

## Effect of Planting Date on the Output of Rice Grown in Yagba Local Government Areas (LGAs), Kogi State, Nigeria

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Farmers grow rice beyond the ideal planting window due to unfavorable weather and the ongoing shift in conditions that boost productivity each year. In Yagba LGA, the study considered rural rice farmers' yields and planting dates. In order to increase rice output in the research area, the goals were to pinpoint the rice farmers' planting date that yields the highest yield as well as the production barriers. Farmers' responses to a standardized questionnaire were used to collect data, which was then evaluated using descriptive analysis percentage and Linkert scale. According to the findings of the study, the best time to plant for maximum grain output is late march. In addition, the study observed that the major limitations to rice production were, inadequate funding among others. The study therefore recommended that farmers should have access to extension services where they acquire more knowledge on technical skills and information about dates of planting rice, growing, processing, and selling rice. In addition, the government should offer farmers accessible loan and credit facilities since they require adequate money for quality rice production.

**Keywords:** Yagba, Rice, Planting date, Output, Extension services.

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## INTRODUCTION

Rice is a member of the poaceae family, Asian (*Oryza sativa*) or African (*Oryza glaberima*), is a well-known grain crop throughout the world. Rice farming is a major activity and source of income for millions of households around the world, and many countries in Asia and Africa rely heavily on rice as a source of foreign exchange income and government revenue (Adeyongo et al., 2022; Sennuga et al., 2023). According to Dogara and Jumare (2014), rice is the second most produced grain in the world. It is a harvest that transcends regional, religious, cultural, national and international boundaries, and it is a harvest second only to wheat. Indian and China supply more than half of the world's travel. Brazil is the most important producer outside of Asia, followed by north and Central America, the United States ranks third in North America continent after Brazil. In Africa, Nigeria is the second largest producer on the continent, behind Egypt. It is the sixth most grown crop in Nigeria after sorghum,

millet, cassava, yams and cowpea. It is grown in four major rice growing environments: highlands, rain-drenched lowlands, irrigated lowlands and deep waters (Adangara et al., 2022; Sennuga et al., 2023).

In West Africa, a regional rice area, rainfed upland rice is a significant rice growing ecology. Except for Antarctica, where cultivation is impossible, rice is farmed and harvested today across the world (Dogara and Jumare, 2015). One of the most significant cereals in the world is rice, also known as *Oryza sativa* (Asian Rice) or *Oryza glaberrima* (African Rice). The other two major food crops in the world are maize and wheat. No less than 42% of the world's daily calorie requirements are provided by all three (NASS, 2020; Sennuga et al., 2023). Man, animals, and birds all consume rice, and it is also used to make beer and starch. Rice is very easy to store and move from one location to another. A novel upland rice variety termed "New Rice for Africa" (NERICA), an interspecific hybrid of *Oryza sativa* and *Oryza glaberrima*, has been produced by the African Rice Center (formerly the West African Rice Development Association (WARDA) that may be able to address the issue of highland environments (WARDA, 2001b). Their ideal planting and ripening times are different. It is impossible to overestimate the impact of planting date on plant output. Knowing when and where to plant rice is crucial for planning and making decisions related to food security, as well as for using harvest areas and calendars for harvesting, production simulation, and the assessment of biotic and abiotic stress (Sennuga, 2023).

It is also crucial for research, where it is a key input for impact analysis and most significant effect of climate change on crop production (Dou et al., 2016). Nigeria's land area is 923,768 square kilometers, with 71.2 million hectares of it being farmed. Of that, 4.6 million hectares are thought to be ideal for rice farming, while only roughly 1.8 million hectares, or 39%, are now used for this purpose (NASS, 2020). Its manufacture is labor-intensive, and labor however, is a significant component of production costs (Bates et al., 2015). Despite recent increases in rice production, Nigeria's rice policy appears to be driven by a number of objectives, including: reducing unfair competition from imported rice; pursuing self-sufficiency and national food security; reducing poverty and raising farmer incomes; and encouraging graduates to work in the rice industry. This is necessary because more jobs must be created and the ordinary Nigerian's nutritional status must improve having access to inexpensive rice (Abdulahi et al., 2023).

#### **AGRICULTURE RICE PRODUCTION IN NIGERIA**

Due to its straightforward production method, rice is regarded as a significant crop in Nigeria. According to Dou et al., (2016), in Nigeria, rice is solely farmed for domestic use and commercial sale (Lanning et al., 2012). Rice cultivation has a long history in some regions of Nigeria, yet in other regions it

is viewed as a luxury food that is only consumed on rare occasions (Tollens et al., 2013). Many Nigerians now eat rice as one of their staple meals as a result of its expanding availability. Nigeria produces a variety of rice varieties, including white, red, and black rice. Although some of them are regarded as traditional breeds, others have only recently been made available (Oikeh, 2008; Ameh et al., 2023). In Nigeria, rice is only sometimes produced in mangroves and is typically planted on highlands or paddy fields depending on the demands of certain types. New rice cultivars or varieties are created and sold in research facilities in Nigeria or imported from Asian nations like China, Japan, and India.

There are two varieties: *Oryza sativa* and *Oryza glaberrima*, the former of which is produced all over the world and the latter in part in West Africa (Jeong, 2010; Iliyasu et al., 2023). Rice is a member of the Poales order and Poaceae family of cereals, formerly known as Gramineae. Rice is very significant in Nigeria because it has so many applications. Many communities have advanced as a result of their ability to produce more rice, but its failures have led to widespread famine, fatalities, and political instability in many nations, including Nigeria (Idu et al., 2013). Since it has become a significant crop in many nations in the Americas and Africa, the acceptance of rice as a food has recently increased (Seck, 2012). The most popular types of rice-based food nationwide are puddings and boiled varieties. Local rice-based cuisines in Nigeria include "Masa," or "Waina," "Tuwo," and "Alkakk," particularly in the northern areas. It is consumed alongside stew or in combination with pears, potatoes, yams, and beans (Oludare, 2014). While producing rice is fraught with difficulties all over the world, particular difficulties are particular to each geographical area. However, there are a few issues that are prevalent almost everywhere: drought, fertilizer availability, salinity of the soil, pests and diseases, mechanization, land availability, and assistance from governments, NGOs, and international organizations (Ameh et al., 2023).

#### **PROSPECTS IN RICE PRODUCTION IN NIGERIA**

According to Ojo and Adebayo (2012), the availability of food for a healthy existence is the primary definition of food security. Only when more than 50% of the population has access to food in the necessary quantity and quality can a nation become food self-sufficient (Lauer et al., 1999; Ojo and Adebayo, 2012). People must have the means to consistently eat food, and it must fulfill acceptable levels of nutritional criteria in terms of calories, minerals, and physiological demands (Davies, 2009; Ojo and Adebayo, 2012). The outlook for rice demand is still extremely good due to economic stability. To feed the expanding population, an additional 116 million tons of rice will be required by 2035. By 2035, Africa will need roughly 30 million tonnes of rice, a 130% increase in rice consumption from 2010 (FAO, 2020).

Rice is the food with the quickest rate of growth. One-third of extra rice will be required by Nigeria alone (Fakayode et al., 2010).

A rise in rice acreage (7.9% annually) and a modest rise in yield (1.4% annually) have been the major drivers of Nigeria's recent increase in rice output (9.3% annually) (Akpokodje et al., 2001). Although Nigeria's rice production has increased, the growth in consumption has outpaced it (Akpokodje et al., 2001; Fakayode et al., 2010). Due to the strategic importance of rice, the Nigerian government has been actively influencing the rice sector for more than 40 years. However, because of shifting priorities and regimes, these policies have been inconsistent. For instance, imports were prohibited from 1986 to 1990 but were permitted with 100% duties in 1995. Following that, tariffs were cut to 50% in 1996 and then raised to 85% in 2001 (Akpokodje et al., 2001; Dahunsi et al., 2023). Due to the fluctuating tariffs, many businesspeople in the nation prioritized rice planting when the government chose to outright ban rice imports in 2016 as a result of currency shortages and economic stagnation. Although the federal government has taken the necessary actions to address this through Nigerian customs, rice is still imported through illegal trade. If this program is maintained, Nigeria would be able to produce enough rice for its own needs and even export it. In Nigeria, the agricultural industry is a significant source of employment for many people. About 70% of Nigerians work as local farmers, traders, laborers, producers of fertilizer, and manufacturers of agricultural machinery (Odoemenem and Inakwu, 2011).

### Research objectives

The broad objective of this study is to investigate the effect of planting date on rice yield in Yagba, Kogi State, Nigeria. The specific objectives are to:

- i. describe the socio-economic characteristics of rice farmers in the study area;
- ii. identify rice farmers planting date for more improved yield;
- iii. analyze the rice farmers output (at different planting dates);
- iv. identify the constraints affecting rice production in the study area.

## MATERIALS AND METHOD

### Description of study area

This study took place in LGAs in Yagba district. Yagba district is a Yoruba-descendant community in Kogi State in central Nigeria. Yagba LGAs is situated between latitudes 7° and 15° and longitudes 5° and 70 East. The yagba people have historically interacted socially, culturally, and economically within their tiny social-political groupings with

fluid political boundaries. The study area's soil composition is appropriate for growing rice, but rural farmers' ignorance about the optimal time to plant rice results in underutilization of the land. Three Local Government districts in Kogi State - Yagba-east, Yagba-west, and Mopamuro Local Government Areas - are home to the Yagba people, who speak several Yoruba dialect.

### Sampling Techniques and Sample Size

Yagba LGAs is located in Kogi State in central Nigeria. Yagba LGAs has eight (8) rural communities which include Effo, Egbe, Odo Ere, Odo Eri, Ejiba, Isanlu, Ijowa, and Ijagbe. For this study, five (5) of these rural communities/villages - Egbe, Ejiba, Effo, Isanlu, and Mopa - were purposively selected primarily because of their age-long agricultural practice and presence of rice production noted there. The five communities are similar in agro-climatic, ethnic group, religion and cultural settings. However, Egbe and Ejiba communities gets only public extension services with about 5000 smallholder farmers per extension agent (1:5000) while other three communities did not have access to extension services (Sennuga et al., 2020). Within each community, rice farm families were invited to participate in the study through community meetings, in which the objectives of the study were discussed extensively with all the participants. A simple random sampling technique was used to select rice farmers for this study. The sample size of the study was 100 smallholder rice farmers. It consists of 20 rice farmers from each community giving a total of 100 respondents. The criteria adopted in the selection of individual participants include: age between 18 and 65 years, rice farming experience, interest in participating, and being permanent resident of the community. The foremost rationale for selecting 100 farmers per community were based largely on the number of farming households that volunteered and showed interest during the community meetings, as well as conformed to the previously mentioned criteria.

### Method of data collection

Primary data were collected using structured interview schedule, focus group discussion and in-depth interview from the rice farmers. Structured questionnaires were administered to collect data and the survey took about 1 hour 03 minutes. The key themes in the survey included socio-economic characteristics of smallholder rice farmers, education level, rice farming experience, planting date, farmers output (at different planting dates) and constraints affecting rice production. In order to ascertain the appropriateness and reliability of the questions set for the survey, the survey were pre-tested among three smallholder farmers working with University of Abuja, FCT, to correct aspect related to verbal understanding and to ensure the interviewees' performance, and some minor corrections were effected before administering the survey to study participants



**Figure 1.** Rice growing field in the study area.

**Source:** Field survey 2023



**Figure 2.** Data collection by the researcher in the study area.

**Source:** Field survey 2023

in Yagba LGAs. Figures 1 to 4 shows pictures of field work and interactions with the farmers and respondents.

#### **Method of data analysis**

To achieve the stated objectives, the data were analyzed using descriptive statistics, which uses mean, median, mode, frequency distribution table and percentage (%). With aid of Statistical Package for Social Science (SPSS) version 27 the data were analyzed and the descriptive statistics were used to present the results.

## **RESULTS AND DISCUSSION**

### **The Socio-economic characteristics of rice farmers in Yagba LGAs, Kogi State, Nigeria**

#### **Distribution According to Gender**

Table 1 revealed that 82% of respondents were men, 31% were women. Numerous studies have demonstrated that men actively participate in the processing of agricultural products. This suggests that in Yagba, Kogi State, more men



**Figure 3.** Rice growing field in the study area.  
**Source:** Field survey 2023



**Figure 4.** Researchers and some rice farmers in the study area.  
**Source:** Field survey 2023

are involved in rice farming.

#### **Marital status of the respondents**

According to the finding of this study, 79% of respondents are married, 15% of respondents were single, while 6% of respondents were divorced, which is the lowest percentage in the group.

#### **Respondents' distribution based on the house hold size**

The findings show that 50% of families are small, with a household size of 1 to 5 persons, 17% of the population had a family size of more than 10 persons, compared to 33% of respondents who had a family size between 6 and 10 persons (middle family size). This suggests that the vast majority of the Kogi State rice growers in Yagba have

**Table 1.** Distribution of respondents according to socio-economic characteristics.

<b>Socio-economic variables</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Gender</b>		
Female	17	17
Male	82	82
Nil	1	1
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Marital Status</b>		
Single	15	15
Married	79	79
Divorced	6	6
<b>Total</b>	<b>100</b>	<b>100</b>
<b>House Hold Size</b>		
Small Family (0-5)	50	50
Medium Family (6-10)	33	33
Large Family (>10)	17	17
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Age</b>		
<30	10	10
30-50	43	43
>50	47	47
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Farming Experience</b>		
0-5 years	24	24
6-10 years	36	36
11-15 years	20	20
16-20 years	3	3
20 years and above	17	17
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Rice Farming Type</b>		
Subsistence	98	98
Mechanized	2	2
Specialized	0	0
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Cooperative Society Membership</b>		
Yes	77	77
No	23	23
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Educational level</b>		
No formal education	5	5
Primary School	13	13
Secondary school	40	40
OND/HSC/NCE	26	26
Bsc./HND	12	12
MSc.	1	1

**Table 1.** Contd.

<b>Total</b>	<b>100</b>	<b>100</b>
<b>Religion</b>		
Christianity	91	91
Islamic	9	9
<b>Total</b>	<b>100</b>	<b>100</b>
<b>Source of Capital</b>		
Savings	70	70
Loans	20	20
Credits	7	7
<b>Total</b>	<b>100</b>	<b>100</b>

**Source:** Field Survey, (2023)

compact families.

**Respondents’ distribution based on age**

Only 10% of the respondents, according to the findings, are younger than 30 years of age. The middle-aged farmers make up 43% of the total population. Over 50 years of age make up 47% of the respondents. The majority of Yagba’s rice farmers are older than middle age based on the findings of this study.

**Respondents’ distribution based on farming experience**

According to the finding of study, 24% of farmers have been farming between 0 to 5 years, 36% have been farming for more than 6 to 10 years, and 20% have been farming between 11 to 15 years. Only 2% of farmers have been in the system for more than 20 years, and only 3% have been farming between 16 and 20 years. This really suggests that Yagba’s farmers have a lot of experience growing rice.

**Respondents’ distribution based on farming type**

Majority (98%) of Yagba rice farmers engaged in subsistence farming, with only 2% using machinery. None of the farmers practiced specialized agriculture.

**Respondents’ Enrollment in Cooperative Societies**

According to the findings of study, while 23% of the rice farmers in Yagba did not belong to cooperative groups, 77% of the farmers belong to cooperative society.

**Respondents’ distribution based on educational level**

The result in Table 1 also revealed that 13% of respondents had elementary education, 13% had secondary education, and 40% had secondary education. Only 5% of respondents have no formal education while 26% of people hold OND, HSE, or NCE credentials. Only 12% of the population had completed a four-year degree. Only 1% of people have a MSc. in their name. This demonstrates that the majority of

respondents have a secondary education.

**Respondents’ distribution based on religion**

The findings of this study show that, 91% of Yagba rice farmers were identified as Christians. Only 9%, were identified as Muslim.

**Respondents’ distribution based on source of capital**

The majority of responders (73%) used their savings as source of funds to manage their farms. The other 7% of respondents had access to credit services, whereas 20% of the respondents had access to loans to manage their farms

**The rice farmers’ planting date in Yagba, Kogi State**

This section present finding on the planting date gotten from inquiry made to gain insight on the farmers’ planting date in Yagba, Kogi State.

**Distribution of planting date among rice farmers in Yagba, Kogi State**

According to the result in Table 2, 16% of the population prefers planting in early March, early April, and late April. About 22% of the respondents chose to plant in late March. Additionally, it can be inferred that 8% of respondents preferred to plant in early and late May, 7% preferred to plant in early June, and 2% preferred to plant in late June. While 1% plant rice in late July and early August, 3% do so in early June. This demonstrates that the majority of people chose to plant in late March (22%), but a sizeable minority (16%) choose to plant in early to late April. While only a small percentage of respondents (1%) planted rice from late July to early August.

**Distribution of output yield (per hectare) among rice farmers in Yagba, Kogi State**

The results in Table 3 reveals that in early March, 8 farmers harvested between 6 and 10 bags, 3 harvested between 16

**Table 2.** Distribution of respondents planting date.

Planting Date	Frequency	Percentage
Early March	16	16%
Late March	22	22%
Early April	16	16%
Late April	16	16%
Early May	8	8%
Late May	8	8%
Early June	7	7%
Late June	2	2%
Early July	3	3%
Late July	1	1%
Early August	1	1%

**Source:** Field Survey, (2023)

**Table 3.** Distribution of respondents' output yield per hectare.

Planting Date	Frequency	Output Yield Per Hectare (Bags Of 100kg)						Total (%)
		1-5	6-10	11-15	16-20	21-25	26-30	
Early March	16	1	8	1	3	3	-	16
Late March	22	1	-	6	6	8	1	22
Early April	16	-	2	2	4	7	1	16
Late April	16	-	-	6	6	4	-	16
Early May	8	-	2	2	3	1	-	8
Late May	8	1	3	2	1	1	-	8
Early June	7	4	2	1	-	-	-	7
Late June	2	1	-	1	-	-	-	2
Early July	3	-	1	2	-	-	-	3
Late July	1	-	1	-	-	-	-	1
Early August	1	-	1	-	-	-	-	1
<b>Total</b>	<b>100</b>							<b>100</b>

**Source:** Field Survey, (2023)

and 20 bags, and a further 3 harvested between 21 and 25 bags. Late in March, six farmers collected between 11 and 25 bags, six more collected between 16 and 20 bags, and eight farmers collected between 21 and 25 bags. Early in April, 4 farmers received between 16 and 20 bags, while 7 farmers received between 21 and 25 bags. Late in April, 6 farmers acquired between 11 and 15 bags, 6 acquired between 16 and 20 bags, and another 4 acquired between 21 and 25 bags. Early in May, 3 farmers received between 16 and 20 bags, 2 farmers received between 6 and 10 bags, and 2 farmers received between 11 and 15 bags. 3 farmers acquired 6 to 10 bags at the end of May, while 2 farmers acquired 11 to 15 bags. In early June, 4 farmers harvested 1 to 5 bags, 2 harvested 6 to 10 bags, and 1 harvested 11 to

15 bags. 1 farmer received between 1 and 5 sacks in late June. 1 got between 11 and 15 bags. In early July, two farmers collected 11 to 15 sacks. 1 acquired 6 to 10 bags. Early August and late July, one farmer each got 1-10 bags.

#### **Distribution of constraints faced by rice farmers in Yagba, Kogi State**

Based on the reports in Table 4, 70% of respondents strongly agreed, 26% agreed, 3% strongly disagreed, and 1% disputed that a marketing flaw is a lack of member commitment. About 90% of respondents strongly agreed, and 10% felt that inadequate money made marketing challenges more difficult. A dispersed farming community also had a role, according to 24% of respondents who strongly agreed,



**Table 4.** Distribution of respondent's constraints in farming rice effectively.

Constraints	Strongly agree	Agree	Strongly Disagree	Disagree
Poor member commitment	70	26	3	1
Poor funding by the Government	90	10	0	0
Dispersed settlement of farmers	24	19	18	39
Poor access to extension services	86	13	1	0
Poor institutional linkages	80	19	1	0
Poor market infrastructures	82	17	1	0
Poor adherence of members to constitutions/regulations	62	34	4	0
Seasonality of rice production	70	29	1	0
Low literacy level of members	82	14	3	1
Unfavorable Government policy	58	39	3	0
Poor technical skill of rice production and marketing	67	29	4	0
Poor maintenance of production Implements	69	26	5	0
Pest and diseases	61	31	8	0

**Source:** Field Survey, (2023)

19% who agreed, 18% who strongly disagreed, and 39% who disagreed. Poor access to extension service also impacts, according to 86% of respondents who strongly agreed, 13% who agreed, and 1% who strongly disagreed.

A great number 80% of respondents strongly agreed, 19% agreed, and 1% strongly disagreed that a key marketing barrier is a lack of institutional connectivity. A bad market infrastructure harms rising markets, according to 82% of respondents who strongly agreed, 17% who agreed, and 1% who strongly disagreed. 62% of respondents very agreed, 34% agreed, and 4% strongly disagreed that members' lax adherence to bylaws and rules had an impact on marketing efforts. 70% of respondents strongly agreed, 29% agreed, and 3% strongly disagreed that rice production and marketing are impacted by the season.

A large proportion 82% of respondents strongly agreed, 14% agreed, 3% disagreed, and 1% disputed that members' low literacy levels provide a significant marketing challenge. Unfavorable government policy also influences marketing operations, according to 58% of respondents who strongly agreed, 39% who agreed, and 3% who strongly disagreed. Poor technical abilities add to the marketing issue, strongly agreed by 67% of respondents, agreed by 29%, and strongly disagreed by 4% of respondents. 69% of those surveyed agreed—strongly—that inadequate maintenance of production implements has an impact on rice yield, whereas 26% agreed and 5% strongly disagreed. A significant danger to rice output is posed by pests and diseases, according to 61% of those who strongly agreed, 31% who agreed, and 8% who strongly disagreed. Based on the findings of this study, poor funding was mentioned by 90% of respondents, poor access

to extension services by 86%, poor infrastructure by 82%, poor institutional links by 81%, poor member commitment by 70%, and seasonality of rice production by another 70%.

#### CONCLUDING REMARK

Following several analyses that included the use of mean, percentages, and Likert scales to examine how planting dates affected the yield of rice grown in Yagba LGAs, Kogi State, Nigeria, it was determined that the majority of farmers in the study area were males over the age of 40 who were married, while 10% were secondary school dropouts, they were medium-scale farmers, and had a family size of three or fewer children. The majority of farmers in this research region have been growing rice for an average of 10 years, it is also determined. The majority of these farmers prefer to plant rice between early March and late April, while a smaller minority prefers early May to early June. Very few farmers prefer planting throughout the year. These farmers outlined some of the difficulties they encounter when producing rice, including low member commitment to rice farmers association, inadequate funding, limited access to extension services, weak institutional connections, weak market infrastructures, the seasonal nature of rice production, low literacy levels, weak technical skills, unfavorable government policies, poor maintenance of production tools, and the issue of pests and diseases. The conclude from the findings of study is that planting dates have a clear impact on rice production since farmers who plant rice between early March and late April yield the most. When growing rice, the farmers in the study area face numerous difficulties.

### Recommendations

The following suggestions are given in light of the findings of the study.

1. The ideal time of year to plant rice (late March and early April) in order to achieve maximum output should be explained to the farmers by the extension agents.
2. Farmers should have access to extension agents who can teach them technical skills and information about growing, processing, and selling rice.
3. The government should offer farmers accessible loan and credit facilities since they require adequate money for quality rice production

### Conflict of interests

The authors declare no conflict of interest.

### REFERENCES

- Abdulahi, R. O., Sennuga, S. O., Bamidele, J., Osho-Lagunju, B. & Ameh, D. A. (2023). Policy issues for Improving Monitoring and Evaluation of Agricultural Extension Programmes in Nigeria: A Critical Review, *Journal of Agricultural Economics, Extension and Rural Development* 11(10), 29-47
- Adangara, U. M., Sennuga, S. O., Ezinne, E. M., Barnabas, T. M., & Alabuja, F. O. (2022). Effect of Information Sources on Farmers Adoption of Sawah Eco-technology in Rice Production in Kwali Area Council – FCT, Nigeria. *Acta scientific Agriculture*, 6(7), 03-09. <http://dx.doi.org/10.31080/ASAG.2022.06.1153>
- Adeyongo, I. L., Chibuikwe, F., Ezike, D. N., Alabuja, F. O., & Sennuga, S. O. (2022). Adoption of Agricultural Innovation among Rice Farmers in Federal Capital Territory Nigeria, *International journal of Agriculture extension and social development*, 5(2), 30-36. <https://doi.org/10.33545/26180723.2022.v5.i2a.145>
- Akpokodje, G., Lançon, F. & Erenstein, O. (2001). Nigeria's rice economy: state of the art. Project report - The Nigerian Rice Economy in A Competitive World: Constraints, Opportunities and Strategic Choices. Bouake: WARDA. Bouake: WARDA. [https://pdf.usaid.gov/pdf\\_docs/PNADB851.pdf](https://pdf.usaid.gov/pdf_docs/PNADB851.pdf)
- Ameh, D. A., Sennuga, S. O., Bamidele, J., Osho-Lagunju, B. & Abdulahi, R. O. (2023). Linkage Behavior and Practices of Agencies in the Agricultural Innovation Transfer Sub System in Nigeria: Issues for Agricultural Extension policy, *Journal of Agriculture & Education Research*, 1(1), 1-6. <https://www.wecmelive.com/open-access/linkage-behavior-and-practices-of-agencies-in-the-agricultural-innovation-transfer-sub-system-in-nigeria-issues-for-agri.pdf>
- Bates, D., Mächler, M., Bolker, B. M. & Walker, S. C. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 46-59. <http://dx.doi.org/10.18637/jss.v067.i01>
- Dahunsi, O. M., Sennuga, S. O., Erhabor, T. A. & Majolagbe, M. O. (2023). Effect of Different Pre-Sowing Treatments on the Germination of *Faidherbia Albida*, *Abuja Journal of Agriculture and Environment (AJAE)*, 3(1), 59-66.
- Davies, A. E. (2009). Food Security Initiatives in Nigeria: Prospects and Challenges. *Journal of Sustainable Development in Africa*, 11(1), 186-202. [https://jsd-africa.com/Jsda/V11N01\\_Summer2009/PDF/Food\\_Security\\_Initiatives\\_in\\_Nigeria.pdf](https://jsd-africa.com/Jsda/V11N01_Summer2009/PDF/Food_Security_Initiatives_in_Nigeria.pdf)
- Dogara, A. M. & Jumare, A. I. (2014). 'Origin, Distribution and Heading date in Cultivated Rice', *International Journal of Plant Biology and Research*, 2(1), 2-6. <https://www.jscimedcentral.com/public/assets/articles/plantbiology-2-1008.pdf>
- Dou, F., Tarpley, L., Chen, K., Wright, A. L., & Mohammed, A. R. (2016). Planting date and variety effects on rice main and ratoon crop production in South Texas, *Communications in Soil Science and Plant Analysis*, 47(21), 2414–2420. <http://dx.doi.org/10.1080/00103624.2016.1243705>
- Fakayode. S. B., Omotesho, O. A. & Omoniwa, A. E. (2010). Economic Analysis of Rice Consumption Patterns in Nigeria, *Journal of Agricultural Science Technology*, 12, 135-144. <https://jast.modares.ac.ir/article-23-3722-en.pdf>
- FAO (2020). Food and Agricultural Organization Regional Office for Africa. <https://www.fao.org/africa/news/detail-news/en/c/1612346/>
- Idu, E. E., Ochigbo, A. A., Jolaoso, M. A., Onwualu, A. P., Hassan, A. & Onjuwuo, S. S. (2013). Rice for Food Market and Development, *2<sup>nd</sup> International Conference on Rice for Food Market and Development*, pp. 41. <http://www.kinki-ecotech.jp/download/Rice-Africa2013Proceedings.pdf>
- Iliyasu, H., Sennuga, S. O., Bamidele, J., Osho-Lagunju, B. & Abdulahi, R. O. (2023). A Critical Review of the Impact of Climate Change on Food Security in Nigeria: A Vulnerability Assessment, *Merit Research Journal of Agricultural Science and Soil Sciences* 11(6), 077-087. <http://dx.doi.org/10.5281/zenodo.10325783>
- Jeong, J. S. (2010). Root-Specific Expression of OsNAC10 Improves Drought Tolerance and Grain Yield in Rice under Field Drought Conditions, *Plant Physiology*, 153(1), 185-197. <https://doi.org/10.1104/pp.110.154773>
- Lanning, S. B., Siebenmorgen, T. J., Ambardekar, A. A., Counce, P. A., & Bryant, R. J. (2012). Effects of Nighttime Air Temperature During Kernel Development of Field-grown Rice on Physicochemical and Functional Properties. *Cereal Chemistry*, 89(3), 168-175. <http://dx.doi.org/10.1094/CCHEM-12-11-0146>
- Lauer, J. G., Carter, P. R., Wood, T. M., Diezel, G., Wiersma,

- D. W., Rand, R. E., & Mlynarek, M. J. (1999). Corn Hybrid Response to Planting date in the Northern Corn Belt. *Agronomy Journal*, 91(5), 834-839. [https://corn.agronomy.wisc.edu/Pubs/JL\\_JournalArticles/91-834.pdf](https://corn.agronomy.wisc.edu/Pubs/JL_JournalArticles/91-834.pdf)
- NASS. (2020). *Crop Progress and Conditions*. USDA National Agricultural Statistics Service (NASS). [https://www.nass.usda.gov/Charts\\_and\\_Maps/Crop\\_Progress\\_&\\_Condition/2020/index.php](https://www.nass.usda.gov/Charts_and_Maps/Crop_Progress_&_Condition/2020/index.php)
- Odoemenem, I. U. & Inakwu, J. A (2011). Economic analysis of rice production in Cross River State, Nigeria, *Journal of Development and Agricultural Economics*, 3(9), 469-474. <https://academicjournals.org/journal/JDAE/article-full-text-pdf/8AAB7B68454>
- Oikeh, S. (2008). Growing upland rice: a production handbook, *Africa Rice Center*, pp. 1-41.
- Ojo, E. O. & Adebayo, P. F. (2012). Food Security in Nigeria: An Overview, *European Journal of Sustainable Development*, 1(2), 199-222. <https://doi.org/10.14207/ejsd.2012.v1n2p199>
- Oludare, A. O. (2014). Analysis of the efficiency of mechanized and non-mechanized rice production in Kaduna State, Nigeria, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria, pp. 20-41.
- Seck, P. A. (2012). Crops that feed the world 7: Rice, *Food Security*, 4, 7-24. <http://dx.doi.org/10.1007/s12571-012-0168-1>
- Sennuga, S. O., Fadiji, T. O. & Thaddeus, H. (2020). Factors Influencing Adoption of Improved Agricultural Technologies (IATs) among Smallholder Farmers in Kaduna State, Nigeria, *International Journal of Agricultural Education and Extension*, 6(2), 358-368.
- Sennuga, S. O. (2023). Evaluation of the Factors Affecting Smallholder Rice Farmers' Use of ICTs to Access Market Information in the Federal Capital Territory, Abuja, Nigeria, *African Journal of Agriculture and Allied Sciences*, 3(2), 1-15.
- Sennuga, S. O., Bamidele, J., Olaitan, M. O. & Odoh, P. O. (2023). Assessment of Small-scale Poultry Farmers' Use of ICT In Kwali Area Council of the FCT, Abuja, Nigeria, *Abuja Journal of Agriculture & Environment* 3(2), 246-258
- Tollens, E., Demont, M., Sié, M., Diagne, A., Saito, K. & Wopereis, M. C. S. (2013). An Overview of Rice Research for in Partnership in Africa, *Realizing Africa's Rice Promise*, 2, 1-23. <http://dx.doi.org/10.1079/9781845938123.0001>
- WARDA (2001b). NERICAs in Guinea: Towards food security. The history and keys of success. West Africa Rice Development Association, Bouaké, Côte d'Ivoire.