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MUSHROOM PRODUCTION BY SMALL-SCALE FARMERS: AN APPROACH TO ECONOMIC EMPOWERMENT AND REDUCING HUNGER AMONG RURAL HOUSEHOLDS IN NORTH CENTRAL NIGERIA

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Abstract

The study was carried out to investigate mushroom production by small-scale farmers as an approach to economic empowerment and reducing hunger among rural households in North Central Nigeria. The study used 389 respondents sampled through multi-stage sampling technique from three States and the Federal Capital Territory. Descriptive and inferential statistics (Binary logit regression model and Binomial test) were used to analyse the data. Results showed that the majority of the respondents were males (59.13%), married (53.47%), with the average age of 37.37 years, a mean household size of five persons and a mean educational level of 14 years. They were mostly into farming (32.90%) and at full-time level (77.63%). The farmers earned an average annual income of ₦360,539.85 and ₦426,092.55 before and after adding mushroom to their farming activities and were satisfied with the proceeds from mushroom production. Strategies such as establishing and participating in cooperative groups (mean = 3.55), development of improved mushroom growing materials (mean = 3.40) and extension agents training of farmers on input use for mushroom production (mean = 3.30) were advocated to increase mushroom production. Socio-demographic characteristics such as gender, marital status, age, educational level, household size and farm status positively influence the income earned by farmers from mushroom production. It is recommended that there is need for a robust extension programme to be carried out on farmers training on the use of inputs.

Keywords: farm income, level of satisfaction, poverty status, mushroom farming, production, poverty reduction

Introduction

Mushrooms are part of fungal biota and they are fleshy, spore-bearing fruiting bodies of fungi, typically produced above ground on soil or on their food sources (Ayodele, 2023). He further described mushrooms as macro fungi with distinctive fruit bodies, which can be hypogeous, large enough to be seen with the naked eyes and to be picked by hand. Sharma *et al.*, (2016) as well described mushrooms as a fungal that grows on different substrates and it physiologically has a domed cap that rests on a stalk with gills showing on the underside of the cap. Sharma *et al.*, (2016) stated that mushrooms are white vegetables and boneless vegetarian meat and that they are of different types, namely: Terrestrial/Tericolous mushrooms, Lignicolous mushrooms and Mycorrhizal

mushrooms. Many poisonous and edible mushrooms exist. People in the past have wrongly eaten the poisonous type, which has created unpalatable experience and has led to people's withdrawal from wild mushroom consumption (Ayodele, *et al.*, 2023).

On economic consideration, Barmon *et al.* (2012) stated that the production of mushroom (*Agaricus bisporus*) is a profitable venture even for low-income rural households and providing employment for the unemployed in the rural areas. Nevertheless, mushrooms can be eaten directly after cooking or preserved by drying for use on a later day (Alfred and Arifalo, 2012). They further stated that mushrooms are very nutritious in terms of food value, being known to contain large quantities of high-quality protein,

vitamins and minerals with a negligible fat content; and medicinal since it is known to have healing effects on heart and coronary diseases, cancer, diabetes and protection against infections; soil remediation and help to yield good level of income to the farmer.

Of recent, the cultivation of mushrooms in the Nigeria has been advocated for and this is not unconnected to the numerous beneficial effects associated with its consumption and commercialization as it is hoped that farmers' commitment to the cultivation of the crop, will lead to a reduction in unemployment status among the rural people, increase in their farm income, alleviation in their poverty status and improvement in their standard of living.

FAO (2023) report defined hunger as an uncomfortable or painful physical sensation caused by insufficient consumption of dietary energy. Stressing further, the situation of hunger becomes chronic when the person does not consume sufficient amounts of calories regularly to lead a normal active and healthy life (FAO, 2023). One of the approaches farmers can overcome hunger in their households and communities is through one kind of economic empowerment or the other. To this end, economic empowerment is the ability to make and act on decisions that involve control over the allocation of financial resources (Golla *et al.*, 2011). Agriculture and Economic Empowerment report stated that economic empowerment can take place in where the farmers are and can be by improving the standard of living of the farmers through income generated from the sales of agricultural produce.

From the aforementioned approach, the cultivation of mushrooms is advocated for and seen as one of the surest ways (because of its numerous benefits and commercial level) of meeting farmers' needs, solving hunger issues and ensuring the economic empowerment of the farmers. It is on this note the study seeks to investigate the production of mushrooms by small-scale farmers as an approach to economic empowerment and hunger reduction among rural households in North Central Geopolitical zone, Nigeria. The specific objectives are to: examine the socio-demographic characteristics of the respondents in North Central Geopolitical zone; evaluate farmers' farm income before and after

adding mushroom to their previous farming activities; assess the extent to which the proceeds from mushroom farming have boosted farmers income; examine the farmers level of satisfaction with the proceeds from mushroom farming; and identify the strategies that the farmers can adopt to boost mushroom production in the study area.

Hypotheses:

- i: There is no significant relationship between farmers socio-demographic characteristics and the extent to which proceeds from mushroom have boosted farmers income.
- ii: There is no significant difference between farmers that are satisfied and those not satisfied with the income earned from mushroom production.

Methodology **Study Area**

The study was conducted in three (3) States and the Federal Capital Territory in North Central Geopolitical zone of Nigeria.

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. It has an estimated population size of about 3,067,500 as of 2022 (NPC, 2022) and lies between Latitude and Longitude 9.07⁰ N and 7.339⁰E respectively (FCT, Wikipedia 2016) FCT is located in the savannah region. FCT has a land mass of approximately 8000 Km². The territory comprises six Local Government Councils: Abuja Municipal, Bwari, Kuje, Gwagwalada, Kwali and Abuja. Abuja, the capital city is located between the hills of the extensive Gwagwa plain. FCT is underlain mainly by the differentiated crystal rocks of the pre-Cambrian to early Paleozoic basement complex and cretaceous sedimentary formation (Ishaya, *et al.*, 2010). He further described the soil in FCT as made of parent materials that are coarse sand loam in the basement complex to silt clay in nature. The climate in FCT is tropical with the highest average temperature reaching 37⁰C and above and this occurs between March – May. It can be as low as 15⁰C during the cold season and could even fall to 7⁰ C during the rains between July – August and during the harmattan in November to February. The average rainfall

of the area is 1632mm and it occurs between April – 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 (NPC, 2022). It was created in 1991 with the coordinates of Latitude 7.7337⁰N and Longitude 6.6906⁰ E. Kogi State has 21 Local Government Areas (LGAs) with Lokoja being the capital seat of the government (Kogi State – Wikipedia). Kogi State – Wikipedia reported that the State has two distinct regions which are West Sudanian savanna and the Guinea forest – savanna. The State has important geographical features like several rivers flowing within and out of the State. Omatule *et al.*, (2023) described Kogi State soil texture as that which showed a range of silty loam, clay loam to loam at the surface and clay to loamy sand in the sub-surface soils. In addition, Omatule *et al.*, (2023) indicated that the soil texture varied from moderate or strong medium to coarse sub angular and angular blocky. Atedhor (2015) acknowledged that the agroclimatic conditions of Kogi State makes it suitable to grow crops like yam, cassava, sorghum, cowpea, rice, groundnut and melon. The major ethnic groups are the Bariba, Busa and the Fulani people. There are notably three major languages which are Okun, Epira 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

Kwara State is an old State that is 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 of 3,551,000 as of 2022. The geographical coordinates are Latitude 8.9669⁰N and Longitude 4.3874⁰E (Kwara State Wikipedia). Kwara State Wikipedia stated that on a climatic consideration, Kwara State is a State that is hot all year round and the temperature typically varies from 64⁰F to 95⁰F

and is rarely below 57⁰F and above 100⁰F. On economic trend, Kwara State Wikipedia stressed that the people are predominantly farmers growing crops (coffee, kola nut, ground nut, cotton, cocoa, etc.) and rearing 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 8⁰.20'N and 11⁰30'N and Longitude 3⁰30' and 7⁰20'E. Its land area is approximately 76,363Km². The State's 2022 estimated population size was about 6,783,300 people and though they have numerous tribes, the major among 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 like cassava, maize, rice, yam, millet, cowpea, etc and rear animals like cattle, sheep and goats.

The monthly average temperature of the State is between 23⁰C and 37⁰C, while the annual rainfall is between 1100 – 1600mm with vegetation that is mainly composed of short grasses, shrubs and scattered trees.

Study population and sampling techniques

The population of study comprised of mushroom farmers.

The multi-stage sampling techniques was used for selecting these respondents. North Central Nigeria comprises 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 States and the FCT for the study. Table 1 shows the States, Local Government Areas (LGAs/councils) and communities that were respectively used for the study. At stage two was the random selection of two (2) LGAs (among the identified LGAs where mushroom farming is well carried out) from each of the States and the FCT, thus making a total of eight (8) LGAs. At stage three, there was the random selection of two (2) communities per LGA from the identified areas where mushrooms are cultivated. This then brought the total number of communities used for the study to sixteen (16). Stage four involved the random selection of

twenty-five (25) mushroom farmers per community and this resulted to a total of four hundred mushroom farmers that were used for the study. It was these farmers that were administered with the question instrument. From

the returned question instrument, about three hundred and eighty-nine (389), that is, 97.25% that were suitable for analysis were used for the study.

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
Kogi	Kuje	Damwa	25
		Agwai	25
	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

Sources of data and data collection instrument

Primary data was used for this study. The primary data were obtained directly from the respondents using questionnaires and interview schedule.

Method of data collection

The data collection instruments were personally administered to respondents by the researcher and in other cases by the trained enumerators.

Validation of Research Instrument

The research instrument was validated through the use of face validity approach. In this approach, experts in the field of Agricultural Economics and Extension and Science were presented with the instrument for assessment, criticism and suggestion (Erie, 2009).

Analytical Technique

Descriptive statistics was used to analyse all the objectives, while the hypotheses of the study were analysed with inferential statistics. For the strategies that were adopted to boost mushroom production, Likert type rating scale was used. The scale ranged from Strongly agreed, Agreed,

Disagreed and Strongly disagreed respectively coded as 4,3,2 and 1. This yielded a mean value of 2.50. Factors with means ≥ 2.50 indicates that the strategies can boost mushroom production. On the contrary, when the values are < 2.50 , it implies otherwise. Hypothesis 1 was analysed with a Binary logit regression model. It was used to show the relationship between farmers socio-demographic characteristics and income from mushroom production. Binary logit regression model was expressed implicitly and explicitly as follows:

$$Lny = \ln(p/I-P) = F(BiXi) + ei$$

$$\ln(P/I-P) = F(BiXi) + ei$$

Where: Y = Farmers income (₦) (High income =1 (Above ₦200,000); low income = 0 (Below ₦200,000)

P = Probability of farmers with high income from mushroom farming

I-P = Probability of farmers with low income from mushroom farming

I-n = Natural Logarithm function

- (Bi) = Vector of logistic respect coefficients
 (Xi) = 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)

Binomial test was used to analyse hypothesis 2. The analysis involved the two-tailed binomial test which was used to determine the significance of difference in proportion of respondents that were satisfied with the income earned from mushroom production from those that were not satisfied. The binomial distribution formula is given below:

$$b(x;n,p) = nC_x * p^x * (1-p)^{n-x}$$

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

Socio-demographic Characteristics of the Respondents

The socio-demographic characteristics of the respondents are shown in Table 2. The result revealed that most (59.13%) of the respondents were males while the other fraction (40.87%) were females. The dominance of males in the farming of mushroom could be attributed to the fact that they are heads of households and simply assume responsibility and ownership of their farming activities. The result is in line with findings of Alfred and Arifalo (2012) who found dominance of males in mushroom production in South West, Nigeria. The age group of the respondents revealed a mean age group of 37.37 years with the modal (53.47%) belonging to between 30 – 39 years. About 19.79% and 26.73% of the respondents were below 30 years and above 39 years respectively. The result

implies that the farmers were young, energetic and are in their active age. Similar mean age (31.6 years) was reported by Ashiegbu *et al.*, (2021), therefore showing consistency with this result. Respondents' marital status shows that the majority (66.67%) of them were married, about 21.59% were single, 4.11% were divorced and 4.63% were widows(er). Having the majority of the respondents as being married may have a significant effect on how the farmers handle their farming activities to meet the needs of their family members. Marriage also increases the farmers' concern for household welfare and food security which may result in positive effects on their decision to grow mushrooms. This result is supported by Ominikari *et al.*, (2017) who found the dominance of married farmers in Fadama III Agricultural project in Bayelsa State, Nigeria.

Respondents' educational level revealed that most (48.07%) of them have post-secondary educational qualifications. Few (7.46%) of them had no formal education, same fraction (7.46%) had primary education while about 37.02% of them had a secondary school educational level. The mean was 18.58 which thus implies that the respondents are educated and so can be guaranteed to be able to read and understand farm instructions that can help them to boost their production and income. The result agrees with the findings of Adejo and Ademu (2018) who found the majority (43.80%) of rural mushroom farming households to be highly educated to tertiary educational level. The average number of persons was approximately 5 persons per household. Meanwhile majority (45.24%) of them had between 4 – 6 persons as their household size. About 34.96% and 19.80% respectively had less than 4 persons and more than six persons as their household size. The result simply implies that the respondents have a small household size, though what is most important is that the respondents have people who depends on them for their economic needs and who may on the other hand be a proxy for family labour. The result of Okwuokenye *et al.* (2022) recorded a similar household size (4 – 6 persons) as being possessed by the majority (50%) of the farmers around the same area.

The primary occupation of the respondents showed that most (32.90%) of the farmers were into farming. Others were into trading (24.94%),

civil service (22.98%), company works (10.03%) and self-employed (9.25%). The result implies that the respondents were engaged in farming and that farming is the major occupation of the people of the area. Farming as an activity may have been conceived to be able to economically empower them and alleviate their poverty status. The findings of Adejo and Ademu (2018) is in line with this result as they concurred with having the majority of the rural people engaging in farming as their major occupation. In terms of the major source of

income, the majority (82.01%) of the respondents majorly earned their income from farming, while the other respondents (17.99%) majorly earned theirs from other sources. Farming has been declared as the people's major source of income and this is an indication that the area is purely agrarian. Going further, the majority (95.63%) of the respondents were into crop farming in combination with mushroom farming as their major type of farming activity. Very few of the respondents were into poultry (1.80%) and fishing (2.57%).

Table 2: Socio-demographic Variables of the Respondents

N = 389

Socio-demographic variables	Categories	Frequency (%)	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)	37.37 years
Marital status	Single	84 (21.59)	
	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)	
	Secondary Educ.	144 (37.02)	
	Post Sec. Educ.	187 (48.07)	14 years
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)	4.9 persons
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	Mushroom 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

Engaging majorly in cropping may not be unconnected to the ease of growing crops in general and mushroom in particular. On economic consideration, cropping and particularly, mushroom farming may have been seen or found to be more yielding, profitable and less risky than the other types of farming

activities. For the respondents that were into farming, their farming status revealed that the larger fraction (77.63%) of respondents were into full-time farming, while the other fraction (22.37%) were into part-time farming. being into full-time farming will create room for the farmers to invest more of their resources and

time as well as show more commitment to their farming activities. This will in the long run result to a steady increase in farm output and income that may be sufficient to guarantee economic empowerment to the farmers.

Evaluation of Farmers Income before and after Adding Mushroom to their Crops

Table 3 shows the annual income of the respondents before and after adding mushrooms to the crops they were farming before. The result revealed that most (31.63%) of the respondents earned an income of between ₦301,000 – ₦400,000 before adding mushrooms to the crops they were farming, while most (40.62%) of the farmers earned an income greater than ₦500,000 after adding mushrooms to the crops they were

farming before. The average income earned by the farmers before and after adding mushrooms to the crops they were farming before was ₦360,539.58 and ₦426,092.55 respectively. The difference in average earnings was ₦65,552.70 and this was in favour of the farmers after adding mushrooms to the crops they were farming before. This result therefore suggests that mushroom farming has boosted the farmers' income and this will go a long way in further empowering the farmers and ameliorating their poverty status. Ashiegbu *et al.*, (2021) findings supported this result as they noted that an increase in the participation of youths in mushroom production led to an increase in the farmers income level, implying that mushroom production is economic yielding.

Table 3: Evaluation of Farmers' Income before and after Adding Mushroom to their Crops

Farm Income (₦)	Income before mushroom farming		Income after mushroom farming			
	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	₦360,539.58	158	40.62	₦426,092.55

Source: Field survey, 2022; Difference in farm income before and after adding mushroom to farmers crops = ₦360,539.58 - ₦426,092.55 = ₦65,552.70

Extent to which Proceeds from Mushroom have Boosted Farmers Income

The extent to which proceeds from mushroom have boosted farmers income is shown in Table 4. The results revealed that most (66.67%) farmers indicated that mushroom farming has helped to boost their income. About 27.25% and 12.08% respectively indicated that mushroom production has helped to boost their income/economy to a just high and average extent. The result implies that mushroom

production has added to the income, thus boosting their economy and therefore helping to alleviate their poverty status. This is evident in the difference (₦65,552.70) experienced by the farmers after adding mushrooms to the other crops they were cultivating before. The findings of this study were confirmed by Jonnatul *et al.*, (2019) who reported that mushroom cultivation not only empowers rural farmers but also alleviates poverty at the grass root level.

Table 4: Extent to which Proceeds from Mushroom have Boosted Farmers Income

Extent to which mushroom proceeds have helped to boost farmers income	Frequency	Percentage
Very high extent	236	60.67
Just high extent	106	27.25
Average extent	47	12.08

Source: Field survey, 2022

Farmers Level of Satisfaction with the Proceeds from Mushroom Farming

The farmers level of satisfaction with the proceeds from mushroom farming revealed that the majority (54.22%) of the farmers indicated that they were just satisfied with the proceeds from mushrooms (see Table 5). Other respondents indicated that about 42.16%, 5.14%

and 0.26% were very satisfied, averagely satisfied and poorly satisfied respectively. The level of satisfaction may not be unconnected with the ease of farming the crop and the proceeds in income that are earned by the farmers which is sufficient to alleviate the farmers poverty level.

Table 5: Farmers Level of Satisfaction with the Proceeds from Mushroom Farming

Level of satisfaction with farming of mushroom	Frequency	Percentage
Very satisfied	164	42.16
Just satisfied	204	52.44
Averagely satisfied	20	5.14
Poorly satisfied	1	0.26

Source: Field survey, 2022

Strategies to Boost Mushroom Production

The strategies to boost mushroom production is shown in Table 6. The results in the order of their mean magnitude revealed that the establishment of cooperative groups (mean = 3.55), development of improved mushroom growing materials (mean = 3.40) and extension agents training of farmers on input use for mushroom production were the 1st, 2nd and 3rd strategies that can be adopted by the farmers to boost mushroom production. Other strategies were provision of strong capital base for

mushroom farmers (mean = 3.29) and development strategies to globalize the production and marketing of mushrooms (mean = 2.90). The establishment and participation of strong capital base to the farmers are seen as crucial strategies that seek attention for the improvement of mushroom production. Doing this will involve pulling their meagre resources together and using it to achieve what wouldn't have been possible if they were to carry out such activity individually.

Table 6: Strategies to Increase Mushroom Production

S/N	Strategies for increasing mushroom production	Mean	Standard Dev.	Ranking
i.	Establishment of cooperative groups with the main interest of growing mushroom	3.55*	0.50.	1st
ii.	Development of improved mushroom -growing materials	3.40*	0.62	2nd
iii.	Extension agents training of farmers on input use for mushroom production	3.30*	0.59	3rd
iv.	Provision of strong capital base to mushroom farmers	3.29*	0.63	4th
v.	Develop strategies on how to globalize the production and marketing of mushrooms	2.90*	0.82	5th
vi.	Research into other uses of mushrooms	2.42	0.90	6th
vii.	Encourage more farmers into mushroom farming	2.31	0.92	7th
viii.	Create more sensitization on the importance and uses of mushrooms	2.11	0.92	8th

Source: Field survey, 2022; Agreed ≥ 2.50

Having identified the development of improved mushroom growing materials as a strategy for boosting production level, it is expected that such a strategy would involve research that will result in producing improved growing materials that are high yielding, early maturing pest and disease resistant that can further guarantee an increase of rural people income and alleviate their poverty level. The training of farmers on input use by extension agents will help the farmers to understand better, the intricacies involved in production and then help them to improve on their performance. Developing strategies to globalize the market will help to guide against seasonal glut and optimize sales that could be sure of improving farmers' income. The strategies mentioned above were identified by Jonnatul (2019) as limiting factors to mushroom production. So, providing solutions to the factors will help to increase the production of mushrooms.

Relationship between Respondents' Socio-demographic Characteristics and Farmers Income

Table 7 shows Binary Logistics regression which was used to analyze mushroom farmers' socio-demographic characteristics and income from mushroom production (hypothesis one). The explanatory variables (socio-demographic) of the model were eight (8) in number and they jointly exacted about 69% influence on mushroom farmers income. The F-statistics Value was 12.75 at the 5% level of significance. Six (6) of the variables (namely; gender, marital status, age, education, household and farm status) out the eight of them were significant to mushroom farmers income. Further explanation revealed that:

Gender of the respondents had a beta coefficient of 0.940, t-value of 4.216 and odd ratio of 2.315. the relationship was positive and significant at the 1% level. The result implies that since male constituted the majority (59.13%), it simply means that the involvement of more males in mushroom farming will lead to an increase of about 2.3 times more income from mushroom production and such can go some extent in reducing the hunger level of the farmers. The increase may be adduced to the energetic nature of man in mushroom production activities. The dominance of males may still be ascribed to the

fact that males are mainly heads of households and are decision makers as regards to farming. Ashiegbu *et al.*, (2022) report supported this assertion as they opined that while men take decisions as heads of their families, women are usually more involved in agricultural production. Respondents' marital status was found to have a beta coefficient, t-value and odd ratio of 0.366, 2.410 and 3.115 respectively. The relationship was positive and significant at the 5% level. Based on the fact that the result was dominated by married farmers (66.67%), it therefore implies that the involvement of more married farmers in the farming of mushroom will result to increases in income by about 3.1 times and thereby creating some level of empowerment to the farmers. This may be possibly due to the fact that married farmers often have more people in their households who may act as source of free farm labour. This result is supported by that of Alfred and Arifalo (2012) who declared the dominance of married farmers in the farming of mushroom.

Age of the farmers had a positive and significant relationship at 1% level with farm income earned from mushroom farming. Its beta coefficient was 0.083, t-value was 3.142 while the odd ratio was 2.001. The result implies that an increase in farmers age will result in 2 times increase in farm income earned by the farmers which may help in cushioning the effects of poverty in where the farmers are. The result implies that older farmers are more likely to earn more income from mushroom farming. This scenario may be attributed to the much experience and skill endowment that they may have gathered from the farming exercise over the years. This result was agreed by Etwire *et al.*, (2013) who stated that older farmers may not be resourced constrained and with more farming experience make more money than their younger counterparts from farming activities. The educational level of the respondents showed a positive and 5% significant relationship with farm income earned by the mushroom farmers. The beta co-efficient was 0.886 with a t-value of 1.008. the result implies that farmers with higher educational level are bound to earn higher income level from their mushroom farming. The odd ratio of the relationship was 1.916, indicating that a farmer with higher level of education will earn income that is about 1.9

times more than what his counterpart with lower educational level would earn. Educated farmers are able to read and understand basic instructions about farming activities and therefore, can have their farm production performance enhanced. The result was corroborated by Ashiegbu *et al.* (2021) who asserted that increased level of education led to increased level of mushroom production, thus, resulting to higher income.

The beta coefficient, t-value and odd ratio of respondents' household size was 0.759, 2.311 and 3.185 respectively. The relationship was positive and significant at the 1% level. The result implies that as household increases, the higher the likelihood of the respondents' farm income. Larger household size can create room for delegation of important farm activities that can result to higher farm income. Findings of

Ashiegbu *et al.* (2021) is in line with this result as they found that an increase in household size will lead to an increase in Youth participation in mushroom production technologies which will consequently lead to an increase in their farm income. Farm status ($b = 0.230$; $t = 1.986$ and odd ratio = 2.213) of the respondents was positive and statistically significant at the 5% level to respondents' farm income. Since most (77.63%) of the respondents were into full-time production of mushrooms, it therefore suggests that an increase in the number of full-time farmers in the production of mushrooms will lead to having higher income from the farming process. Full-time engagement of the farmers in the production of mushrooms will make the farmers concentrate and commit more of their resources into the farming process with an anticipated increase in farm income that could help the farmers to improve on their livelihood.

Table 7: Relationship of Respondents' Socio-demographic Characteristics and their Impact on Income

Variables	Coefficient (B)	t-value	Prob. Level	Exp (B) (Odd ratio)
Constant	54.238	12.527	0.000.	
Gender	0.940**	4.216	0.000	2.315
Marital status	0.366*	2.410	0.003	3.115
Age	0.383**	3.142	0.001	2.001
Educ. level	0.886*	1.008	0.005	1.916
Religious affiliation	0.176	0.739	0.516	1.632
Household size	0.963*	2.311	0.000	3.185
Farm size	0.759	2.074	0.734	0.871
Farm status	0.230*	1.986	0.004	2.213

$F = 12.75$; $P (< 0.05)$; $Adjusted R^2 = 0.691$

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

Test of Difference in Respondents that were Satisfied and those not Satisfied with the Income earned from Mushroom Production

An analysis of respondents that were satisfied and those not satisfied with the income earned from mushroom production is showed in Table 8. This was carried out with the use of Binomial test and to analyse hypothesis 2 which states that: There is no significant difference between farmers that are satisfied and those not satisfied with the income earned from mushroom production. The result revealed that a larger proportion (95%) of the respondents noted to be satisfied with the income earned from mushroom production. The other fraction (5%) of the respondents were found to be less satisfied with the income earned from mushroom production. On a statistical

consideration, the result was significant at the 1% level of probability. Based on this information, the null hypothesis was rejected while the alternative was accepted. In line with the proportion of respondents that are satisfied (95%), it indicated that the number of mushroom farmers who are satisfied with the income earned from mushroom production is significantly high.

Farmers satisfaction was further confirmed with the test on measures of association and the result is shown in Table 8. The critical value is shown in brackets. The result revealed that farmers' satisfaction on income earned from mushroom production is in a positive association with the proceeds from mushroom farms (10.0147 (0.124)). That means that the more mushrooms that are grown will lead to more income earned

from the farming activities. It therefore implies that mushroom farming is very lucrative and profitable to the farmers. This result conforms with findings of Basanta *et al.*, (2012) who opined that mushroom producers earn household income from the profit of mushroom production. The result is also in line with the findings of Moxley (2022) who revealed that mushrooms

can support the advancement of a sustainable food system by positively impacting on the economy, environmental and socio-cultural dimensions of sustainability. Also, food production systems that are environmentally friendly are highly encouraged (Okon. Essien & Udousoro, 2019).

Table 8: Associations between Farmers who are Satisfied and those not Satisfied with the Proceeds (Income) from Mushroom Farming

Farming status	Frequency	Percentage	Prob. Level
Satisfied	368	0.946	0.001
Less satisfied	21	0.054	
Total	389	1.000	

Source: Field survey, 2022

Table 9: Association between Farmers Satisfaction and Proceeds from Mushroom Farming

Farmers status	Proceeds from mushroom farming
Farmers' satisfaction.	10.0147 (0.124)

Source: Field survey, 2022

Table 9 shows farmers' satisfaction and proceeds from mushroom farming have a positive association. It means that proceeds from farming mushrooms gave the farmers a sense of satisfaction.

Conclusion and Recommendations

The study assessed the production of mushrooms by small-scale farmers as an approach to economic empowerment and reducing hunger by rural households in the North Central Ecological zone, Nigeria indicates that mushroom production is mostly carried out by male farmers who are in their active age and well educated. The farmers were mostly full-time and this has contributed to their increased income after adding mushrooms to the crops farmed before. The farmers earned an average income of ₦360,539.85 and ₦426,092.55 before and after adding mushrooms to their farming activities. They had a difference of ₦65,552.70 after adding mushrooms to the crops cultivated in the past. Suffice to say that farming mushrooms is capable of boosting farmers' income and alleviate their poverty level. It was for this reason the farmers claimed to be satisfied with the proceed from mushroom farming.

Several strategies like; establishing and participating in cooperative groups, development

of improved mushroom growing materials, extension agents training of farmers on input use for mushroom production, provision of strong capital base to mushroom farmers and developing strategies to globalize the production and marketing of mushroom were advocated as strategies to boost mushroom production. Socio-demographic characteristics like gender, marital status, age, education, household size and farm status of the farmers were all positively related and significant variables to farmers income.

Based on findings of the study, it was recommended that;

There is also need for the farmers to be encouraged into forming cooperative groups where their meagre resources can be pulled together for a strong capital base. This has become necessary because it was agreed as a strategy to boost farmers income through mushroom farming, and

It is important to undertake research on developing improved planting or growing materials that would adapt to the different climatic regions. Such will help to increase the areas where mushroom is grown and beyond that this will increase the availability of mushroom in more areas of the country, increase its consumption in the short-run, income and economic empowerment in the long-run

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