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Effect of Information Sources on Farmers' Adoption of Sawah Eco-technology in Nigeria

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Abstract

This study examined the effect of information sources on farmers' adoption of Sawah eco-technology in Nigeria. Purposive sampling technique was used to select 166 sawah farmers from Delta, Ebonyi, Kebbi, Kwara, Niger and Ondo states. Interview guide was used to elicit information on the farmers' personal and production characteristics, sources of information and the sawah eco-technologies. Frequency counts, percentages, means, and chi-square were used to analyse the data. The results of the study revealed that average years of rice production and sawah rice production of the respondents were 34.0 years and 6.9 years respectively. The average farm size and yield of sawah rice of the respondents were 0.46 ha and 3.25 tonnes/ha, respectively. Commonly adopted sawah eco-technologies by the farmers were nursery bed preparations (100.0%), bund construction (92.9%), canal construction (84.9%), flooding (78.3%), puddling (73.4%) and use of power tiller (65.2%). The main sources of information on sawah by the respondents were contact farmers (92.4%), farmers' association (87.3%), extension agents (87.3%), researchers (79.3%) and friends/relations (77.9%). There was significant ($p<0.05$) association between respondents' use of contact farmers ($\chi^2 = 31.28$), extension agents ($\chi^2 = 22.19$), farmers association ($\chi^2 = 23.06$), researchers ($\chi^2 = 19.62$) and friends / relations ($\chi^2 = 31.09$) and adoption of sawah eco-technology. This study concluded that information sources are important in dissemination of sawah technologies in Nigeria. Therefore, improving the use of information sources that significantly affect adoption of sawah technology should be encouraged among farmers.

Key words: Information sources, *Sawah* eco-technology, technology adoption

Introduction

Rice is cultivated in virtually all the agro-ecological zones in Nigeria. Despite this, the area cultivated to rice still appears small. Nigeria has an estimated 4.6 million hectares of land for rice production, with only 1.7 million hectares put into cultivation (Abbas *et al*, 2018). Domestic rice (paddy) yield remained almost stagnant from 1.2 to 1.5 t/ha between 1995 and 2005 and production has never been able to meet the demand, leading to considerable imports. In Nigeria, 180 million people are estimated to consume nearly 6 million tons of rice per year. Just over half, or about 3.1 million tons, is imported despite a tariff of 70%. Over half of imports in 2015 entered Nigeria from

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neighbouring Benin where the duty is only 12%. Nigeria's rice import has jumped to 3.4 million metric tons in 2019, making Nigeria the world's biggest rice importer after China (Grow Africa, 2018). The demand for rice has been increasing at a much faster rate in Nigeria than in other West African countries (Udemezue, 2018). Since the mid-1970s, rice consumption in Nigeria has risen tremendously, at about 10% per annum due to changing consumer preferences (Udemezue, 2018). Consequently, the Nigerian government has interfered in the rice sector over the past few decades such as, import ban, increased tariff on rice importation and recently the anchor borrower's programme not only to make households to be food secure, but also to ease the pressure on foreign exchange that often go to secure imports that are used to bridge the consumption demand-supply gap (Abbas *et al*, 2018). Public policy in this respect has neither been consistent nor appropriate and domestic production has continued to lag behind demand (Abbas *et al*, 2018). The urgent need to increase local production necessitated the introduction of *sawah* technology to enhance domestic production.

Sawah technology system of rice production, which served as a driving force for the realization of Green Revolution in Asia, is a promising tool for the improvement of food production in sub-Saharan Africa and Nigeria in particular (Alarima *et al*, 2018). The green revolution package of high-yielding crop varieties (HYVs), irrigation and agrochemicals is mainly a technological intervention to boost food production, which can only be effective if properly communicated and disseminated to the farmers through appropriate channels. *Sawah* is a bunded, puddled and levelled field with inlet and outlet for irrigation and drainage (Alarima *et al*, 2016). Wakatsuki *et al.* (2018) asserted that *sawah* rice farming system is the only solution to the long awaited green revolution in West Africa. This can only be achieved if the farmers acquired the skills and knowledge required for effective adoption and utilization of *sawah*, properly communicated to the farmers through appropriate channels.

An important pre-requisite for the adoption and diffusion of any innovation within a social system is the effective communication of information relating to the innovation involved (Bakkabulindi, 2014). As reported by Orgill (2019), effective communication channels can facilitate innovation diffusion. Communication of agricultural innovations is the engine of growth and social transformation in rural areas (FAO. 2014). Agricultural development is not foreseeable without information and information cannot play its role until it is communicated. Communication of innovations is important to provide information and knowledge on agricultural innovation and adoption to eliminate poverty amongst households. In the area of agricultural extension, communication can play an important role in raising the productivity of farmers.

According to Yusuf (2018), Nigeria has elaborate agricultural research and extension system, far reaching innovations that are capable of boosting farmer's agricultural

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production and Nigeria's economic development. The impact of such technological innovation can only be felt if the farmers at the receiving end can optimally utilize them in their day to day farming activities. LawalIro *et al.* (2014) revealed that the more information is accessible, the more it is likely to be used. Therefore, for information to be used must be communicated to the users for their day to day activities. However, most of these innovations do not reach the farmers and this has been attributed to lack of effective agricultural information dissemination strategies. Communication strategies that can ensure effective delivery of these technological innovations have to be in place.

A major constraint to agricultural development in Nigeria is the rate of transfer of improved agricultural technologies to farmers from their sources rather than the non availability of the technologies. Agricultural research results constitute an important knowledge base that should be made available to farmers through sources whose attributes are acceptable. Adoption of modern technology must be used in order to meet the increased demand for food by the population and disseminated through the use of multi – media communication strategies for their impact to be felt.

Identification of the information sources and channels, utilization pattern of these channels and credibility of the sources of information as perceived by the farmers will be helpful for extension agencies and personnel engaged in transfer of *sawah* technology. This will help in selecting appropriate information channels for effective and rapid transfer of *sawah* technology to the target farmers. This study examined the effect of information sources on farmers' adoption of Sawah eco-technology in Nigeria. The specific objectives are to identify different sources and channels of agriculture information available to the *sawah* farmers, identify the most utilized sources and channels and determine the effect of information sources on the adoption of *sawah* technology so as to develop a suitable communication strategy for improved production.

Methodology

The study was carried out in Nigeria. Nigeria is located on Latitude 9° 04' 39.90" N Longitude 8° 40' 38.84" E. Nigeria is located in Western Africa on the Gulf of Guinea and has a total area of 923,768 km^2 (356,669 sqm). Nigeria shares land borders with the Republic of Benin in the west, Chad and Cameroon in the east, and Niger in the north. Agriculture contributed 41.84% to the GDP in 2009. Nigeria has 36 states and Abuja the Federal Capital Territory (FCT). Nigerian economy is mainly an agrarian one. Rice is one of the main crops grown in Nigeria. Rice is grown all over Nigeria. The major states know for rice production are Kebbi, Niger, and Ebonyi. Other states are Anambra, Lagos, Ekiti and Ondo states. In Nigeria, the sawah system was introduced through on-farm adaptive research in the two research sites of Gara and Gadza inland valleys, located in Bida, Nigeria in 1986 (Wakatsuki *et al*. 2018). This study was carried out in six states where *sawah* is being practiced. The states are Delta, Ebonyi, Kebbi,

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Kwara, Niger and Ondo.

Data used in this study were collected in all the *sawah* sites in Nigeria namely: Asaba, Abakaliki, Arugungu, Ilorin, Bida and Akure. A list of rice farmers in the villages where *sawah* technology was disseminated was compiled. One hundred and sixty six *sawah* farmers in the study locations were purposively selected as shown in the Table 1 below. A well-structured interview guide was used to elicit information from the farmers.

Table 1: *Sawah* farmers sampled

State	Location	Sampled *Sawah* Farmers
Delta	Asaba	1
Ebonyi	Abakaliki	12
Kebbi	Kebbi	12
Kwara	Ilorin	4
Niger	*Ejeti	30
Niger	*Emir Ajape	2
Niger	*Etsusegi	6
Niger	*Etundandan	20
Niger	*Nasarafu	12
Niger	*Shabamaliki	25
Niger	*Sheshibikun	40
Ondo	*Akure	2
Total		166

*All the locations in Niger state are in Bida.

Percentages and mean were used to analyze the socio-economic and farming characteristics of the farmers. Chi-square analysis was used to determine the relationships between adoption of sawah technologies and other study variables.

Measurement of Variables

Information Sources on Sawah Eco-technology: This was measured by listing sources of information available while the respondents chose the appropriate sources applicable to them. These sources are: electronic media (TV/radio), extension agents, researchers, friends/relations, contact farmers, farmers association, extension/farm publication, farm visit, NGOs and print media (newspapers, journals, magazine). Multiple responses were allowed.

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Adoption of Sawah Eco-Technology: This was determined by listing all the aspect of *sawah* technology and farmers were asked to indicate those adopted. The aspects of *sawah* technology are bund construction, power tiller use and puddling, levelling, smoothening, nursery, canal construction, irrigation and flooding, dyke construction and use of sand bags. Multiple responses were allowed.

Results and Discussion

Farm Characteristics of Respondents

The results of the study reveal that respondents' years of rice production and sawah rice production were 34.0 years and 6.9 years respectively. The mean household size and farm size were 12 persons and 0.46 ha respectively. Average income of farmers was ₦361,000 per year. The average yield of *sawah* rice among the respondents was 3.25 tonnes per hectare. Although this yield is low but is however higher than 1.5 tonnes per hectare from traditional rice fields. The results further revealed that 80.7% depend on family labour and 92.8 % are members of farmers' association.

Table 2: Farm characteristics of respondents

Variables	Distributions
Farm size	Average= 0.46 ha
Income	Average=₦361,000
Years of experience in rice production	Average=34 years
Years of experience in *sawah* rice production	Average=6.98 years
Yield	Average = 3.25 tonnes

Information Sources on *Sawah* Eco-technology

The main sources of information on *sawah* eco-technology for the respondents as shown in Table 2 are extension agents (87.3%), researchers (79.3%), friends/relations (77.9%), contact farmers (92.4%), farmers association (87.3%), farm visit and print media (newspapers, journals, magazine) (12.7%). This is in line with Adio *et al.* (2016) who revealed that the information sources and service mostly used by the farmers included radio, television, extension workers, cooperative societies, friends and

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colleagues, newspapers and magazines, books/leaflets, phones, libraries and institutes. Information is a critical resource in the operation and management of the agricultural enterprise. Access to the right information at the right time in the right format and from the right source may shift the balance betweensuccess and failure of the farmer (Botlhoko and Oladele, 2013). Information is an essential ingredient in agricultural development programmes. The non-provision of agricultural information is a key factor that has greatly limited agricultural development in developing countries. Agricultural information interacts with and influences agricultural productivity. Agricultural productivity can arguably be improved by relevant, reliable and useful information and knowledge.

Table 3: Information sources about *sawah* eco-technology among the respondents

Information Sources	Percentage*
Electronic media (TV/radio)	19.3
Extension agents	87.3
Researchers	79.3
Friends / relations	77.9
Contact farmers	92.4
Farmers association	87.3
Extension/farm publication	20.7
Farm visit	68.1
NGOs	22.1
Print media (newspapers, journals, magazine)	12.7

* Multiple response

Adoption of *Sawah* Eco-Technology

Table 3 reveals that *sawah* eco-technology has high adoption among the respondents. Commonly adopted *sawah* eco-technologies by the farmers were nursery bed preparations (100.0%), bund construction (92.9%), canal construction (84.9%), flooding (78.3%), puddling (73.4%) and use of power tiller (65.2%). The high yield from *sawah* field (i.e. 3.25 tonnes/ha against 1.5 tonnes/ha), resulting from high rate of tillering, water and fertilizer management in addition to weeds control ability resulted in the rate of adoption. *Sawah* eco-technology offers low-cost irrigation and water management for rice production resulting in paddy yield of more than 4 tonnes/ha but with improved agronomic practices and management, paddy yield can be more than 10 tonnes/ha (Alarima, *et al* 2018).

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The *sawah* system can be managed as multifunctional constructed wetland (Wakatsuki *et al.* 2018). Submerged water can control weeds and because of the reduction of ferric to ferrous ion, phosphorous availability is increased and both acid as well as alkaline soil pH is neutralized. Hence, micronutrients availability is also increased. These mechanisms not only encourage the growth of rice plants but also the growth of various aquatic algae and other aerobic and anaerobic microbes which help increase nitrogen fixation in the *sawah* system. These processes increase the fertility of *sawah* system hence the yield.

Table 4: Adoption of *sawah* eco-technology package

***SAWAH* Technology Package**	**Adoption (%)**
Puddling	73.4
Flooding	78.3
Levelling	48.3
Smoothening	12.4
Nursery	100
Power tiller use	65.2
Dyke construction	4.1
Bund construction	92.9
Canal construction	84.9
Use of sand bags	59.3

Association between Adoption of S*awah* Eco-Technology and Sources of Information

Table 4 reveals significant association between contact farmers (χ^2 = 31.28), extension agents (χ^2 = 22.19), farmers' association (χ^2 = 23.06), researchers (χ^2 = 19.62) and friends / relations (χ^2 = 31.09) and adoption of *Sawah* eco-technology. This implies that contact farmers, extension agents, farmers' association, researchers and friends/relations influence the adoption of *sawah* eco-technology among the farmers. In

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addition, the results imply that face-to-face methods (such as contact farmers, extension agents, farmers' association, researchers and friends/relations) used in dissemination of information on sawah have significant effect which may be as a result of the fact that the interactions are immediate and may be confidential. In addition, easy and convenient access to these sources of information by the farmers may also be responsible for the results of this study. This also revealed that farmers-led sources are more effective in dissemination of sawah technology among the respondents.

As reported by Duhan and Singh (2017), agricultural universities, state agriculture department, private companies, agriculture input dealers, internet, fellow farmers, town criers, television, mobile phones, film shows and radio are information sources which aid effective dissemination of information and adoption of technology. Mosharraf *et al.* (2016) further reported that neighbor, television, experienced farmers, radio, input dealer, newspaper, local extension agent and farm laborer were major sources preferred by the majority of the farmers for getting information while farm publications, NGO workers and fisheries officers were least preferred by the farmers as information sources.

Table 5: Association between adoption of *sawah* eco-technology and sources of information

Variables	χ^2
Electronic media (TV/radio)	7.12
Extension Agents	22.19*
Researchers	19.62*
Friends / relations	31.09*
Contact farmers	31.28*
Farmers Association	23.06*
Extension publication	5.76
Farm Visit	2.85
NGOs	3.95
Print media (Newspapers, Journals, magazine)	10.97

*P≤ 0.05.

Conclusion and Recommendations

Information sources are important in dissemination of sawah technologies in Nigeria. Commonly adopted *sawah* eco-technologies by the farmers were nursery bed preparations, bund construction, canal construction, flooding, puddling and use of power tiller. Contact farmers, extension agents, farmers' association, researchers and

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friends/relations influenced the adoption of *sawah* eco-technology among the farmers. Therefore, improving the use of information sources that significantly affect adoption of *sawah* technology should be encouraged. Effective training of the main source of information (contact farmers, extension agents and researchers) would help in the dissemination of *sawah* technology to other farmers. Extension agents should use a wide range of information channels in the dissemination efforts for *sawah*, such as electronic media (TV/radio), extension agents, researchers, friends/relations, contact farmers, farmers' association, extension/farm publication based on the results of the study.

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