UJEAS

UNIZIK JOURNAL OF ENGINEERING AND APPLIED SCIENCES

UNIZIK Journal of Engineering and Applied Sciences 3(5), December (2024), 1317 - 1323
Journal homepage: https://journals.unizik.edu.ng/index.php/ujeas
PRINT ISSN: 2992-4383 || ONLINE ISSN: 2992-4391

Assessment of constraints to mushroom production and scientific training needs of mushroom farmers in Oyo state Nigeria.

Olawale, O. O., Oke, O. S., Adisa, A. S., Oloba, O. G. and Odediran F. A
Department of Forestry Economics and Extension Service, Forestry Research Institutes of Nigeria, PMB 5054, Jericho Hill, Ibadan, Oyo State, Nigeria.
Corresponding Author Email : okeolugbengas@gmail.com.

Abstract

In many parts of the world, edible mushrooms are utilized for medicinal purposes and they also served as food and vegetable. Mushroom cultivation is an efficient method of disposing agricultural waste and means of producing nutritious food in most part of Nigeria, Mushroom production is another easiest ways of earning a stable income during adverse condition caused by climate change, Involving science in mushroom training enhances understanding and optimization of mushroom cultivation. Therefore, the study assess the constraints to mushroom production and scientific training needs of mushroom farmers in some selected villages in Oyo State, Nigeria, with the following objectives; examine the socioeconomic characteristics of mushroom farmers, examine the enterprise characteristics of mushroom farmers, examine their levels of scientific skill in mushroom production, identify constraints to mushroom production in the study area. Four (4) Local Governments Areas were selected randomly for this study and mushroom farmers were selected purposeful in each village. (50%) of the farming households were randomly selected to give a total sample size of 143 respondents. Data was obtained with the aid of well-structured questionnaire, complemented with schedule interviewed. Descriptive and inferential statistical tools were used to analyze collected data. The results shown that; most of the respondents were young (38.5%), male (63.00%) mushroom farmers between the age of 35 and 44 years, most of the respondents were married (81.80%), with source of credit from personal savings (49,00%), cooperative society (23.80%) and family and friends (17.50%). The respondents are skillful in substrate technology (93.00%), production (86.00%), packaging (79.00%), marketing (72.00%) and storage (64.30%) skills. Main constraints faced by the mushroom farmers were poor marketing channel (72.70%), lack of access to credit facilities (71.30%) and inadequate information (68.50%) on mushroom cultivation. The Pearson Product Moment Correlation (PPMC) analysis shown that, there is significant relationship between the scientific training needs and constraints faced by farmers, From the results so far, it is recommended that Research Institute and Extension agents, should disseminate timely and up–to–date information to farmers on mushroom cultivation. Establishment of farmers' co-operative society among farmers will go a long way in having access to soft loan.

Keywords: Science, Mushroom, Cultivation, Credit and Constraints.

1. Introduction

Mushrooms have been in existed for over 18 (eighteen) million years, even before the evolution of men (De-Wei Li, et al., 2016), History has it that the cultivation of mushroom started in China about 2000 years ago, with the cultivation of "Shitake" Lentinula eddoes (Byman, et al., 2007), this shows that mushrooms have been a source of food for insects, rodents and human. Mycology, which is the scientific study of fungi, molds, yeast and lichen states that mushrooms helps in recycling of carbon and other element through the decomposition of lingo-cellulosic plants residues and animal dung which can serve as the substrates for these saprophytic fungi (Barh, et al.,2023 : Chang, *et al.*, 1985). Mushrooms can be described as a macro fungus with distinctive fruiting bodies, epigeous or hypogenous, that is visible to the eyes and can be picked by hands (Chang, S., and Wasser, S. (2017). The Mushroom fruiting body resembled umbrella in shapes and have various sizes and colours (Egbuche, et al., 2016). According to Jibrin, et al., 2017, some commonly Edible Fungi are Button Mushrooms (*Agaricus spp*), Chicken-ofthe-Woods (*Polyporus sulphureus*), Ears (*Auricularia spp*), Lion's Mane (*Hericium erinaceus*), Nameko

(*Pholiotanameko*), Oyster Mushrooms (*Pleurotus spp*), Shiitake (*Lentinula edode*) and Ling Chi or Reishior (*Ganoderma lucidum*). The most widely grown Mushrooms, which occurs in tropical as well as sub and temperate forests throughout the world is Oyster Mushroom (Aditya, et al., 2024).

Oyster Mushroom was first cultivated on tree logs but now commonly grown on varieties of high cellulose waste materials such as sawdust, wheat or rice straw, this has drastically reduced the fruiting period to about two months (Masahito, et al., 2024 and Kuman, et al., 2011). The Oyster Mushrooms are easier to cultivate than many other species. (Asmamaw, et al., (2015). In addition, utilization of organic waste by Oyster Mushrooms farmers form an integral part of a sustainable agriculture practices (Singh, et al., 2013). Oyster Mushroom production can be practice on a small-scale with little or no startup capital, because they convert high amounts of substrate to fruiting bodies thereby maximizing the potential income (Wei, et al., 2022). The nutritional benefit of Mushroom includes; provision of healthy foods, such as carbohydrates, fat and fiber, starch, protein (Olawale, et al., 2024).

Mushroom cultivation is a very reliable means of making profit for farmers in the face of unfavourable weather conditions that mean Mushroom increase revenue, ensure food security and improve standard of living of farmers whenever there is crop failure brought by climate change (Osuafor, et al. 2023). Mushrooms serves as alternative protein supplement in Vegetarians diets (Alcorta et al. 2021). Mushrooms are referred to as healthy foods because they are very rich source of vitamin B1, B2, B12, C, D and E, including foliate, niacin, riboflavin, thiamine and some essential trace minerals like calcium, copper, iron, magnesium, phosphorus, potassium, selenium and zinc, but they are low in calories and fat (Dawadi, et al., 2022). Mushrooms are healthy foods, it is very rich in carbohydrates, low in fat and fiber and excellent source of high quality protein, but white button Mushrooms contain more protein than vegetables, grains and fruits (Olawale, et al, 2024 and Kumar, et al. 2021).

Mushrooms have been used in traditional medicine throughout the world since olden days (Bautista-González, et al., 2022). Nigerian traditional doctors use various combinations of herbaceous plants and other essential concoction in their medicine. *Pleurotus tuberregiumis* used in some of these combinations are added to cure colds, fever, headache, stomach ache as well as asthma, smallpox and high blood pressure (Amorha, et al., 2018). Furthermore, Mushroom cultivation also enhance chances for improving the sustainability of small scale farming and improved food nutrition, especially in developing countries (Olawale, et al., 2024). Successful cultivation and trade of Mushroom will not only reduce vulnerability to shocks, but also act upon other economic opportunities (Akter, et al., 2022). Mushroom can be produce optimally both for vegetative and reproductive growth in an required atmospheric condition. When fruiting, a relative humidity, ranging from 80-95% is needed at the early, mid and later stages (Cho, 2004). Mushroom farming in Nigeria faces several challenges, which includes inadequate skilled labor, inadequate capital, limited access to resources, lack of infrastructure, lack of knowledge, lack of expertise in mushroom culturing and certifications by the National Agency for Food, Drug Administration and Control (NAFDAC), (Olawale, et al,. 2024).

However, despite these challenges, Mushroom farming can be a sustainable and profitable business venture in Nigeria (Olawale, et al., 2024). (Jibrin, et al. 2017) suggested that Mushroom farming can play an important role in enhancing the human diet, where a major portion of the population is highly selective of food preference, especially in nations with ever increasing populations, coupled with food demand issues, Training needs assessment is "an on-going process of gathering data to determine what training needs exist so that training can be developed to help the organization accomplish its objectives." Brown (2002), However, Training needs view all aspect of an operational area, in order to effectively identified initial skills, concepts and attitudes of human elements in a system, so that appropriate training can be specified (Olawale, et al., 2024). Training is a process whereby people acquire capabilities to aid achievement of goals. (Thomas and Laseinde, 2015: Akinsorotan, 2007). Incorporating scientific principles and methods into mushroom production training, participants tends to gain a deeper understanding of the complex interactions involves in mushroom cultivation.

The quality of spawn is the most decisive factors for successful Mushroom growth, (Orji, et al 2018) . Although a lot of people have been trained in basic spawn production techniques such as mushroom biology, ecology and substrate preparation, but it is unfortunate that setting up Mushrooms laboratories and purchasing expensive equipment like autoclaves, microscopes, spectrophotometers has hindered interested people from engaging in the Mushroom production business (Canford, 2004). Specifically, to acquire adequate and timely scientific training, exploit the potential of mushroom farmers and to improve the farmer's productivity. Thus, constraints to mushroom production and scientific training needs of mushroom farmers in Oyo State, Nigeria have been investigated. The study therefore

described the socioeconomic characteristics of Mushroom farmers, determined the enterprise characteristics of Mushroom farmers, examined the levels of skill/training in Mushroom production and Identify constraints to Mushroom production in the study area.

2.0 Material and methods

2.1 Research Methodology

Table 1: Distribution of Mushroom farmers in different Local Governments Area in Oyo States.

Selected Local Government	Selected Villages	Number of selected mushroom farmers	50% of selected mushroom farmers
Surulere	Onipanu	44	22
Ogbomoso South	Oke Ola farm settlement	32	16
Akinyele	Moniya	120	60
Oluyole	Idi – Ayunre	90	45
Total	4 Villages	286	143

2.1.1. Sampling Techniques

The target population comprised of Mushroom farmers in different Local Governments Area in Oyo States. Sampling technique adopted involved a purposive selection of 4 Local Governments Area where Mushroom production is prevalent. Surulere, Ogbomoso south, Akinyele, and Oluyole L.G.A were randomly selected. 50% Mushroom farmers were randomly selected across the villages to make a total sample size of 143 respondents.

2.1.1.1. Data collection procedure

The data for the study were collected with the use of a well structured questionnaire and scheduled interview for the Mushroom farmers in Oyo State. The variables involved are independent and dependent variables. Data were analyzed using descriptive statistics such as percentages mean and frequency distribution and inferential statistics such as Pearson Product Moment Correlation (PPMC).

3.0 Results and Discussions

Result obtained from the study revealed that Majority of the respondents were (81.8%) married, (63.0%) males and (37.0%) females respectively. The result also reveals that household size between 4-6 members made up the largest proportion (64.8%) in this study. On the average, the farming household consisted of five (5) people. Also, most (38.5%) of the respondents in the study area were between the age of 35 and 44 years of age with mean age 43.8 and standard deviation was 9.56. This is an indication that the Mushroom farmers are still in their active productive age. Most of the respondents had (47.6%) no formal education, this simply mean that the largest percentage of the respondents were not leaned. Only 10.5% of the respondents had primary education, this is an indication that high level of illiteracy increased the challenges associated with Mushroom production in the study area.

Table 2: Socio Economics characteristics of Mushroom farmers

Variables	Frequency	Percentage (%)	
Age			
25 – 34 years	28	19.6	
35 – 44 years	55	38.5	
45 – 54 years	42	29.4	
Above 55 years	18	12.6	Mean=43.18
			SD=9.56
Sex			
Male	90	62.9	
Female	53	37.1	

Marital Status			
Single	16	11.2	
Married	117	81.8	
Window	04	2.8	
Separated	06	4.2	
Educational level			
Primary	15	10.5	
Secondary	37	25.9	
Tertiary	23	16.1	
No formal education	68	47.6	
Household size			
1 – 3	34	23.8	
4 – 6	92	64.8	
7 – 9	17	11.9	Mean = 4.62
			SD = 1.58

Respondents Enterprise characteristics

The respondents had between 1- 10 years of (62.9%) farming experience. The study indicated that the respondents (Mushroom farmers) are relatively new to Mushroom production probably because of existence of wild edible types being dependent upon by many farmers. Almost all (90.9%) the Mushroom farmers had less than 1 hectare of farm size. Therefore, the respondents are smallholders' farmers cultivating less than 1 acre of farm land. This indicates that Mushroom farmers can cultivate on the available land since Mushroom production does not require large space as alternative source of income. This result implies their present scale of production was relatively small. The study also indicated that about half of them (41.3%) do not belong to any farmer group. The result further shows that (49.0%) of the respondents got their capital for Mushroom production from personal savings. The study also indicated that specie cultivated by all the farmers is Oyster Mushroom. Majority (44.8%) of the respondents produce Mushroom on a medium scale while few (18.1%) of the respondents produced on a small scale. This suggest for large scale production to increase the farmers income.

Table 3: Distribution of respondents by their enterprise characteristics

Variables	Frequency	Percentages%	
Farming Experience (Years)			
1 – 10	90	62.9	
11 – 20	32	22.4	
21-30	16	11.2	
Above 30	05	3.5	Mean= 10.85
			SD= 8.34
Farm size (Acre)			
Below 1	130	90.9	
Above 1	13	9,10	
Other income generating activities			
None	43	30.1	
Farming	50	35.0	
Trading	33	23.1	
Artisan	14	9.8	
Contractor	02	1.4	
Pensioner	01	0.7	
Membership in any farmer group			
Yes	84	58.7	
No	59	41.3	
Source of labour			
Self	5	3.50	
Family	11	7.69	
Hired labour	38	26.6	
Self, family and hired labour	89	62.2	

Sources of income for mushroom production		
Personal savings	70	49.0
Family/friends	25	17.5
Loan from bank	14	9.80
Co-operative society	34	23.8
Specie of mushroom cultivated		
Oyster mushroom	143	100
Scale of production		
Small scale	53	37.1
Medium	64	44.8
Large	26	18.1

Distribution of respondents by skills in mushroom production

Evidences from the table 3 shows that farmers agreed that they have the requisite skill needed in the preparation of Mushroom substrate (93.0%). Knowledge gap were however revealed in technical skill (47.6%) and quality control (43.4%) as about half of the farmers revealed that they lack these skills which can make them not to realize full potential of crop. Training should help in improving skill so lack of skill apparently reveals the need for training in Mushroom cultivation.

Table 3: Distribution of respondents by skills in mushroom production

Skills in mushroom production	Yes (%)	No (%)	Mean
Substrate Technique	133 (93.0)	10 (7.0)	0.93
Technical skill	75 (52.4)	68 (47.6)	0.52
Production skill	123 (86.0)	20 (14.0)	0.86
Packaging skill	113 (79.0)	30 (21.0)	0.79
Marketing	103 (72.0)	40 (28.0)	0.72
Storage	92 (64.3)	51 (35.7)	0.64
Quality control	81 (56.6)	62 (43.4)	0.57

Constraints faced by farmers in Mushroom production

Farming activities are not seamless and same goes for Mushroom production. Table 4 shows that poor marketing (sales) is the most severe (72.7%) problem faced by Mushroom farmers followed by lack of access to credit (71.3%), inadequate information on Mushroom production (68.5%), while non availability of viable spawn (8.4%) is the least severe of all constraints. This conforms to the submission of Singh, 2013, who discovered that poor sales particularly lack of assured market is one of the most severe problem associated with Mushroom cultivation.

Table 4: Constraints in mushroom production

Level Constraints in Mushroom production	Severe	Mild	Not a constraint	Mean	Rank
Poor marketing channel	104 (72.7)	34 (23.8)	5 (3.5)	1.69	1st
Lack of access to credit	102 (71.3)	35 (24.5)	6 (4.2)	1.67	2nd
Inadequate information on Mushroom cultivation	98 (68.5)	37 (25.9)	8 (5.6)	1.63	3rd
Non availability of viable spawn	90 (62.9)	38 (26.6)	15 (10.5)	1.52	4th 4t
High labour requirement	88 (61.5)	34 (23.8)	21 (14.7)	1.47	5th
Lack of technical skill	52 (36.4)	73 (51.0)	18 (12.6)	1.24	6th
Climate change	12 (8.4)	88 (61.5)	12 (8.4)	1.22	7th

Time consuming	53 (37.1)	64 (44.8)	26 (18.2)	1.19	8th
High input cost are required	47 (32.9)	61 (42.7)	35 (24.5)	1.08	9th
Highly perishable	12 (8.4)	88 (61.5)	12 (8.4)	1.22	10th

(PPMC) analysis showing the relationship between constraints and training needs of the Mushroom farmer.

Pearson Product Moment Correlation (PPMC) was used to access the relationship between constraints faced by Mushroom farmers' and the training needs. Table 4 shows that there is a significant positive relationship between constraints (r = 0.452, p = 0.000) faced by Mushroom farmers and the training need at 0.05 level of significance. The more the constraints faced by farmers, the higher the training needs. A farmer is expected to be better in Mushroom production as he goes through trainings thereby eliminating most of the constraints that could arise in the course of Mushroom production. It is therefore understandable that farmers facing much constraint will yearn for training, so as to solve the bottlenecks they encounter in their production.

Table 4 : Pearson Product Moment Correlation (PPMC) analysis showing the relationship between constraints and training needs of the Mushroom farmer.

Variable	r value	P-value	Decision	Remark
Constraints	0.452	0.000	S	Reject

S-Significant NS-Not significant

Conclusion and recommendation

Based on the findings of the study, the results shown that most of the respondents were young, married, male mushroom farmers who source of credit are majorly from personal savings, the respondents are skillful in substrate technology, packaging and marketing of mushroom.

The main constraints encountered by Mushroom farmers in the study area were lack of access to credit, followed closely by poor marketing channel and Inadequate information on Mushroom cultivation.

5.0 Recommendation

The following are recommendation based on the research findings: Research institute and Extension agents, should disseminate timely / up – to – date information to farmers on Mushroom cultivation. Establishment of famers' co-operative society among Mushroom farmers will enable them to have access to soft loan. Farmers should be enlightened to purchase viable spawn from research institutes that have mandates on Mushroom production, such as Forestry Research Institute of Nigeria (FRIN), National Horticultural Research Institute (NIHORT) and National Biotechnology (BIOTECH).

References

Aditya, N., Jarial, R.S., Kumud, J., Bhatia, J.N., 2024. Comprehensive review on oyster mushroom species (Agaricomycetes): Morphology, nutrition, cultivation and future aspects. *Heliyon Journal*, Volume 10, Issue 5, 1-28.

Akinsorotan, A.O., 2007. Training Development; "Element of Agricultural Extension Administration" *Journal Personal Management*. Bounty Press, Ibadan, Pp.65-69.

Asmamaw, T., Abebe, T., Gebre, K., 2015. Optimization of oyster (Pleurotus ostreatus) mushroom cultivation using locally available substrates and materials in Debre Berhan, Ethiopia. *Journal of Applied Biology and Biotechnology* Vol. 3 (01), pp. 015-020, http://www.jabonline.in DOI: 10.7324/JABB.2015.3103.

Barh A, Kamal S, Sharma VP, Sharma K, Kumari B, Nath M. 2023. Identification and morpho-molecular characterization of low spore strain in Oyster mushroom. *Mol Biol Rep.Journal*. 50(6):5029-5038. doi: 10.1007/s11033-023-08452-y.. PMID: 37095362.

Brown, J. 2002. "Training Needs Assessment: A Must For Developing An Effective Training Program", *Public Personnel Management Journal,* vol. 31, no. 4, pp. 569-579.

Byman, A. and Bell, E., 2007. Business research methods. 2nd edition, Oxford University Press, USA. *Technology Journal*, 225:151 – 156.

Canford, K.C., 2004. Mushroom Industry in Zimbabwe, University of Zimbabwe, Zimbabwe. Mushroom Growers' Handbook 1.

Chang, S., and Wasser, S., 2017. The Cultivation and Environmental Impact of Mushrooms. Oxford Research. *Encyclopedia of Environmental Science*. Retrieved 5 Jul. 2024, from https://oxfordre.com/environmentalscience/view/10.1093/acrefore/9780199389414.001.0001/acrefore-9780199389414-e-231.

Chang, S.T., and Miles, P., 1985. A Sporeless Strain in Pleurotus florida. Mushroom newsletter for the

Tropics. Vol.5 Friendship Printing Co. Ltd, Kowloon, Hong Kong. Pp19-21.

Orji, O. A., Gbara, A. and Osakwe, J. A. 2018. Growth and Longevity of *Pleurotus tuberregium* (FR.) Sing as Affected by Mixtures of Decomposed Palm Bunch Refuse and Topsoil. *Scientia Africana Journal*, Vol. 17 (No. 2),. Pp 80-89.

De-Wei, Li., Castañeda-Ruiz, R. F. and James, L.M. 2016. Evolution of Fungi and Update on Ethnomycology. In book: *Biology of Microfungi Journal*, Chapter: 11, 237-266 Publisher: Springer Link. DOI: 10.1007/978-3-319-29137-6_11.

Egbuche, C.T., Nwaihu, E.C., Ekwugha, U. E., and Osuorji, J.O., 2016. Natural Resources And Food Security: A Case Study of Effect of Supplements on the Growth and Fruiting Body of Oyster Mushroom, (Pleurotus Sajorcaju), *Journal of Multidisciplinary Engineering Science Studies (JMESS),*. Vol.2 Issue 6.536-554. ISSN: 2458-925X.

Jibrin, J.N., Aliero, A.A., Shehu, K., Abubakar, A., 2017. An Introduction to Mushroom Production in Nigeria. *Msc Thesis*. Ahmadu Bello University Press Limited, Zaria, Kaduna State, Nigeria.

Kumar, D, Reddy, M.S., and Upadhyay, R.C., 2011. Antioxidant activity of three species of wild mushroom genus Cantharellus collected from Northwestern Himalaya, India. *Intanational Journal of Agric. and Biology*. 13:3, 415-418.

Kumar K, Mehra R, Guiné RPF, Lima MJ, Kumar N, Kaushik R, Ahmed N, Yadav AN, Kumar H. 2021. Edible Mushrooms: A Comprehensive Review on Bioactive Compounds with Health Benefits and Processing Aspects. *Journal of Foods*. 10(12):2996. doi: 10.3390/foods10122996. PMID: 34945547; PMCID: PMC8700757.

Masahito, Y., Mariko, S., Masayoshi, Y., Hirofumi, H.,, Shazwin, M. T., Shahabaldin, R., Mohd, F., Md Din, Fatimah, H., Mohd, H. 2024. Cultivation of Oyster mushroom sawdust (Pleurotus ostrreatus) on fermented moso bamboo, *Science Direct Journal of King Saud University–Science*. Volume 31, Issue 4, Pages 490-494. https://www.researchgate.net/publication/324581172.

Olive, O.O, David, U.K., 2021. Valuation of Rice Farmers' Preferences and Willingness to Pay for Climate-Smart Agricultural Technologies in Southeast, Nigeria. *Asian Journal of Econ. Model* 9: 48-57.

Osuafor, O.O., Enete, A.A., Ewuzie, P.O., Elijah, S.T., 2023. Mushroom production and its economic potentials in Nigeria. *Advance Journal of Agric. Ecology* 8:1, 1-13.

Olawale, O. O., Oke, O.S., Odediran, F.A., Adeoye, A.S., Adisa, A.S., 2024. Perceived Benefits and Knowledge Level of Mushroom Farmers Towards Mushroom Production in Selected Local Governments Area, Oyo State, Nigeria. *Journal of Forest and Environmental Science* Vol. 40, No. 3, pp. 188-195, https://doi.org/10.7747/JFES.2024.40.3.188.

Singh, I.J., and Ganesh, P. 2013. Effect of different Substrate supplements on the growth and yield of two species of Mushroom Pleurotus florida and P. Sajor-caju. *International Multidisciplinary Research* Journal, 2(3): 61-64.

Thomas, K. A. and Laseinde, A. A. 2015. Training Needs Assessment on the Use of Social Media among Extension Agents in Oyo State, Nigeria. *Journal of Agricultural Informatics*, 6(1). DOI: 10.17700/jai.2015.6.1.144.

Wei, H., Qing, D., Tao, L., Jia, L., Jie, Z., 2022. Effects of spent mushroom substrate biochar on growth of Oyster mushroom (Pleurotus ostreatus), *Journal* of *Environmental Technology and Innovation*, Volume 28, pp. 102729. https://doi.org/10.1016/j.eti.2022.102729.