



## **FACTORS INFLUENCING ADOPTION OF RECOMMENDED ONION PRODUCTION TECHNOLOGIES AMONG FARMERS IN WESTERN AGRICULTURAL ZONE OF BAUCHI STATE, NIGERIA**

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### **ABSTRACT**

The study examined the factors influencing adoption of recommended onion production practices among farmers in western agricultural zone of Bauchi state, Nigeria. Multi-stage random sampling procedure was used to select 201 respondents for the study. Data were collected with the aid of questionnaire and analysed using descriptive statistics and tobit regression analysis. The result of the study revealed that 37.3% of the respondents were youth with a mean age of 42yrs, 69.7% were male and 75.6% were married, 61.7% had a household size of 1-10 persons, 64.2% had a farming experience of 1-10 years. Substantial proportion (36.8%) of the respondent had secondary education and 62.7% of the respondents were members of a cooperatives. The findings also revealed that 89.6% & 76.6% of the respondents had a farm size of 1-4 hectares and a yearly extension visit, respectively. The level of adoption of onion production technologies documented that, use of recommended land preparation, use of recommended improved variety, planting method by transplanting, planting (mid june), plant spacing of 15×15 cm, recommended fertilizer application (organic20-25ton/ha or 300kg/ha of 15-15-15), recommended methods of fertilizer application(placement), weeding (used of herbicides), diseases control (use of agro-chemicals) and pests' control (pesticides) were the technologies adopted at various levels. Age, farm size and access to credit were the major socio-economic factors influencing the adoption of recommended onion production technologies in the study area at  $P \leq 0.05$ ,  $P \leq 0.05$  and  $P \leq 0.01$  levels of significance, respectively. The major constraints faced by the onion farmers were low technical know-how (4.06), inadequate processing facilities (4.04) and inadequate storage facilities (3.86). In conclusion, the age, farm size and access to credits are the major factors influencing the adoption of recommended onion production practices in the study area. It is recommended that more storage facilities should be provided in order to reduce the loss farmers incurred after production and farmers should be trained on modern onion production and storage to enable the operate in less risky environment.

**Keywords:** Adoption, Factors Influencing, Recommended Production Technologies & Onion.

### **INTRODUCTION**

Nigeria is a predominantly agricultural nation. Because of its fertile land and production factors such as weather conditions, soil fertility, water availability, and comparatively inexpensive labor supply, agriculture is Nigeria's largest and most important economic industry (Umar *et al.*, 2021). The majority of people in rural areas rely on agriculture for their daily survival, which includes cultivating various crops, livestock, fishing, and other activities (kashem *et al.*, 2016). Agriculture continues to be Nigeria's principal economic activity, employing 70–80 percent of the population, largely on a subsistence level. Agriculture



contributes 25–30% of the Gross Domestic Product despite its importance to the country's economy (GDP). Nonetheless, it is the single largest source of employment in the economy, as it serves as a secondary source of raw materials for other industries. Despite declining growth rates over time, the industry remains important to the country's socio-economic development through providing food crops for long-term food security. According to, Issa *et al.* (2016), the role of extension is particularly important because of farmers' low productivity, which is primarily due to the use of traditional technologies. As a result, the introduction of improved inputs and agricultural practices is a prerequisite for increasing production in particular and agricultural development in general. According to Dibra (2015), the acceptance of innovation, even when they provide evident benefits, is a tough process, and many inventions require a period before being embraced by the public. According to Senthilkumar *et al.* (2018), the implementation of technologies and recommended management methods should result in significant increases in onion yields. Individuals or groups are the ones who adopt an innovation inside a social structure. In light of this, Awotide *et al.* (2016) defines adoption as the long-term incorporation of an innovation into farmers' usual agricultural activities among Nigeria's small-scale farmers. Furthermore, adoption is not a permanent behavior; this means that an individual may choose to stop using an invention for a variety of personal, institutional, and social reasons, one of which could be the availability of another approach that better meets the needs of farmers. The onion (*Allium cepa*) is a Liliaceae (onion) family vegetable crop (Alabi and Adebayo, 2008) The most frequently grown member of the genus *Allium* is the onion, sometimes known as a bulb onion, common onion, or garden onion. The plant's name is derived from the Latin *Unio* or *annianus* and is linked to the Welsh *einion*, which means "anvil." *Unio* was the Late Latin name for an onion species that resembled a single white pearl. The onion (*Allium cepa* L.) is said to have originated in Central Asia, where it is the most diverse, as well as Iran, Afghanistan, and West Pakistan. It has traditionally been farmed in the West African savanna for both food and profit (Gopal and Gadge, 2016). (Kassam, 2011). According to estimates from the United Nations Food and Agriculture Organization, the globe produces approximately 37 million tons of onions each year on seven million acres of land. The onion is grown in about 170 countries throughout the world and is one of the most widely consumed vegetable crops. China is the world's largest producer of onions, while Japan and India are the world's second and third largest producers of green onions and dry onions, respectively. According to a statistical analysis on the world's top onion producers, Nigeria placed 24th in the world and fourth in Africa, behind Egypt, with 621,000 tons produced annually behind Egypt, Algeria, and Morocco, output ranks 24th in the world and 4th in Africa. Onion is mostly grown in the Nigerian states of Kano, Kaduna, Jigawa, Sokoto, Plateau, Bauchi, and Kebbi (Yahaya *et al.*, 2021). Onions require a well-drained, humus-rich soil, such as alluvial soils, well-drained fertile loam, and most sandy soils rich in humus. Because onions require a lot of organic matter, the soil in which they are planted must be able to hold moisture during the dry season (Anyanwu, 2003). Onion comes second among the 15 vegetables defined by the Food and Agriculture Organization in terms of global production among all spice crops (Anjum *et al.*, 2019). Onions are mainly grown in a traditional manner, with technology passed down from generation to generation. As a result, it's important to focus on increasing production by upgrading old technologies. Improved crop varieties, fertilizer application, improved water management procedures, agronomical and farm management practices are among the technologies that have been found to increase agricultural output (Mochida *et al.*, 2013). Farmers' reliance on traditional farming instruments for a large portion of agricultural productivity has contributed to the low level of output. In response to the growing population,



the government and several aid agencies have encouraged and assisted smallholder farmers to embrace improved technologies to boost their productivity. Low productivity has always resulted in a failure to achieve food self-sufficiency, resulting in food deficits, which have been attributed to inefficiencies in production and resource utilization (Adeoye & Balogun, 2016). The poor average yield of onion production in Nigeria may be due to small-scale onion farmers' failure to embrace modern agricultural technology, as well as their inefficiencies in resource (input) allocation and use, (Anyatengbey, 2020). Onions are commonly grown in commercial quantities in Nigeria's northern areas. Low adoption of better varieties, poor farm management and agronomic methods, disease and pest concerns have all been blamed for the vegetable's low yield (Amfo *et al.*, 2021). As a result, the country's onion demand outstripped its local supply. The study was carried out to;

- i. Describe the socio-economic characteristics of the respondents
- ii. Assess the level of adoption of onion production practices
- iii. Determine the factors influencing adoption of onion recommended production practices in the study area.
- iv. Describe the constraints affecting adoption of onion production technologies

## **MATERIALS AND METHODS**

### **The Study Area**

Bauchi state lies between 9.30 North of the equator and longitude 8.50 and 110 East of the Greenwich Meridian. The state is bordered by Kano, Jigawa and Plateau States to the west. Yobe, Gombe and Adamawa to the North-East and Kaduna to the North-West. Bauchi state covers a total area of 49, 259.01km<sup>2</sup> which is about 5.3% of the total land mass of Nigeria. It has a total population of the area experiences both dry and rainy seasons, during the month of April the temperature of 40°C is recorded in which is the hottest and in November to January, the temperature of 17.11°C is recorded being the coldest month of the year and as well the time when hamattan is experienced in the area. The mean annual rainfall ranges from 460mm in the Northern part of the state to 1300mm in the southern and south-western part. The relative humidity decreases from 94% in August to less than 10% during hamattan. The topography ranges from hilly in the south to low land in the north. The vegetation ranges from Sahel Savana and Sudan Savana in the North to Guinea Savana in the South. Thus, the choice of the area is based on the fact that it is typical representation of diverse socio-economic, cultural and rural urban setting obtained in Northern Nigeria; with the majority of farmers engaged in farming at subsistence level. The people of the area are predominantly farmers, traders, fishermen, hunters and pastoralists. This was made possible by the favorable climatic condition and natural gift to the place. The state has varieties of tribes like Hausa, Fulani, Kanuri, Jarawa, Sayawa and Kare-Kare etc (BSADP, 2022). The study was carried out in Bogoro and Tafawa Balewa Local Government Areas of Bauchi State.

### **Sampling Techniques and Sample Size**

The respondents for the study were chosen using a multi-stage sampling technique. The western agricultural zone, out of the three (3) agricultural zones in Bauchi state; was purposively picked in the first stage, because onion cultivation is one of the key agricultural activities in the area. In the second stage, two (2) LGAs were chosen to give from the zone namely Bogoro and Tafawa Balewa because of its intensity on onion production intensity. In the third stage, four (4) villages from each LGA were also purposively selected, given a total of eight (8) villages. Purposive sampling is based on the study area's onion production intensity.

In the last stage, 10% of registered onion farmers were proportionately and randomly selected from each village given a total sample size of 201 respondents.

**Table: 1.** Sampling Size Determination Plan

AGRIC ZONE	LGA	VILLAGES	SAMPLE FRAME	SAMPLE SIZE (10%)
Western zone	Bogoro	Gambar Lere	209	21
		Dutsen Lawan	236	24
		Unguwan Waje	135	14
		Dinkin Rimi	369	37
		<b>4</b>	<b>949</b>	<b>95</b>
Sub total	Tafawa Balewa	Marti	264	26
		Duklin Bauchi	186	19
		Saran Bisa	312	31
		Tafare	298	30
		<b>4</b>	<b>1060</b>	<b>106</b>
<b>Total</b>	<b>2</b>	<b>8</b>	<b>2009</b>	<b>201</b>

Source; BSADP, 2023

### Method of Data collection

Primary and secondary data was used in the study. The primary data was collected using a well-structured questionnaire that was distributed to selected onion farmers in the study area while the secondary source of information such as books, internet, and journals were consult.

### Method of Data Analysis

Descriptive and inferential statistics were used to analyze the information gathered, descriptive statistics was used to achieved objective i, ii and iv while tobit regression was used to achieved objective iii of the study.

### Descriptive statistics

To achieve objectives i, ii and iv, descriptive statistics (frequency, percentage, and mean) was used.

### Tobit Regression Model specification

The multiple regression models are explicitly specified as:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 \dots b_{11} X_{11} + u$$

Where:

Y= Adoption of recommended onion production practices was measured by: Adoptors (1) and non-adaptors (0) of recommended onion production practices by the respondent.

X<sub>1</sub> = Age (in years)

X<sub>2</sub> = Sex of onion farmer (1 = Male and 0 = Female)

X<sub>3</sub> = Marital status (Single =1 and Married =0)

X<sub>4</sub> = Household size (number of people in household)

X<sub>5</sub> = Years in acquiring education (number of in acquiring education)

X<sub>6</sub> = Farmers experience (number of years in onion production)

X<sub>7</sub> = Number of years in cooperative (number of years in cooperatives)

X<sub>8</sub> = Size of Land (in hectares)

X<sub>9</sub> = Extension visits (Yes = 1, No = 0)

X<sub>10</sub> = Access to Credit (Yes=1, No=0)





$X_{11}$  = Annual Income (in naira)

U = Error term

a = Constant

$b_1$ -  $b_{11}$  = Regression coefficients

## RESULTS AND DISCUSSION

### Socio-economic Characteristics of the Onion Farmers

Sex is the characteristics of men and women that are socially constructed. Sex is a reflection of one's self-image as relating to either being male or female. According to the results, there were 30.3% female respondents, with 69.7% of the respondents being male. This suggests that in the research area, men participated more actively in onion production than women did, the greater proportion of male could be as a result of their higher access to production resources such as land. According to Ibrahim (2014), men predominate in the onion marketing sector in Toro. According to Ibitoye (2013), in Kogi State, men outnumber women in the farming industry. Additionally, it is consistent with Issa *et al.* (2016) result that men predominated the maize farming industry in their examination of socio-economic factors impacting farmers' adoption of better maize production practices. The high proportion of male farmers in the state is to be expected given that farming is done manually by rural farmers in Nigeria and that the majority of the key tasks demand a lot of energy and can be too taxing for most women.

Marital status is the condition of being either married or unmarried. It could also be seen as one's situation with regard to whether one is single, married and widowed. According to the distribution of respondents by marital status in the table, majority (75.6%) of them were married. Additionally, the results show that 6.5% of them were widowed and 17.9% of them were single. This indicates that the majority of the respondents who were involved in the production of onions were married people, which imply that married persons were involved in small-scale onion production, which may be due to its economic imperative and or family responsibility driving them to participate in the onion production in the study area. This is consistent with the findings of Yahaya *et al.* (2021) and Idrisa *et al.* (2012), who found that most respondents working in the cultivation of onions and maize were married.

It is evident that education provides knowledge on the efficient use of resources at farm level and decision on consumption and savings. Education as a variable has the tendency of enhancing farmer's ability to derive, decode and evaluate useful information as well as improving labour quality. In the table, the respondents are arranged according to their level of education, which reveals that 36.8% of the respondents had a secondary education, while 31.8%, 17.4%, 11.9%, and 2.0% had tertiary, primary, and non-formal adult education, respectively. This implies that most respondents were literate and can therefore understand production information disseminated toward understanding regulations or programs that have an impact on farming, accept and adopt agricultural technologies, decide which agricultural enterprises to choose for production, financing, and access to formal credit sources. According to Umar *et al.* (2014) and Rajib (2018), on how readily farmers accept new technologies, they said a lot depends on the farmers' educational level.

Farmer organizations are more efficiently to attract and retain a wider membership, generate more funds, and provide better services to their members. According to membership in farmer's cooperatives, the majority of onion farmers in the research region (62.7%) are members of one or more groups, while 37.3% do not. This suggests that being active in social groups enables farmers to gain access to farm inputs, financing, and other resources that



increase production. The conclusions of Yahaya *et al.* (2021) study, "Evaluation of Onion Value Chain Actors in Kebbi State, Nigeria: A Case Study of Producers and Retailers," are in opposition to this. According to their research, the majority of onion producers did not belong to a cooperative that promoted onion farming.

Access to credit by a farmer enables him/her to get various inputs; hence access to credit has a positive influence towards technology adoption. In the research area, majority of onion growers (55.7%) have access to financing, as opposed to 44.3% who do not. The financial restrictions on farmers' ability to purchase inputs can be loosened by having access to financing, which increases the likelihood that farmers will adopt more advanced new technology. Access to credit was generally high in the study area, this could be because they were aware of the existence of such facilities, and the lack of rigorous protocol involved in acquiring it. It concurs with Odoemlam *et al.* (2020) that the respondents' improved onion production techniques are significantly and favorably impacted by their access to finance.

Most respondents (71.1%) got their land by inheritance, 26.4% got it through purchase, and the other 2.5% got it through other means. This conclusion demonstrates that the dominant form of land tenure in this region was inheritance, which may provide a barrier to large-scale production. Olusegun *et al.* (2011) found that the size of the farm and the mode of land acquisition had an effect on farmers' ability to use agricultural innovation and new farming techniques.

Family, hired labor, and other sources such as the use of draught animals make up the labor force. As a result, it is clear that a large portion of the labor that was used was family labor (64.2%), followed by hired labor (32.3%) and other sources such as the used of draught animals (3.5%). This suggests that the typical home size can sustain the family work that might be required for the use of recommended onion production practices, which lowers the cost of production and provides farmers, particularly smallholder farmers, with high income. According to Oyewole *et al.* (2014), Yemane (2014), Leake and Adam (2015), and other studies, households with high labour availability are more likely to implement recommended onion production technology than households with low labour availability. Consequently, the study area's onion producers relied more on family labour.

The distribution of respondents based on their primary information sources is shown in Table outcome. Friends and family, who made up 53.2% of the respondents, were found to be the farmers' most frequent information sources. Extension agents come in second with 25.9%, followed by media (18.4%), others of information (2.5%), in that order. This is in contrast to Atasie *et al.* (2017) findings, which showed that radio is a significant source of agricultural information.

Extension contacts or visits are known to engender innovative effectiveness, knowledge transfer, information dissemination and adoption drive of the farmers in general. Access to extension agent influences farmer to make informed decision and optimize farming practices. Frequency of extension visits in dissemination of information and advisory services gives the adopters more confidence to sustain the use of an innovative package. The distribution of respondents based on how frequently they engaged in extension visits. The majority (76.6%) of the total, receives annual extension visits, followed by others (18.9%), monthly (4.0%), and weekly (0.5%). It implies that the respondents receive few extension visits and services which limit their access to information about recommended onion production technologies thus reduces the adoption rate of the technologies. Poor extension services, according to Mohammad (2011) and Kudi *et al.* (2010), were a contributing factor in the limited uptake of new technologies.

**Table 2a:** Qualitative Socioeconomic characteristics of respondents (n=201)

Variable	Frequency	Percentage (%)	-
<b>Sex</b>			
Male	140	69.7	
Female	61	30.3	
<b>Marital Status</b>			
Single	36	17.9	
Married	152	75.6	
Widowed	13	6.5	
<b>Level of Education</b>			
Non-formal	24	11.9	
Primary school	35	17.4	
Secondary School	74	36.8	
Tertiary Institution	64	31.8	
Adult education	4	2.0	
<b>Member cooperative</b>			
Yes	126	62.7	
No	75	37.3	
<b>Access to credit</b>			
Yes	112	55.7	
No	89	44.3	
<b>Land tenure system</b>			
Inheritance	143	71.1	
Purchase	53	26.4	
Others	5	2.5	
<b>Source of Labour</b>			
Family	129	64.2	
Hired	65	32.3	
Others	7	3.5	
<b>Source of information</b>			
Extension agents	52	25.9	
Media	37	18.4	
Friends and relative	107	53.2	
Others	5	2.5	
<b>Extension visits</b>			
Weekly	1	0.5	
Monthly	8	4.0	
Yearly	157	76.6	
Others	38	18.9	

**Source:** Field survey, 2023

The age of farmer plays a very important role in determining the productivity of onion production. Table 2 displays the respondents' age breakdown. It showed that 37.3% of the respondents, or the majority of those who responded, are between the ages of 35 and 44. In this study, the respondents ranged in age from 15 years old to 64 years old. The poll also showed that all of the respondents were between the ages FAO (1983) designated as economically productive in a population (i.e., between 15 and 64 years); but, none of the respondents fit



within the age category designated as dependents (i.e., between 15 and 64 years). The outcome supports Grema *et al.* (2014), research, which showed that middle-aged people were more engaged in onion production than young people and the elderly, by implication, more than half of the onion growers were under the age of 40, showing that they were of a healthy and active age and competent to handle the bulky character of agricultural output like onion. According to Aruppillai *et al.* (2020). A farmer's capacity to manage farm businesses and access to farmland and other inputs is somewhat influenced by his or her age. The most creative and motivated individuals are found in these age groups, according to Ironkwe and Olojede (2012), and young farmers are thought to be more adaptable in their decision to accept new practices.

Household size refers to the total number of individuals that live together and who are fed by the same household head. The table shows the distribution of respondents by household size. According to the poll, the majority of respondents (61.7%) inhabited households with between 1-10 members. A household size of between 11 and 20 individuals was reported by over 34.8% of the respondents. A family size of 21–30 persons was only the case for 3.5% of the respondents. Ten persons made up the average household size. This suggests that most of the respondents had big families, which provide opportunity to engage helping hands from the household to provide family labour required for onion farming, thereby providing cheaper source of farm labour which may be related to the labor-intensive traditional agriculture that is still practiced in most rural areas. This finding is consistent with those made by Ike and Uzokwe (2011) and Etwire *et al.* (2013), who found that large household sizes are associated with both food insecurity and poverty, particularly when the household head relies heavily on agriculture for a living.

Farming experience refers to the length of time a person had been in farming or participating in farming activities. Experience goes along with skill acquisition, which is fundamental to efficiency and effectiveness in any job operation (Trechter, 1996). The distribution of respondents based on their prior experience in growing onions is shown in Table 2 below. It was discovered that the majority (64.2%) of the respondents had 1–10 years of experience producing onions. While the percentages for individuals with 11 to 20, 21 to 30 years, and 31 to 40 years of experience, were 29.4%, 5.0%, and 1.5%. This indicates that the research area's onion farmers had some level of experience in growing and producing onions, which aided in their comprehension and increased adoption of onion production technologies. As a result, if the farmer's expertise is effectively applied by fixing the prior farming error, it will aid in the adoption of recommended onion production technologies.

A farmer's managerial skills and choices in various farm activities are significantly influenced by the number of years of experience that person has in farming. It affects how he perceives and comprehends implementing the recommended method of growing onions. Additionally, this supports the conclusions reached by Haile (2015) and Kariyasa *et al.* (2011).

Farm size refers to the total area of land or the total hectares of land under agricultural practices or cultivation by a farmer. Land is crucial since it is the most fundamental component of farming and has a significant impact on a farmer's productivity. In this survey, it was discovered that the respondents' farms ranged in size from 1-4 to 5-12 hectares, with an average farm size of 2.45 hectares. About 89.6% of the respondents to the current study farmed between 1-4 hectares of land. Only 8.0% and 2.5% of the total land area were under cultivation, correspondingly. This implies that the respondents were small-scale subsistent onion crop farmers who produce on small scale. The use of small farm sizes could also be due to prevalent tenure system and or the financial capacity of the farmer to purchase, access inputs or other cost associated with large farms. This is in line with the finding of Mamudu *et al.* (2012), who



discovered that farm size is one of the factors that strongly influence farm households' decisions to adopt new technology.

Income may enhance labour and purchasing power, and therefore low farm income level implies difficulties in buying farm inputs like improved seed, fertilizers and herbicides (Diirro, 2013). Increase in annual farm income is expected to have a positive impact on recommended onion adoption technologies, as it is expected to increase the adoption rate of the respondents; all things being equal. According to the study's findings, the majority of respondents (60.2%) had annual incomes between 50,000 and 300,000, 34.3% had annual incomes between 300,001 and 500,000, and 5.5% had annual incomes between 500,0001 and 800,000, with a mean average of 291558.06. This suggests that the majorities of farmers are small-scale operators, and depicts that the respondent's income size was relatively small, and household head with limited resources, may want to spend on essential items like food, school fees, hospital bills etc This finding agrees with the report of Chikaire *et al.* (2017) who pointed out that there is an essential association between income level of the farmers and use of ICT because whenever the income level is likely to increase then information access could be easy which could lead to appropriate agricultural decisions.

**Table 2b:** Quantitative Socioeconomic characteristics of respondents (n=201)

Variable	Frequency	Percentage (%)	Mean ( $\bar{x}$ )
<b>Age (Years)</b>			
15– 24	9	4.5	<b>42</b>
25– 34	31	15.4	
35– 44	75	37.3	
45– 54	72	35.8	
55 – 64	14	7.0	
<b>Household Size (No. of persons)</b>			
1 – 10	124	61.7	<b>10</b>
11– 20	70	34.8	
21 – 30	7	3.5	
<b>Farming Experience (Years)</b>			
1– 10	129	64.2	<b>10</b>
11 – 20	59	29.4	
21 – 30	10	5.0	
31 – 40	3	1.5	
<b>Farm size</b>			
1-4	180	89.6	
5-8	16	8.0	
9-12	5	2.5	
<b>Annual income</b>			
50000-300000	129	60.2	
300001-500000	69	34.3	
500001-800000	11	5.5	
<b>Total</b>	<b>212</b>	<b>100.00</b>	

**Source:** Field survey, 2023

### **Level of Adoption of Recommended Onion Production Technologies**

Adoption describes the farmer's acceptance and continued usage of the recommended onion producing technologies. The findings showed that farmers had adopted onion production technologies at various levels. This was recorded using a grading system with stages from awareness through adoption, when it comes to the use of pesticides, the recommended method for applying fertilizer (placement), the recommended fertilizer, diseases (use agro-chemicals), and weeding, it makes up 38.8%, 33.8%, 33.8%, 29.9%, and 22.4% of the population respectively. This demonstrates that the technology's complexity affects the decision of onion farmers to adopt or reject technologies for onion cultivation. On the other hand, awareness level of adoption comprises of recommended land preparations (49.3%), recommended improved varieties (43.8%), planting in mid-June (30.3%), and plant spacing of 15x15 (31.8%). This suggests that the research area's onion farmers are completely aware of the recommended technology for growing onions, which might speed up adoption. Odoemenem and Obinne (2010) found that improved cereal varieties, fertilizer, insecticides, and herbicides were among the innovations for increased cereal crop production that were accessible to small-scale farmers in Benue State. The assessment of the adoption of these innovations revealed that 32.43% of the farmers in the research area accepted improved crop varieties, followed by fertilizer with 27.03% and insecticides with 24.32%. Herbicide had the lowest adoption rate, at 16.22%. According to Mustapha *et al.* (2012), the majority of respondents used high yielding cultivars (77.5%), early maturing varieties (69.37%), the usage of herbicides (93.75%), and broadcasting methods (55%). Through the use of appropriate extension methods, there is the potential to decrease the difficulty of some practices.

**Table 3:** Distribution of Respondents According to Level of Adoption of Recommended Onion Production Technologies

<b>Production Technologies</b>	<b>A</b>	<b>I</b>	<b>E</b>	<b>T</b>	<b>Ad</b>
Recommended land preparation	99(49.3)	14(7.0)	39(19.4)	13(6.5)	36(17.9)
Use of recommended improved variety	88(43.8)	18(9.0)	15(7.5)	27(13.4)	53(26.4)
Planting method by transplanting	64(31.8)	29(14.4)	21(10.4)	24(11.9)	63(31.3)
Planting (mid june)	61(30.3)	30(14.9)	20(10.0)	46(22.9)	44(21.9)
Plant spacing of 15×15 cm	64(31.8)	32(15.9)	24(11.9)	40(19.9)	41(20.4)
Recommended fertilizer application (organic 20-25ton/ha or 300kg/ha of 15-15-15)	43(21.4)	36(17.9)	20(10.0)	34(16.9)	68(33.8)
Recommended Methods of fertilizer application (placement)	51(25.4)	29(14.4)	9(4.5)	44(21.9)	68(33.8)
Weeding (used of herbicides)	80(39.8)	13(6.5)	18(9.0)	45(22.4)	45(22.4)
Diseases control (use of agro-chemicals)	67(33.3)	14(7.0)	13(6.5)	47(23.4)	60(29.9)
Pests' control (pesticides)	82(40.8)	6(3.0)	11(5.5)	24(11.9)	78(38.8)

A = Awareness I = Interest E = Evaluation T = Trial Ad = Adoption.

Figures outside=frequency

Figures in bracket=percentage

Source: field survey, 2023



### **Factors Influencing Adoption of Recommended Onion Production practices**

The tobit regression model was used to estimate factors influencing adoption of recommended onion production practices. The results as presented in Table 18 indicate that factors that influenced farmers decision to adopt onion production technologies is significantly influenced by age, sex, household size, size of land, access to credits and income annual. Age was positively (0.027500) significant ( $P \leq 0.05$ ). This means that age have a higher likelihood of being a factor influencing adoption of recommended onion production practices in the study area. The studies agrees with the findings of Moreet *et al.*(2014), was positively and strongly connected with adoption, according to the findings of the relationship analysis. Sex was positive and significantly influenced the adoption of recommended onion production practices at  $p \leq 0.1$  level of probability. This means that sex has positive influence on the adoption of recommended onion production practices by 0.066824 units. This occurs as a result of sex distribution was slanted toward males in the study area and this is very common on account of religious, cultural and social beliefs or settings of the respondents. Yemane (2014) has revealed a significant relationship between adoption decision and sex of the household head. It indicates those females were not efficient and able to adopt upland rice variety as compared to their male counterpart.

Household size was positive and significantly influenced the adoption of recommended onion production practices at  $p \leq 0.1$  level of probability. This implies that any increases on the household size of onion farmers, then the adoption of recommended onion production practices also increase by 0.096909 units. This means that large number of household size will probably enhance labor and adoption of recommended onion production practices in the study area. The above finding agreed with Abubakar *et al.* (2016) which indicated that household size and farming experience were significant at  $p \leq 0.01$  in determining factors influencing adoption of lowland rice production technologies. Furthermore, the parameter of respondents' land size in hectares had a significantly ( $p \leq 0.05$ ) positive (0.041463) effect, which implies that the size of the respondents' farms has a higher likelihood of increasing the chances of adoption of recommended onion production practices in the study area. Issa *et al* (2016), his findings found land size to be strongly connected to adoption of IMPPs at a 1% level of probability with a positive coefficient (0.620) Access to credit (0.000648) were positive and significantly influenced the adoption of recommended onion production practices in the study area at  $p < 0.01$  level of probability. This implies that an increase in access to credits to the onion farmers will influenced adoption rate. Kudi *et al.* (2010) and Odoemlam and Nzeakor (2020)., in their studies, described that farmers will adopt new innovations if they have access to credit which would enable them to purchase inputs and pay for labor necessary.

Finally, the coefficient of annual income of respondent's onion farms had a positive (0.093598) and significant impact ( $P \leq 0.1$ ) on influencing the adoption of recommended onion production practices in the study area. This implies that an increase in annual income of the respondents would improve their living standards and increase production, thus it enhances the adoption of recommended onion production practices in the study area. This corroborates Chitra and Ramanna (2018), according to the findings, annual income, was found to be strongly associated with farmer adoption levels in all three farming systems.

**Table 4:** Distribution of Respondents According to Factors Influencing Adoption of Recommended Onion Production Technologies

	<b>Coefficients:</b>	<b>Std. Error</b>	<b>Pr(&gt; z )</b>
(Intercept):	6.544e+00	1.329e+00	8.49e-07 ***
Age	-5.364e-02	2.433e-02	0.027500**
Sex	5.851e-01	3.192e-01	0.066824 *
Marital Status	-2.452e-01	3.488e-01	0.482084
HH.size	6.271e-02	3.777e-02	0.096909 *
Years acquiring Edu.	4.161e-02	4.041e-02	0.303164
Onion.farming.Exp.	4.517e-02	2.776e-02	0.103689
Number.of.years.in.cop	9.491e	-026.715e-02	0.157539
Size.of.Land	-2.211e	-01 1.084e-01	0.041463 **
Extension.visits	1.298e	-012.350e-01	0.580589
Access.to.credit	-1.180e+00	3.461e-01	0.000648 ***
Income.Annual.	2.214e-06	1.320e-06	0.093598 *

\*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%

#### **Diagnostic Variable**

Number of observations	201
Log-likelihood:	-390.3271 on 389 df
PSEUDO R <sup>2</sup> =	0.1350741
Number of Fisher scoring iterations:	6

Source: field survey, 2023

### **Constraints Faced in the Adoption of Recommended Onion Production Technologies in the Study Area**

Farmers reported some perceived constraints, including technical know-how, inadequate processing and storage facilities, poor credit accessibility, inadequate infrastructural facilities, drought and disease issues, inadequate extension services on improved onion varieties, and inadequate recommended varieties, despite the research institutes' intervention in the adoption of recommended onion production technologies in the study area. According to the severity of the issues listed by the farmers and given in Table 19, the respondents' perceptions of and experiences with them in the research region were ranked by respondents. Technical know-how, which was regarded and concurred by the respondents as a major barrier experienced in the adoption of recommended onion production technologies and ranked top, is one of the constraints perceived and faced in the adoption of onion production technologies, according to the farmers. Inadequate processing facilities, storage facilities, poor accessibility to credits, infrastructural facilities, drought problems, disease problems, extension services on improved onion varieties, inadequate recommended varieties were second, third, fourth, fifth, sixth, seventh, while low level of awareness, pest problems, high cost of farm inputs, climate problems, and land tenure were ranked eighth, ninth, tenth, eleventh, and thirteenth, respectively This, somewhat supports the findings of Abubakar *et al.* (2016), Mustapha. (2020), and Ibrahim (2014) that low input availability, insect infestation, a lack of fertilizer, ignorance of new technologies, and inadequate credit facilities were some of the barriers perceived to prevent farmers from adopting advised onion production practices.

**Table 5:** Distribution of Respondents According to the Perceived Constraints Faced in the Adoption of Recommended Onion Production Technologies in the Study Area

Constraints	n = 201	SD	D	U	A	SA	MS	Rank
Technical know-how		8	6	41	57	89	4.06	1 <sup>st</sup>
Inadequate processing facilities		4	11	40	64	82	4.04	2 <sup>nd</sup>
Inadequate storage facilities		4	14	56	60	67	3.86	3 <sup>rd</sup>
Poor accessibility of credits		9	18	33	89	52	3.78	4 <sup>th</sup>
Inadequate infrastructural facilities		5	25	39	76	56	3.76	5 <sup>th</sup>
Drought problems		7	19	48	72	55	3.74	6 <sup>th</sup>
Diseases problems		8	17	47	80	49	3.72	7 <sup>th</sup>
Inadequate extension services on improved onion varieties		9	31	34	66	61	3.69	8 <sup>th</sup>
Inadequate recommended varieties		20	11	41	76	53	3.65	9 <sup>th</sup>
Low level of awareness		18	27	29	61	66	3.65	9 <sup>th</sup>
Pests problems		9	16	62	66	48	3.64	10 <sup>th</sup>
High cost of farm inputs		37	12	6	81	65	3.62	11 <sup>th</sup>
Climate problem		5	25	39	76	56	3.24	12 <sup>th</sup>
Land tenure		44	18	29	71	39	3.21	13 <sup>th</sup>

Source: Field Survey 2023

SA = Strongly Disagree D = Disagree, U = Undecided, A = Agree, SA = Strongly Agree and MS = Mean Scores

## CONCLUSION AND RECOMMENDATIONS

Age, sex, household size, size of land, access to credit, and annual income were the main variables that influenced the farmer's decision to adopt recommended onion production practices in the study area, indicating that these variables are the main variables that could be used to condition the farmer's decision with regard to the adoption of recommended onion production practices in the study area. However, there are perceived barriers to the use of the recommended methods for growing onions in the study area. Therefore, appropriate steps must be implemented to alleviate some of these obstacles in order to improve the adoption of recommended onion production practices in the study area. It is therefore, recommended that More extension agents should be hired in order to provide the farmers with technical know-how and up-to-date information about agriculture in the research region because onion farmers in the area rely heavily on family and friends for knowledge about onion production and Onion producers should be educated on recommended production technologies through extension services agencies and the government

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