

EFFECTS OF ACCESS TO FARM RESOURCE ON ADOPTION OF SAWAH TECHNOLOGY AMONG FARMERS IN RICE PRODUCING STATES OF NIGERIA

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ABSTRACT

Access to necessary farm resources plays a vital role in the adoption of any agricultural technology. This study examined the effect of access to farm resource on the adoption of Sawah technology in Nigeria. The study described the socioeconomic characteristics of the respondents, determined the adoption level of Sawah among the respondents and ascertained respondents' access to required resources. Using interview guide, data were collected from 154 selected Sawah farmers. Descriptive statistics and Regression analysis were used to analyse the data. The respondents were predominantly male (99%), married (98%) and had Quranic education (64%), with mean age of 42.3 years. The mean household size was 14, farm size ranged from 0.03 to 10 hectares (Average = 0.5 ha), the average yield was 4.65 tonnes per hectare, and mean farmers' annual income was ₦151000. Sawah technology package was fully adopted by 56.3% of farmers, partially adopted by 30.6% and discontinued by 13.2%. The farmers had access to land, but the access varied from full (46.2%) to partial (53.8%). Farmers had little (43.7%) to no access (37.0%) to equipment and tools, of which the main concern was the power tiller. The majority of farmers had access (80.7%) to required labour. Farmers had no adequate access to improved seed (70.6%), credit and loans (70.6%), information (76.5%) and extension services (69.7%). Farmers' level of adoption was related to access to land ($\beta = 0.204$), equipment/tools ($\beta = 0.178$), required labour and r ($\beta = 0.356$), cash ($\beta = 0.191$), information ($\beta = 0.247$) and extension services ($\beta = 0.275$). This study has brought to fore the roles of access to resources in adoption and dissemination of Sawah technology. For further dissemination and adoption of Sawah technology, policymakers must bear the major findings of this study in mind especially on provision of land, improved seed, credit and loans and extension services.

Keywords: Sawah technology, Farm resource, Adoption, Farmer and Access to land

INTRODUCTION

Access to farm resources played a vital role in adoption of any agricultural technology. Adoption of agricultural technology depends on availability and efficient use of farm resources such as land, labour, information, capital (credit) and farm inputs (fertilizers, irrigation and seeds) (ATAI, 2011). Availability of these farm resources has been identified as major factor in agricultural development. The lack of access to farm resources could therefore be a constraint to agricultural development. The constraint of lack of access to farm resources range from unsecured land tenure, to lack of capital and access to affordable credit, access to input, access to good road infrastructure and poor extension services (Alarima *et al.*, 2011).

The constraints related to the tenure system, such as insecurity of land tenure, unequal access to land, lack of a mechanism to transfer rights and consolidate plots, have resulted in under-developed agriculture, high rate of landlessness, food insecurity, and degraded natural resource (Alarima *et al.*, 2011). The lack of capital and access to affordable credit is cited by smallholders as the main factor behind the low productivity in agriculture (ATAI, 2011). Infrastructure such as roads and irrigation play a key role in facilitating technology adoption. Improved transportation is also associated with diffusion of technology, better

use of inputs and better prices for farmers (ATAI, 2011).

Sawah as a tool for achieving a self-sufficiency in rice production in Africa particularly Nigeria relies more on the availability of needed farm resources. Adoption of Sawah technology can only be effective in providing the most desired increase in rice production in Nigeria based on the availability and efficient use of farm resources. Sawah refers to levelled rice field surrounded by banks with inlet and outlet for irrigation and drainage. The basic elements of Sawah system include improved irrigated rice basins, seedbed preparation, transplanting and spacing of seedlings, fertilizer application and most importantly, appropriate water management. Sawah development involves the construction of structures such as bunds, canals, and dykes, which require land with secure tenure (either permanent or for a reasonable number of years) for the farmers to break even on the investment (Alarima, *et al.*, 2011).

Land tenure security determines whether people will invest in and adopt Sawah technology and can therefore be regarded as an important ingredient in adoption of the technology. According to FAO (2001), land tenure and barriers related to land availability are major constraints to agricultural intensification. Input such as seeds, fertilizers, irrigation facilities and farm implements are also critical for adoption of any agricultural technology.



The non-provision and non availability of these inputs has greatly limited agricultural development in developing countries. Information is a critical resource in the operation and management of the agricultural enterprise. Agricultural information is an additional factor of production to the existing factors of production, such as land, labour and capital (Tembo, 2008). Access to the right information at the right time in the right format and from the right source may shift the balance between success and failure of the farmer (Opara, 2010).

The decision to adopt and the level of adoption of sawah technology in the end therefore depend on the number of resources that are available and can be mobilized by farmers. This study therefore examined farmers' access to farm resources and its effect on adoption of Sawah technology in Nigeria. The specific objectives are:

1. Describe the socioeconomic characteristics of the respondents
2. Determine the adoption level of Sawah among the respondents

3. Ascertain respondents' access to required resources

METHODOLOGY

This study was carried out in five states and the FCT where Sawah is being practiced. The states are Niger, Ondo, Kwara, Ebonyi and Abuja (i.e. the FCT). Data used in this study were collected in all the Sawah sites in Nigeria namely: Bida, Akure, Ilorin, Abakaliki and Abuja. A well-structured interview guide was used to elicit information from the farmers.

A list of rice farmers in the villages where Sawah system was disseminated was compiled. The availability of inland valley is a prerequisite for the adoption of Sawah rice production technology. A total of 500 farmers were involved in Sawah rice production across the states as supported by Oladele and Wakatsuki (2010). One hundred and fifty four farmers in the study locations randomly selected were interviewed in the course of the study due to their involvement in Sawah rice production as shown in Table 1.

Table 1: Sawah farmers sampled

State	Location	Sampled Sawah Farmers
Federal Capital Territory	Abuja	1
Ebonyi	Abakaliki	12
Ondo	Akure	2
Niger	Bida/Badegi	135
Kwara	Ilorin	4
Total		154

Frequencies and percentages were used to analyse the socio-economic and farming characteristics of the farmers. Regression analysis was used to determine the relationships between adoption and predictor variables. The regression equation is presented as follows:

$$ADOP = a + \beta \times X_1 + \beta \times X_2 + \beta \times X_3 + \beta \times X_4 + \beta \times X_5 + \beta \times X_6 + \beta \times X_7$$

Where

X₁ = Access to land

X₂ = Access to equipment/tools

X₃ = Access to required labour

X₄ = Access to cash/credit

X₅ = Access to information

X₆ = Access to extension services

X₇ = Access to improved Seed

Table 2 also shows the detail description of the variables in this.

Table 2: Measurement of Variables

Description	Measurement
Adoption level	3-point likert scale of full adoption (3), partial adoption (2) and discontinued/not adopted (1)
Sex	Ordinally as Male (1) Female (2)
Age	Measured in years
Marital Status	Ordinally as Married (1) Single (2)
Educational Level	Quranic (1) No formal education (2), Primary education (3), secondary education (4), and Tertiary education (5).
Household size	Number of persons in the household
Farm Size	Measured in hectares
Years of experience	Measured in years
Yield of Sawah rice	Measured in kg
Income	Measured in Naira
Years of experience in Sawah	Measured in years
Access to resources	3-point likert scale of full (3), partial (2) and no (1)

RESULT AND DISCUSSION

Socioeconomic characteristics

The study as shown in Table 3 reveals that the adoption score range between 9 and 26 with a mean of 19.39. Majority of the respondents had score above the mean score indicating a high level of adoption. In general, Sawah technology package was fully adopted by 56.3% of farmers, partially adopted by 30.6% and discontinued by 13.2%. The high level of adoption is due to the inherent benefits in Sawah which include high yield, improvement in the rate of tillering of the rice, efficiency of fertilizer usage and effective weeds control (Fashola *et al.*, 2006). As shown in Table 3, Sawah rice farmers are predominantly male (99%) with an average age of 42.3 year and the bulk falling within the productive age of 15-45 years, and few aged farmers are involved in Sawah farming. Majority of the

respondents married (98%), had Quranic education (64%). Household size of the farmers ranged between 1 and 40 with a mean of 14. Most of the farmers had family size of between 11 and 20, which served as source of labour that can be used on the farm. The mean size of farm grown on Sawah is 0.5±SD ha, however, majority of the farmers had farm size less than 0.5 ha with mean income of ₦151000. Mean farmers' years of experience in rice production and Sawah production were 32±SD and 6±SD years, respectively. The mean yield of rice from the Sawah field is 2.5±SD tonnes with majority of the farmers (77.30%) having yield of less than 2 tonnes. In all, yield of Sawah field among the Sawah farmers was 4.65±SD tonnes per hectare. This also shows an improvement in the yield of farmers with about 1.5t/ha before the introduction of Sawah technology.

Table 3. Distribution of Sawah Farmers by their socioeconomic characteristics

Description	Min	Max	Mean	SD
Adoption level	9	26	19.39	4.24
Sex	Mostly Male (99%)			
Age	25	80	42.3	13.58
Marital Status	Mostly Married (98%)			
Educational Level	Mostly Quranic (64%)			
Household size	1	40	14	
Farm Size	0.03	10	0.53	1.03
Years of experience	7	65	31.91	16.33
Yield of Sawah rice	80	36000	2462.26	5056.08
Income	10000	500000	151110	83351.61
Years of experience in Sawah	1	11	6.34	3.31

Access to required resources among farmers

Tables 4 shows the access to required resources profile of the farmers in the study area. Farmers had access to land but the access varies from full (46.2%) to partial (53.8%). Full access occurs in the case of the landowners that have enough land and did not migrate to other communities. Partial access occurs among the tenants and those with limited hectares of land in their communities but migrate to other communities to get land for production. Control over the land rests solely with the landowners. They decide the size of the land to be cultivated by tenants and may prevent tenants from expanding the size of their Sawah farms. Farmers had little (43.7%) to no access

(37.0%) to equipment and tools, of which the main concern is the power tiller. Majority of the farmers had access (80.7%) to required labour. This is because; farmers make use of their family members as main source of their labour. The large size of the family (11-20) is an added advantage for the farmers. As clearly shown, farmers had no access (70.6%) to improved seed, credit and loans (70.6%), information (76.5%) and extension services (69.7%). These will definitely have a negative effect on the adoption of Sawah technology. The demand for use of these resources is high and is limiting the expansion of the adoption of Sawah technology in Nigeria.

Table 4: Access to farm resources among the Respondents

Access to farm resources	Full (%)	Partial (%)	No (%)
Access to land	46.20	53.80	0.00
Access to equipment/tools	19.30	43.70	37.00
Access to required labour	80.70	18.50	0.80
Access to cash/credit	2.50	26.90	70.60
Access to information	4.20	25.20	70.60
Access to extension services	0.80	22.70	76.50
Access to improved Seed	1.70	28.60	69.70



Regression analysis of access to farm resources and adoption of sawah technology by Sawah farmers

The result from regression analysis in Table 5 shows that level of adoption was related to access to land ($\beta = 0.204$, $P < 0.01$). Land is a fundamental factor of production in the agricultural sector (Arau and Okorji, 1998). Land plays a critical role in adoption of any agricultural technology. Chirwa (2006) reported that access to larger parcels of land was associated with commercialisation of food crops. Alarima *et al.*, (2013) reported that land tenure arrangements significantly affect the adoption of Sawah technology by farmers in Ashanti region of Ghana. Land tenure security determines whether people will invest in and adopt Sawah technology and can therefore be regarded as an important ingredient in adoption of Sawah technology. Access to equipment/tools ($\beta = 0.178$, $P < 0.01$) was also related to adoption of Sawah technology. Farm equipment and tools reduced the drudgery of the farmers, enhanced the cropping intensity, and ensured the timeliness of efficiency of utilisation of various farm resources improved agricultural production. Sawah development involves the use of different farm tools, the most important being power tiller. Ademiluyi *et al.* (2008) reported power tiller is the only power-driven tool that is effectively being used for sawah activities in Nigeria and a set of power tiller cost between 5000 and 7000 USD which an average farmer cannot afford to buy. A significant relationship also existed between access to required labour and level of adoption ($\beta = 0.356$, $P < 0.01$). Labour is an important input in the agricultural sector especially in Sawah. Sawah is a labour-intensive farming system for operations like levelling, puddling, transplanting, weeding, harvesting, drying, and threshing. According to Erenstein *et al.*, (2003), labour alone represents 83% of the estimated production cost of upland rice. The result of regression analysis also shows that access to cash/credit was related to level of adoption ($\beta = 0.191$, $P < 0.01$). According to Kumar *et al.*, (2010), credit plays a pivotal role in the agricultural development. Agricultural productivity and growth are hindered by limited access to credit facilities (Odoemenem and Obinne). Credit is one of the critical inputs for agricultural development and capitalizes farmers to undertake new investments and adopt new technologies (Kumar *et al.*, 2010). Availability and access to adequate, timely and low interest rate credit from institutional and governmental sources is of great importance to

farmers. Agricultural credit enhances productivity and promotes standard of living of small scale farmers (Adebayo and Adeola, 2008). Kuwornu *et al.*, (2012) described credit as more than just another resource such as land, labour and equipment, because it determines access to most of the farm resources required by farmers. Access to information ($\beta = 0.247$, $P < 0.01$) had a significant relationship with level of adoption of Sawah technology. 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 (Sharma *et al.*, 2008). Adoption of Sawah technology can only be achieved if the farmers acquired the skills and knowledge required for effective adoption and utilisation of Sawah, properly communicated to the farmers through an appropriate channel. Effective communication of improved technologies is one of the most important factors of agricultural development (Manandhar, 1990). Agricultural information is an additional factor of production to the existing factors of production, such as land, labour and capital (Tembo, 2008). Adoption of Sawah technology will be improved by relevant, reliable, and useful information and knowledge at the disposal of the farmers. Getting Sawah technology adopted even after proven to be advantageous will depend on how it is packaged and communicated. A significant relationship also existed between access to extension services and level of adoption of Sawah ($\beta = 0.275$, $P < 0.01$). The adoption of new technologies is often influenced by the farmer's contact with extension services since extension agents provide information and technical advice to the farmers. Extension as an educational input can make an important contribution to sustainable agricultural production and rural development (Omogbee and Ajayi, 2009). The success or failure of any extension programme is dependent on effective performance of extension agents. Agricultural extension agents play a significant role in extension services (Tladi, 2004). Unexpectedly, access to seed was not significantly related to adoption. This may be due to the fact that the farmers rely solely on seeds from their previous year for planting. Majority of the farmers plant seeds from their previous year harvest. In addition, with proper land preparation and water management, farmers get higher yield from Sawah compared to traditional method, hence no premium is given to seed. Attention is mostly given to the design and management of Sawah rather than variety of seed.

Table 5. Regression between Adoption and Predictor variable

Variables	Standardized Coefficients (β)	S.E.	Sign
Access to land	0.204	0.187	0.00
Access to equipment/tools	0.178	0.175	0.00
Access to required labour	0.356	0.183	0.00
Access to cash	0.191	0.199	0.00
Access to information	0.247	0.225	0.00
Access to extension services	0.275	0.161	0.00
Access to improved Seed	0.027	0.080	0.33
Constant		0.785	

R = 0.950
R Square = 0.903
Adjusted R-Square = 0.898
F value = 194.345
Sig. = 0.00

*: Significant at $P < 0.05$,

** : significant at $P < 0.01$

CONCLUSION

The study has brought to the fore the import of farmers access to required resources be it human or material. Farmers' access to land, equipment/tools, labour, cash/credit, information, and extension service are found to have significant influence on their adoption. Farmers' access to farm resources is critical to adoption and effective utilisation of Sawah technology. Ensuring high levels of tenure security, adequate access to tools especially power tiller, sustained access to labour, adequate credit facilities and effective and efficient information and extension services is important for sustainable adoption of Sawah technology. Further dissemination and adoption of Sawah technology to other parts of Nigeria in order to attain self sufficiency in rice production must therefore bear in mind the findings of this study especially on provision of land, improved seed, credit and loans and extension services.

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