, increases information seeking behavior of the smallholder farmer by 69.06 % to the favor of high level.

Conclusion and Recommendation

Based on the results, the following conclusions were deduced; Rice farmers in the study area had medium level of information seeking behavior. Also, the result of socioeconomic characteristics of rice farmers influencing information seeking behaviours on safe use of pesticides were the coefficients; of educational level, extension services and distance from farmers’ residence to the market, while the coefficients of radio

ownership and mobile phone ownership were negative. Based on the conclusion, the following recommendations were proffered

- (i) As most of the farmers in the study area and in the country in general are small landholders, improve their information search strategies entails enhancing their access to timely and reliable information, which is capable of boosting their farm outputs
- (ii) Microfinance, commercial banks and other government lending agencies should be persuaded to give credit to farmers at moderate interest rate in order to enhance their odd of increasing their information search through purchasing of print and other media
- (iii) Farmers’ adult literacy education programme is mandatory in order to inculcate the basic skills and abilities to seek and receive needed agricultural information through modern communication channels such as mass media, extension agents, etc.
- (iv) It is thus important for Government agencies concerned to improve access to extension services by farmers through employing more extension staff, prompt payment of salaries and providing other incentives to them to be alive in their duties. Furthermore, there is need to strengthen extension contact through individual extension contact using home and farm visit should be sustained by using modern ICTs.
- (v) Moreover, farmers associations such as cooperative could be encouraged by government agencies concerned to play significant role in analyzing the needs of the farmers and provide them with the required information.

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