

Attitude of Rural Farmers Households Toward the Production and Consumption of Edible Mushrooms as a Strategy to Alleviate Poverty in the North Central States of Nigeria

¹Okwuokenye, G.F. ; ²Ayodele, S.M.; ³Chukwu, M.N.; and B.O. Ekute⁴

¹Department of Agricultural Economics and Extension, Faculty of Agricultural Science, National Open University of Nigeria, KM 4, Kaduna Zaria Express Way, Kaduna State. ^{2, 3 & 4}Department of Biological Sciences, Faculty of Science, National Open University of Nigeria, University Village, Jabi, Abuja.

Corresponding author: ofolunsho@noun.edu.ng

DOI: <https://doi.org/10.62154/1eahvg42>

Abstract

The study examined the attitude of rural farmers' households toward the production and consumption of edible mushrooms as a strategy to alleviate poverty status in the North Central Geo-Agricultural Zone of Nigeria. A sample of 389 farmers sampled using the multiple random sampling technique was used for the study. It employed both descriptive and inferential statistics (binary logit regression, t-test, and binomial test) which were respectively used to analyse the objectives and hypotheses of the study. Results revealed that male dominated (59.13%) the farming of mushroom with most (48.07%) of them having post-secondary school qualification and having farming as their primary occupation (32.90%). The major source of income of most (82.01%) of the respondents is farming and crop farming was the type practiced by most (95.63%) of them and they are into full-time farming (77.63%). The respondents average age and household size of the was 37.37 years and 5 persons, respectively. Most (89%) showed a favourable attitude to mushroom growth and consumption and respondents earned a difference of N65,552.70 in favour of farmers after adding mushrooms to the crops they were growing before. Most (60.67%) of the respondents indicated that the difference in income earned would help to a very high degree alleviate the poverty status of the respondents. Socio-demographic characteristics like gender, marital status, age, educational level and household size were significant factors to the attitude of the respondents in line with production and consumption of mushrooms. The study recommended that scientists should educate people through an organised programme on how to identify edible mushrooms so that they can gain greater interest in the production and consumption of the produce. Also, pesticides and fungicides that are capable of controlling pests and diseases that attack the crop should be developed and used to control attacks on the crop.

Keywords: Rural Farmers, Attitude, Production and Consumption, Edible Mushrooms, Farmers Income, Mushroom Farming.

Introduction

Mushrooms are edible macro-fungi crops which by its nature, grows above the soil and that they grow at a temperature range between 15 – 23°C (Jahan and Singh, 2019). The crop is

fleshy and bears spores that fruits (Ferdousi, *et al.*, 2019). Ferdousi *et al.* (2019) described mushroom as an arable cash crop that is high in value, grown by both smallholders and large-scale farmers across the country, eco-friendly and whose profit level cannot be over-emphasised but that it is labour intensive. Mushroom is delicious when eaten as food, and this practice takes place across the globe for reasons associated with its beneficial effects such as contained in its dietetic qualities (rich in protein, minerals, and vitamins) and many other medicinal properties like lowering blood cholesterol level, defence against cancer, and invigorating hair growth of hair (Martinez-Ibarra, *et al.* 2019). Sharma *et al.* (2016) stated that mushroom production as a matter of fact, can help provide employment opportunities for the unemployed, help families live above poverty line and such practice (growing of mushrooms) can as well help to improve the socio-economic characteristics of poor farmers. It was also asserted that mushroom production and consumption can provide nutritional security (Sharma *et al.*, 2016). Kumari *et al.* (2018) stated that the crop is one of the high value crops that can be grown alongside other crops as a diversification option for both small-holder and large-scale farmers.

Adejo and Ademu (2018) opined that the poverty level of our farmers is increasing by day and that this scenario is evident in the use of mushrooms as a source of protein in their diet just to guarantee the nutritional level and improve the poverty situation. With the beneficial effects of mushrooms, particularly their nutritional value, the ability of the enterprise to provide additional sources of income, and because it does not involve the use of a large parcel of land, it is hypothesised that mushroom cultivation in the country could be another goldmine for farmers. In order to improve the inhibiting factors, which could be perceived or anticipated, the study was conducted to investigate sociodemographic and cultural factors that can affect mushroom production. To this end, the increasing production of mushrooms has been advocated so that its numerous benefits can be restored through its diet and income provision (Adejo and Ademu, 2018).

Poverty is described as the incidence of lack and protracted inability to generate productive resources for the purposes of generating a desired level of output in order to enhance the realization of appreciable income (Mundi, 2017). Mundi (2017) also acknowledged that poverty is of two folds, these are relative and absolute poverty. The level of poverty of farmers can be alleviated through the participation of farmers in poverty alleviation programmes such as mushroom production. Such a programme should be effective, well focused, and well-coordinated to achieve its goal of economic empowerment and poverty alleviation.

The mushroom farming is not without some constraints, as Adejo and Ademu (2018) noted that different farmers are showing different attitudes to this goal of mushroom production. This attitude is either welcoming or discouraging. The issue of concern now is whether or not the attitudes of the farmers have had positive and significant effects on mushroom production in the country in general and in the area of study in particular. This study attempts to determine whether the increase in mushroom production is in any way

influenced by the attitude of farmers or not. Against this background, this study seeks to: describe the sociodemographic characteristics of the respondents in North Central, Nigeria, identify the main reasons why farmers engaged in the farming and consumption of mushrooms in the area, describe the attitude of rural farmers to the production of edible mushrooms, assess the income earned from their farming after adding mushrooms to their crops that have been farmed before, and identify the constraints limiting mushroom production in the study area.

Hypotheses of the Study

The hypotheses were stated in their null forms:

H₀₁: There is no significant relationship between farmer demographic characteristics and their attitude toward the production and consumption of edible mushrooms.

H₀₂: Income earned from mushroom production has not significantly alleviated the poverty status of the rural farmers.

H₀₃: Rural farmers' households with favourable attitudes are not significantly different from those with an unfavourable attitude toward mushroom production.

Methodology

The Area of Study

The area of study are three (3) states and the Federal Capital Territory in North Central, Nigeria. These places are described below:

Federal Capital Territory

Federal Capital Territory (FCT) Abuja was carved out of old Kwara, Niger, Kaduna and Plateau States, it is the Capital seat of Nigeria and was established in 1976. Its estimated population size according to Abuja, Nigeria Metro Population Area as of 2022 was about 3,652,000 and lies between Latitude and Longitude 9.07° N and 7.339°E respectively (FCT, Wikipedia 2016) FCT is located in the savannah region. FCT has a land mass of approximately 8000Km². The territory is made up of six Local Government Councils, which are Abuja Municipal, Bwari, Kuje, Gwagwalada, Kwali and Abuja. Abuja capital city is located between the hills of the extensive Gwagwa plain. The FCT is mainly underlain by differentiated crystal rocks of the pre-Cambrian to early Paleozoic basement complex and cretaceous sedimentary formation (Okwuokenye *et al.*, 2022). Okwuokenye *et al.* (2022) further described the soil in FCT to be made of parent materials that are coarse sand loam in the basement complex with silt clay in nature.

The climate in FCT is tropical with the highest average temperature reaching 37° C and above, which occurs between March and May, while it can be as low as 15° C during the cold season and could even fall to 7° C during rains which take place between July and August, as well as during harmattan in November to February. The average rainfall of the area is 1632 mm and occurs between April and October. The vegetation is guinea in nature and it as well grow shrubs. FCT has mineral deposits like clay, feldspar, tin, gold, iron, ore, etc.

Kogi State

Kogi State is one of the middle belt states and the 9th largest state in Nigeria, but one of the least populous with an estimated population (as of 2022 estimation) of about 4,466,800 million (Kogi State Population Statistics). It was created in 1991 with the coordinates 7.7337°N and 6.6906° E. Kogi State has 21 Local Government Areas (LGAs), with Lokoja being the capital seat of the government (Kogi State – Wikipedia). Kogi State – Wikipedia stated that the State has two distinct regions which are West Sudanian savanna and the Guinea forest – savanna. The State has important geographical features such as several rivers flowing within and out of the State. The major ethnic groups are the Bariba, Busa and the Fulani people. There are notably three major languages which are Okun, Ebira and Igala, with Igala being the largest of them all. Kogi State is endowed with different types of solid minerals and natural resources.

Kwara State

The Kwara state is an old state located in the middle belt of Nigeria. It was created in 1967, with 16 Local Government Areas, with the capital seat at Ilorin. The State has an estimated land area of 36,825 Km² and an estimated population size at 2022 of 3,551,000 (Kwara State Wikipedia). Geographic coordinates are 8.9669°N and 4.3874°E (Kwara State Wikipedia). Wikipedia stated that on a climatic consideration, Kwara state is a state that is hot all year round and the temperature typically varies from 64°F to 95°F and is rarely below 57°F and above 100°F. On economic trend, people are predominantly farmers growing crops (coffee, kola nut, ground nut, cotton, cocoa, etc) and raising animals (cattle, sheep, and goats)

Niger State

Niger State is one of the second-generation states and the largest of all the states in Nigeria. It was created in the year 1967 with Minna as its capital. The state lies between Latitude 8°.20'N and 11°30'N and Longitude 3°30' and 7°20'E. Its land area is approximately 76,363Km². The State's population size as at 2022 according to Niger State Population Statistics is about 6,783,300 people and though they have numerous tribes, the major amongst them are Nupe, Gbagyi and Hausa (Niger State Encyclopedia) Niger State Encyclopedia indicated that the predominant occupation of the people is farming. They grow crops such as cassava, maize, rice, yam, millet, cowpea, etc., and rear animals such as cattle, sheep, and goats. The average temperature of the state is between 23°C and 37°C, while the annual rainfall is between 1100 – 1600mm with a vegetation that is mainly composed of short grasses, shrubs, and scattered trees.

Sampling Techniques

The study population consisted of farmers who were mushroom farmers in the different communities of this study.

A multistage random sampling technique was used to select study respondents. North Central Nigeria comprised of six (6) states namely; Kogi, Kwara, Niger, Benue, Nasarawa, and Plateau States including the Federal Capital Territory (FCT). The first stage involved the random selection of three states namely, Kwara, Kogi, Niger and the FCT for the study (See Table 1). Stage 2 involved the random selection of two (2) LGAs per state (efforts were made to ensure that these were areas where mushroom is produced). This then brought the total number of LGAs used for the study to eight (8). From these LGAs, there was a random selection of two (2) communities per LGA (stage three). Thus, resulting in a total number of communities used for the study of 16 (16). The researcher made efforts to ensure that the guiding criteria adopted in the selection of farmers include the fact that they must be mushroom farmers and active. Stage four involved the random selection of 25 (25) mushroom farmers per community, which resulted in a total of 400 mushroom farmers that were used for the study. The farmers were then administered the question instrument and from the returned question instrument, approximately 389 (97.25%) of them were suitable for analysis.

Table 1: Showing the states, local government areas, and communities used for the study

State	LGAs	Communities	No. of farmers
Federal Capital Territory	Abaji	Kebba	25
		Ebagi	25
	Kuje	Damwa	25
		Agwai	25
Kogi	Ankpa	Ankpa	25
		Adde	25
	Idah	Akpo	25
		Alade	25
Kwara	Ilorin East	Ile-Apa	25
		Zango	25
	Edu	Isapa	25
		Obbo	25
Niger	Bida	Umaru	25
		Bariki	25
	Mokwa	Labozhi	25
		Bokani	25
3 States + FCT	8	16	400

Data Sources and Data Collection Instrument

Primary data were used to meet the objectives and hypotheses of this study. They were sourced directly from the farmers used for the study.

The study adopted the use of questionnaire and interview schedule. They were administered, respectively, to the literate and illiterate farmers. The questions were presented in sections for ease of analysis. Data collection instruments were personally administered to respondents by the researcher and in other cases by trained enumerators.

The retrieval of the question instruments was also conducted through the same channel. These enumerators consisted of residents of the communities where the study was carried out.

The validity of the question instruments was carried out with the use of the face content validity method. The research instrument was validated using a face content validity approach. This involves the use of experts in the field of Agricultural Economics and Extension to assess, criticise, and make valuable suggestions on the improvement of the instruments vis-à-vis the stated objectives of the study (Erie, 2009).

Analytical Techniques

The study data were analysed with descriptive and inferential statistics. Descriptive statistics (frequency, mean and standard deviation) were used to analyse all the objectives except for objectives 3 and 5 which is on the attitude of farmers towards the production of edible mushrooms and constraints limiting mushroom production in the area of study, which were analysed using the Likert scale. The scale ranged from Strongly agreed, Agreed, Disagreed and Strongly disagreed respectively coded as 4, 3, 2 and 1. It produces a weight mean of 2.50 (Obtained as $4 + 3 + 2 + 1 = 10/4 = 2.50$). Factors with means ≥ 2.50 indicates that the attitude of farmers affected the production and consumption of mushrooms in one way or another. Contrarily, when the values are < 2.50 , it implies otherwise. In the case of constraints limiting mushroom production, means ≥ 2.50 indicated that factors were considered as major constraints, while those with values less than 2.50 are considered not important.

The hypotheses of the study were analysed with inferential statistics. First, hypothesis 1 was analysed with Binary logit regression model. It was used to show the relationship between the sociodemographic characteristics of the farmers and their attitude towards the production and consumption of edible mushrooms. The binary logit regression model was expressed implicitly and explicitly as follows:

$$\text{Ln}y = \ln(p/I-P) = F(B_iX_i) + e_i$$

$$\ln(P/I-P) = F(B_iX_i) + e_i$$

Where:

Y = Farmers attitude (favourable = 1; unfavourable = 0)

P = Probability of farmers attitude with favourable attitude to mushroom farming

I-P = Probability of farmers attitude with unfavourable attitude to mushroom farming

I-n = Natural Logarithm function

(B_i) = Vector of logistic respect coefficients

(X_i) = Vector of independent variables (socio-demographic characteristics) given as follows:

(X₁) = Gender: male =1; female = 0

(X₂) = Age: measured in years

(X₃) = Marital Status: married =1; single =2; divorced/separated =3; widow/widower =4

(X₄) = Household size: number of people living and feeding together

(X₅) = Educational status: none =1; primary =2; secondary =3; tertiary =4

(X₆) = Farm size of respondents: measured in hectares.

(X₇) = Religious affiliation of respondents: Christian =1; traditional =2; Muslim =3; others=4

(X₈) = Farm status (full time = 1; part-time =0)

The T-test was used to determine whether the income earned from mushroom production has significantly alleviated the poverty status of rural farmers. Okwuokenye *et al.* (2022) concluded that the t-test is used to compare the means between two groups. The formula for t- test is as shown below:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where:

$\bar{x}_1$ = the mean of group 1 ;

$\bar{x}_2$ = the mean of group 2 ;

S₁ = standard deviation for group 1; S₂ = standard deviation for group 2

S₁² = variance of the group 1 ; S₂² = variance of the group 2

n₁ = size of the first group ; n₂ = size of the second group

√ = square root

Decision rule for t – statistics:

i.e. if t cal > t tab = reject null and accept alternative hypothesis

t-tab > t cal = accept null and reject alternative hypothesis

Hypothesis 3 was analysed with the use of a binomial test and this involved the two-tailed binomial test. The test was used to determine the significance of difference in proportion of respondents that had favourable attitude from those with unfavourable attitude to mushroom production. The binomial distribution formula is given below:

$b(x;n,p) = nCx \cdot p^x \cdot (1-p)^{n-x}$

where; b = binomial probability; x = total number of successes (satisfied or not satisfied)

p = probability of success on an individual trial; n = number of trials.

Results and Discussion

Demographic Characteristics of Respondents

Results on demographic characteristics of the respondents is presented in Table 2. The results revealed that most (59.13%) of the respondents were males and came from people who were in their early to late thirties (30 – 39 years) (53.47%) and had an average age of 37.37 years with varying marital status attainment where most (66.67%) of them were married followed by the those that were respectively singles (21.59%), divorced (4.11%) and widow(er) (4.63%). The educational level of the respondents revealed that most (48.07%) of them had the highest level as post-secondary and no education (7.46%), while about 7.46% and 37.02% respectively had primary and secondary education certificate. The average household size was 5 persons with most (45.24%) participants having household sizes of between four to six occupants. About 34.96% of them had less than 4 persons while

19.80% had more than 6 persons in their households. The primary occupation engaged by most (32.90%) of them was farming, where very few (9%) of them are self-employed. Other occupations engaged in were trading (24.94%), civil service (22.98%) and company work (10.03%). Also, their major source of income was from farming (82.01%) and crop farming is their dominant type of farming (95.63%). Other types of farming engaged in by others were poultry (1.79%) and fishing (2.57%). Majority of the respondents engage in farming as a full-time vocation (77.63%).

The dominance of males in mushroom farming was supported by Adejo and Ademu (2018) who stressed that this is expected in the African context since most of the households were headed by males. Adejo and Ademu (2018) also supported respondents' possession of high educational level which thus indicates that they could read and apply farm innovations and instructions that can enhance production with minimum or no assistance, thereby reducing their poverty level. Results on dominance of married farmers in mushroom production was in consonance with that of Okwukenye and Abdurrahman (2022) who acknowledged the involvement of more married persons in farming activities as a sure means of meeting up with the economic demands of their households.

Table 2: Socio-demographic variables of the respondents. **N** = 389

Socio-demographic Variables	Categories	Frequency (%)	Percentage	Mean
Gender	Male	230	59.13	
	Female	159	40.87	
Age groups	< 30	77	19.79	
	30 – 39	208	53.47	
	40 – 49	65	16.71	
	50 – 59	12	3.34	
	> 60	26	6.68	
Marital status	Single	84	21.59	37.37 years
	Married	271	66.67	
	Divorced	16	4.11	
	Widow(er)	4	4.63	
Educational level	No Formal Educ.	29	7.46	
	Primary Educ.	29	7.46	
	Sec. Educ.	144	37.02	
	Post Sec. Educ.	187	48.07	
Household size	1 -3	136	34.96	
	4 -6	176	45.24	
	7 -9	44	11.31	
	10 -12	22	5.66	
	>13	11	2.83	

Primary occupation	Farming	128	32.90	
	Trading	97	24.94	
	Civil Service	89	22.98	
	Company worker	39	10.03	
	Self Employed	36	9.25	
Major source of income	Farming	319	82.01	
	Others	70	17.99	
Type of farming	Crop farming	372	95.63	
	Poultry	7	1.80	
	Fishing	10	2.57	
Farming status	Full Time	302	77.63	
	Part Time	87	22.37	

Source: Field survey, 2022

The results on household size, revealed that they have large household size, therefore indicating that the respondents have people who depend on them for economic survival. This result was found to be similar with findings of Okwuokenye *et al.* (2022) who reported possession of 4 – 6 persons by majority (50%) of farmers in the same area of study. The age of the farmers showed that they are young and active and more predisposed to risk taking in farming business that could help improve farm productivity and income that could alleviate the poverty situation of the farmers. The result is consistent with the findings Ashiegbu *et al.* (2021) who acknowledged farmers mean age of 31.6 years and described them as being young and energetic.

Considering the farmers primary occupation, it was revealed that farming was the primary occupation of the farmers and this may not be unconnected to the fertile land available at the people's disposal and may be acquired free or at a very small amount of money. In addition, farming was found to be the major source of the respondents income. This practice may be connected to the fact that the areas are agrarian communities where inhabitants delight pleasure and see farming as a way of life and as the best possible means of earning income that could help cushion off their poverty status. Furthermore, crop farming was observed as the type of farming most of the farmers were into. Engaging in crop production may be in line with the less risk involved in considering other types of farming and the rate of return that it guarantees in meeting farmers economic needs. Most of the farmers engagement in full-time farming would have been created from their interest and seen by them as most reliable source of meeting their economic activities. Full-time involvement in farming will also give room for more commitment of their time and other resources that can also help to improve their production level and farm income.

Major Reasons for Mushroom Farming by Respondents

Table 3 shows the reasons why farmers grow and consume mushrooms. The reasons were quite numerous and include the fact that about 91% indicated that mushroom is easy to

farm, hence their participation, 53% said that it serves as food for man, 63% opined that it is medicinal, while 51% indicated that it serves as nutrients in their food. Almost (99%) of the respondents agreed that mushroom farming has a high commercial value, while a very high fraction (92%) noted that mushroom farming has helped solve hunger at home. Only 20% of the respondents gave their reasons for mushroom farming as a result of unemployment. The findings of Alfred and Arifalo (2012) agreed with the result on the conclusion that mushroom farming is of high commercial value to people and is a source of nutrients for people. This result also agreed with reports of Jannatul *et al.* (2019) that mushroom serves medicinal purpose to man and has been universally used as food for man, in addition to the fact that it has helped to solve hunger issues and through income provision, it has helped to alleviate the poverty status of the farmers

Table 3: Reasons for mushroom farming by respondents

Reasons for mushroom farming	Yes (%)	No (%)
Easy to farm	352 (90.49)	37 (9.51)
Food for man	244 (62.73)	145 (37.28)
Medicine for man	244 (62.73)	145 (37.28)
For Nutrients	199 (51.16)	190 (48.84)
For High Commercial value	383 (98.46)	6 (1.54)
Helped to solve hunger at home	359 (92.29)	30 (7.71)
No job	77 (19.79)	312 (80.20)

Source: Field survey, 2022

Attitude of Rural Farmers Household Towards Production and Consumption of Mushrooms

The attitude of rural farmers households towards production and consumption of edible mushrooms is shown in Table 4. The result revealed that the statements that influenced the farmers attitude to the production and consumption of mushrooms were; production of mushrooms has enhanced my farm output (mean = 3.06), production of mushrooms has improved my income (mean = 3.01), production of mushrooms has improved my knowledge of farming practices and skills (mean = 2.94) and production of mushrooms has improved my living standard (mean = 2.83). The aforementioned statements ranked in terms of mean weight, the 1st, 2nd, 3rd and 4th factors that influenced the farmers attitude to the production and consumption of mushrooms in one way or the other. The results on enhancing farmers output, improving income and standard of living of the farmers were supported by Jonnatul *et al.* (2019) who reported that mushroom farming does not only help in producing empowerment but also help to alleviate the poverty status of the rural farmers.

Table 4: Attitude of rural farmers household towards production of mushrooms

Statements	Strongly disagree		Disagree		Agree		Strongly agree		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Mean*	SD
- Production of mushrooms has enhanced my farm output	3	0.77	34	8.74	301	77.38	51	13.11	3.06	0.5
- Production of mushrooms has improved my income	0	0.00	26	6.68	295	75.84	68	17.48	3.01	0.5
- Production of mushrooms has improved my knowledge of farming practices and skills	0	0.46	3	0.77	328	84.32	58	14.91	2.94	0.5
- Production of mushrooms has improved my living standard	1	0.26	61	15.68	262	67.35	65	16.71	2.82	0.6
- Production of mushrooms has helped in improving farmers linkage to input providers	71	18.25	304	78.15	12	3.09	2	0.51	1.81	0.6
- Production of mushrooms has helped in improving people's good thinking about me	51	13.11	324	83.29	14	3.60	0	0.00	1.68	0.5

*Favourable/ agreed (mean > 2.50)

Assessment of Farmers' Income before and After Adding Mushroom to their Crops

The annual income of the respondents before and after adding mushrooms to the crops they were farming before is shown in Table 5. Most (31.63%) of the respondents earned an income of between N301,000 – N400,000 before adding mushroom to the crops they were farming. However, most (40.62%) of the farmers earned an income greater than N500,000 after adding mushrooms to the crops they were farming before. The average income earned by the farmers before adding mushrooms to the crops they were farming before was N360,539.58, while that of the farmers after adding mushrooms to the crops they were farming before was N426,092.55. The difference in average earnings was N65,552.70 and this was in favour of farmers after adding mushroom to the crops they were farming before. The result concludes that mushroom farming has really boosted farmers income, and this will help alleviate the poverty status of the farmers. The result was agreed with the findings

of Ashiegbu *et al.* (2021) which stated that mushroom production is really economically profitable.

Table 5: Assessment of farmers' income before and after adding mushroom to their crops

Farm Income (N)	Income before adding mushroom to crops farmed before			Income after adding mushroom to crops farmed before		
	Freq.	%	Mean	Freq.	%	Mean
≤ 100,000	9	2.31		0	0.00	
100,001 – 200,000	0	0.00		33	8.48	
200,001 – 300,000	111	28.53		47	12.08	
300,001 – 400,000	123	21.62		58	14.91	
400,001 – 500,000	113	29.05		93	23.91	
> 500,000	33	8.48	N360,539.58	158	40.62	N426,092.55

Source: Field survey, 2022; *Difference in farm income before and after adding mushrooms to farmer crops* = $N360,539.58 - N426,092.55 = N65,552.70$

Constraints Limiting Mushroom Production

The constraints that limit mushroom production are quite numerous (see Table 6). These constraints stagnate the mushroom production in the study area in particular and the country in general. The constraints are arranged in the order of their mean magnitude. The 1st, 2nd and 3rd serious constraints plaguing mushroom farming are: problem of identifying edible mushrooms (mean = 2.84), lack of knowledge on mushrooms consumption, its nutritional and medicinal value (mean = 2.73), lack of awareness on the people's part (mean = 2.73) and that it is seen as a taboo to grow mushrooms (mean = 2.71). Other constraints are: pest and diseases (mean = 2.70), capital unavailability (mean = 2.66), unavailability of reliable market for the produce (mean = 2.64), unavailability of reliable growing materials (mean = 2.56) and poor weather condition (mean = 2.51). These later constraints ranked 4th, 5th, 6th, 7th and 8th serious constraints plaguing mushroom production. This result agreed with the findings of Jannatul *et al.* (2022) as it relates to issues concerning pest and disease, poor capital base, lack of growing materials, lack of reliable market and lack of trained labour as constraints limiting mushroom production. Other constraints like problem of identifying edible species, poor weather conditions and lack of awareness were identified by Adejo and Ademu (2018) and so in agreement with this result.

Table 6: Constraints limiting mushroom production

Constraints limiting mushroom production	Mean	SD	Rank
- Problem of identifying edible mushrooms	2.84*	0.76	1 st
- Lack of knowledge on mushrooms consumption, its nutritional and medicinal value	2.73*	0.60	2 nd
- Lack of awareness on the people's part	2.73*	0.51	2 nd
- It is seen as a taboo to grow mushrooms	2.71*	0.52	3 rd
- Pest and diseases	2.70*	0.59	4 th

- Capital unavailability	2.66*	0.54	5 th
- Unavailability of reliable market for the produce	2.64*	0.54	6 th
- Unavailability of reliable growing materials	2.56*	0.56	7 th
- Poor weather condition	2.51*	0.57	8 th
- It is too cheap in terms of market price	2.43	0.59	9 th
- Lack of skill on the farmers part	2.39	0.60	10 th
- It is not consumed by many	2.33	0.64	11 th
- Poor storage facility	2.31	0.63	12 th
- Poor shelf life	2.17	0.69	13 th

Source: Field survey, 2022; Agreed ≥ 2.50

Relationship of Farmers Demographic Characteristics and their Attitude to the Production and Consumption of Edible Mushrooms

Table 7 shows the estimated parameters of the relationship of farmers demographic characteristics and their attitude to the production of edible mushrooms. Binary logit regression model was used to analyze the hypothesis (hypothesis 1) which states that: there is no significant relationship between farmers demographic characteristics and their attitude to the production and consumption of edible mushrooms. The computed F-statistics (12.75) was greater than the critical F (2.167) and so was considered significant at the 5% level and this denotes that the collective influence of the demographic variables on farmers attitude to the production and consumption of edible mushrooms was significant at the 5% level. This led to the rejection of the null and acceptance of the alternative hypothesis. The variables in the model jointly accounted for about 57.3% in the farmers attitude to the production and consumption of edible mushrooms. Five out of the eight explanatory variables were significant to at various levels to farmers attitude to production and consumption of mushroom. The results are further discussed below:

Gender of the respondents had a beta coefficient of 0.921 with a t-value of 2.915. it was positively signed and significant at the 1% level to farmers attitude to production and consumption of mushrooms. The positive sign is an indication that since male constituted the majority (59.13%), the involvement of more males in edible mushroom production, the more favourable attitude they would have to even produce and consume more edible mushrooms. This result is in line with the findings of Adejo and Ademuy (2018) who concluded that males headed households are likely to consume more mushrooms compared to female headed households. The marital status of the respondents was positively related with their attitude to production and consumption of edible mushrooms. Its beta coefficient was 0.236 while the t-value was 2.347 and was significant at the 5% level. The result implies that since married farmers was highest (66.67%) amongst the others, it implies that the more involvement of married farmers in the business of farming mushrooms, the more favourable attitude they would be advanced by the farmers to the production and consumption of edible mushrooms. The result corroborates with that of Ashiegbu *et al.* (2021) who found more of married persons showing enthusiasm and

participating in edible mushrooms production and that they carry out such activity in other to meet family needs.

Age of respondents ($\beta = 0.427$ and $t\text{-value} = 3.541$) was also positive and significantly related at 1% to farmers attitude to production and consumption of mushrooms. The result implies that older farmers would put up more favourable attitude to mushroom production and consumption. Findings of Adejo and Ademu (2018) corroborated with this result as they found that an increase in age increases the probability and by extension, the attitude of the respondents to mushroom consumption. Education level of the respondents shows negative and 5% level of significant relationship with farmers attitude to production and consumption of edible mushrooms. The beta coefficient and $t\text{-value}$ were -0.972 and 2.210 respectively. The result implies that more educated farmers will show higher unfavourable attitude to edible mushroom production and consumption. The reason for the negative relationship may not be unconnected to the fact that such farmers may have higher purchasing power and so could afford other sources of protein like meat, egg and fish for their diet. The result is at variance with findings of Ahir *et al.* (2021) which showed positive and significant correlation between farmers educational level and adoption of mushroom production technology.

Farmers household size ($b = 0.752$; $t\text{-value} = 2.462$) was positively related and significant at the 5% level to farmers attitude to production and consumption of edible mushrooms. The result simply implies that farmers with larger household size will show more favourable attitude to production and consumption of edible mushrooms. This result agreed with findings of Ashiegbu *et al.* (2021) who stated that an increase in household size leads to increase in youth participation in the production of mushrooms and that such activity can help to meet the economic needs of the households and as well cushion the effect of poverty on the households.

Table 7: Relationship of farmers demographic characteristics and their attitude to the production and consumption of edible mushrooms

Variables	Coefficient (B)	t-value	Prob. Level
Constant	73.126		
Gender	0.921**	2.915	0.008
Marital status	0.236*	2.347	0.005
Age	0.427**	3.541	0.001
Educ. level	- 0.972*	2.210	0.121
Religious affiliation	0.018	1.459	0.198
Household size	0.752*	2.462	0.003
Farm size	0.761	0.963	0.274
Farm status	0.621	0.386	0.160

$F_{cal} = 12.75$; $F_{tab} = 2.167$; $P (< 0.05)$; Adjusted $R^2 = 0.573$

Significant at 5% (Critical $t = 1.645$); Significant at 1% level (Critical $t = 2.576$)

Relationship between Income Earned from Mushroom Farming and Poverty Alleviation Status

T – test and descriptive statistics were used to test hypothesis 2 which states that farm income earned from mushroom farming has not significantly alleviated the poverty status of the rural farmers.

Table 8: Effects of adding mushroom to crops farmed by respondents (t-test)

Income status of farmers	No.	Income (N)		t	Decision
		Mean	Difference		
- Earning of farmers after adding mushroom to the crops they produce	389	426,092.55	65,552.70	27.324*	Significant
- Earning of farmers before Adding mushroom to the crops they produce	389	360,539.58			

*Significant at the 5% level (critical t- value = 1.645)

The results on Table 8 shows that the average income earned by the farmers before and after adding mushrooms to their farming activities was N360,539.58 and N426,092.55 respectively. This suggests that the addition of mushrooms to their previous farming activities made the farmers to earn higher income. The difference N65,552.70 in the income earned was significant since the calculated t-value (27.324) was greater than the tabulated value (1.645). on this accord, the null hypothesis was rejected in favour of the alternative. The hypothesis was further analyzed to find out if the income earned from adding mushrooms to farming activities has helped in alleviating the farmers poverty status. This was analysed with descriptive statistics and showed in Table 9. The relationship shows the farm income earned from mushroom farming and its possible alleviation of the poverty status of the farmers. Revealed by the results of the study is the fact that most (60.67%) of the farmers indicated that income earned from mushroom farming has helped to alleviated the poverty status of the farmers to a very high extent. About 27.25% and 12.08% respectively indicated that mushroom production has helped to boost their income to a just high and average extent. Also, as the respondents pointed out, such extents are enough to alleviated the poverty status of the farmers. The difference in income (N65,552.70) (see Table 8) earned after adding mushroom to their farming was concluded to have added economic value to their status-quo and that this is sufficient to help them alleviate their poverty status. The results of this study were supported by Jonnatul *et al.* (2019) who reported that mushroom farming goes beyond empowering rural farmers but also help to alleviate their poverty level.

Table 9: Extent to which income earned from mushroom farming has alleviated the poverty status of the farmers

Extent of mushroom income has helped to alleviate poverty level of farmers	Frequency	Percentage
Very high extent	236	60.67
Just high extent	106	27.25
Average extent	47	12.08

Source: Field survey, 2022

Farmers' attitude towards mushroom production [Binomial test]

The attitude of farmers towards mushroom production is shown in Table 10. This was expressed in hypothesis 3 as: farmers with favourable attitudes are not significantly different from those with unfavourable attitude to mushrooms production. It was analysed with the use of Binomial test which employed propensity score matching method (Logit). The outcome variable is farmers attitude towards the farming of mushrooms.

The result revealed that most (89%) of the farmers showed a favourable attitude towards production or farming of mushrooms and this indicates that the farmers have in one way or the other seen some of the benefits of farming mushrooms, especially as it concerns income improvement of the farmers. The other fraction (11%) expressed an unfavourable attitude towards the production or farming of mushrooms. The respondents' attitude was skewed towards showing favourable attitude towards farming of mushrooms. The result shows significance at the 1% level and the basis of this, the alternative hypothesis was accepted against the null.

The farmers favourable attitude is likely to be linked to the positive effects in terms of increased income as well as nutritional and medicinal benefits associated with the farming of mushrooms. This result is in line with findings of Htay *et al.*, (2022) which unraveled that attitude of farmers in farming was influenced by the net effect of benefits and costs people experienced from their project.

Table 10: Respondents attitude towards production and consumption of mushroom [Binomial test]

Variables	Category	N	Observed Prop.	Test Prop	Chi-square	Prob. Level
Attitude of farmers towards mushrooms production	Favourable (score: >18)	346	0.89	0.50	346.0	.000
	Unfavourable (score: 18 & below)	43	0.11			
	Total	389	1.00			

Significant at the 1% level

Source: field survey, 2022

Conclusion and Recommendations

The focus of the study on attitude of rural farmers households towards production and consumption of edible mushroom as a strategy to alleviate poverty status in North Central Geo-Agricultural zone, Nigeria, indicates that mushroom production is mainly carried out by males who are young in age, married with people to cater for in their households and are of high educational qualification which predisposed them to higher purchasing power to seek alternative sources of protein. Mushroom production and consumption is carried out by many farmers who showed more favourable attitudes and this is not unconnected to the several benefits derived from its production and consumption.

The addition of mushroom to the other crops cultivated by the farmers was proved to be profitable as they showed to earn an average income of 360,539.58 before adding mushroom and 426,092.55 after adding mushroom to the crops cultivated by them. The difference (65,552.70) was noted by them to be highly sufficient to alleviate their poverty status. Though more income would have been earned from mushroom farming if not for the various constraints plaguing its production and consumption. Socio-demographic variables like: gender, marital status, age, educational level and household size were found to be significantly related to farmers attitude on the production and consumption of mushrooms. Findings of the study revealed that the farming and consumption of mushrooms show good prospects since most of the farmers show favourable attitude in this regard.

Based on findings, the following recommendations are hereby advanced:

There is need for the people to be orientated by scientists through organized programme on how to identify edible mushrooms so that they get an increased interest in the production and consumption of the produce. Such sensitization should as well unravel the importance of mushrooms in line with its nutritional and medicinal values. This has become necessary since problem of identification and lack of knowledge was identified as major constraints to patronage of the produce.

It has become necessary for more awareness campaign to be carried out through government agencies of the beneficial effects of farming and consumption and as well see it as a crop that has no religious or evil tied to its production and consumption. This will stop the people from seeing it as a taboo to produce and consume it.

Pesticides and fungicides that are capable of controlling pest and diseases that attack the crop should be developed and used to control attacks on the crop. Doing this will help to encourage its production and have more of it available for man's use; and,

The issue of unavailability of capital was a constraint plaguing mushroom production and consumption. To bring this constraint under check, farmers can be advised to organize themselves into cooperative where their meagre resources can be pulled together and used to make large-scale purchases.

Conflict of Interest

This research has no conflict of interest

Acknowledgement

The research team acknowledges and remain very grateful to the Vice Chancellor and Management of National Open University of Nigeria (NOUN) for logistics and sponsorship of this research and the subsequent publications.

References

- Abuja, Nigeria Metro Area Population. Retrieved at: <https://www.macrotrends.net/cities>. On 6th November, 2022
- Adejo, P.E. and Ademu, H. (2018). Attitude of Rural Farming Household towards the Consumption of Edible Mushrooms in Dekina Local Government Area, Kogi State, Nigeria. *Nutrition and Food Science International Journal*. Volume 5 Issue 3
- Ahir, P., Thakor, R.F. and Kapur, L.T. (2021). Factors Influencing Adoption of Mushroom Production in Gujarat, India. *Journal of Krishi Vigyan*, 10 (1): 90-93
- Alfred, S.D. and Arifalo, S.F. (2012). Socio-Economic and Cultural Factors that Affect Mushroom Production in Southwest Nigeria. *Agricultura Tropica Et Subtropica*, 45/2, 78-83
- Ashiegbu, G.N., Olagunju, O., & Onyeabor, E.N. (2022). Participation of rural youths in mushroom production in Umuahia agricultural zone, Abia State, Nigeria. *International Journal of Agricultural Management and Development*, 12(1), 1-9
- Federal Capital Territory (Nigeria) – Population Statistics, Charts, Map and Location. Retrieved at: <https://citypopulation.de/admin>. On 15th January, 2023
- Ferdousi, J., Al Riyadh, Z., Hossain, M. I., Saha, S.R. and Zakaria, M (2019). Mushroom production benefits, status, challenges and opportunities in Bangladesh: A Review. *Annual Research and Review in Biology*. 34(6): 1 - 13
- Htay.T., Htoo, K.K, Mbise, F.P. and Roskaft, E. (2022). Factors influencing communities and participation in protected area conservation: A case study from Northern Myanmar. Accessed at Retrieved at: <https://www.researchgate.net>. On 18th, August, 2022
- Jannatul, F., Zabid, R., Hossain, M.I. and Satya, R.S. (2019). Mushroom Production Benefits, Status, Challenges and Opportunities in Bangladesh: A Review. *Annual Research & Review in Biology*. 34(6): 1-13
- Kogi State, Nigeria – Population Statistics, Charts, Map and Location. Retrieved at: <https://citypopulation.de/admin>. On 15th January, 2023
- Kumari A., Singh D.P., Singh A. and Kumari M.E, Gómez-Martín, M.B. and Armesto-López, X.A. (2019). Climatic and socioeconomic aspects of mushrooms: The case of Spain. *Sustainability*. 11(4):1030
- Martínez-Ibarra E, Gómez-Martín M.B. and Armesto-López X.A. (2019). Climatic and socioeconomic aspects of mushrooms: The case of Spain. *Sustainability*. 11 (4):1030.
- Mundi, N.E. (2017). Agricultural Innovations and Rural Poverty Alleviation in Nigeria, *11th Inaugural Lecture*, Delivered at the NOUN Headquarters, Jabi, Abuja, on 12th May, 2017
- Niger State, Nigeria – Population Statistics, Charts, Map and Location. Retrieved at: <https://citypopulation.de/admin>. On 15th January, 2023
- Okwuokenye, G.F. and Abdurrahman, A. (2022). Effect of rural-urban migration among youths on agricultural and rural development in two LGAs in Kaduna State, Nigeria. *Journal of Community & Communication Research*. Vol. 7(1): 210 – 218.
- Okwuokenye, G.F., Onyemehian, F. and Damisa, A.K. (2022). Determinants of giant Snail (*Achatina achatina*) production in Federal Capital Territory (FCT) and Nasarawa State, Nigeria: challenges and prospects. *Journal of Agriculture and Environment*. 18(2): 1 – 13

Sharma D., Kumar, A. and J.S. Guleria (2016). Economic viability, technological gap and problems of mushroom cultivation in Mandi district of Himachal Pradesh. *Himachal Journal of Agricultural Research* 42(1): 47-54