
Training Needs of Mushroom (*Agaricus biosporus*) Farmers in Oyo state, Nigeria

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Abstract

The study examined the training needs of mushroom farmers and other factors hindering its production in Oyo State. Multi stage sampling procedure was used to select 143 mushroom farmers and data collected through interview schedule were analyzed using percentage, Chi-squared and correlation statistics at 0.05 probability level. Results showed that almost all (94.4%) were knowledgeable about mushroom production and 64.3% had high knowledge of mushroom benefits. Major constraint faced by the mushroom farmers was poor sales (72.7%). Trainings were needed in mixing/exposure period of substrate (42.9%), absolute infection free (91.4%), chemical preservation (88.8%), and quick freezing (71.8%). On the aggregate, the majority (63.6%) of the farmers have high training needs. There was a significant relationship between farmers' educational level ($\chi^2=9.347$), monthly income ($\chi^2=19.184$), scale of production ($\chi^2=34.493$), constraint ($r=-0.452$) and their training needs. A significant negative relationship was observed between knowledge ($r= -0.362$) of mushroom farmers, benefits derived ($r= -0.200$) and their training needs. Farmers require high level of trainings in mushroom production. Therefore, research institute and government should further intensify effort in sensitization and training of farmers on mushroom production so as to aid its increased production.

Key words: Mushroom production, training needs, mushroom benefits

Introduction

The human population relies on agricultural products for survival and nutritional benefits. Agriculture plays a critical role in the economy partly through the provision of raw materials and employment opportunities. Agriculture is the basic source of food supply through its various branches, one of which is fungiculture – cultivation of fungi for food e.g. mushroom. A mushroom is the fleshy spore bearing fruiting body of a fungus produced above the ground on soil or on its food source. Mushroom cultivation is one of the most lucrative agricultural production activities. It can serve as a substantial means of livelihood (Vinceti, Termote, Ickwitz, Powel, Kehlenbeck and Hunter 2013; Feeney, Dwyer, Hasler-Lewis, Milner, Noakes, Rowe, Wach, Beelman, Caldwell, Cantorna, Castlebury, Chang, Cheskin, Clemens, Drescher, Fulgoni, Haytowitz, Hubbard, Law, Miller, Minor, Percival, Riscuta, Schneeman, Thornsby, Toner, Woteki and Wu 2014). Its cultivation is a viable and attractive activity for both rural farmers and peri-urban dwellers, since it required limited

space and does not require large capital to start the production (African Technology Policy Studies Network, 2013). Most agricultural production especially processing generates wastes which if unused constitute environmental menace. Mushroom cultivation is a means of recycling agricultural wastes or agricultural by-products (Mala, 2018).

Mushrooms are extremely abundant and diverse worldwide. About 14,000 species are now known in the world (Atri and Gulati, 2012), with the most cultivated being the white button mushroom (*Agaricus biosporus*). Among these recognised species, about 7,000 (50%) are considered to possess varying degrees of edibility, out of which more than 3,000 are regarded as prime edible mushrooms (Raphael, 2015). In time past, edible mushrooms were only traditionally harvested in the wild and were difficult to domesticate and cultivate. However, collection from wild woodlands is still important in the world, particularly in southern Asia and other developing countries (Fanzo, Cogill and Mattei, 2012). Wild mushroom resource has continued to shrink from both degraded environment and nature resources. Therefore, there is need for society to move closer to sustainable and safe food security solutions and mushroom cultivation appears to be a promising option (Feeney *et al.*, 2014).

Mushroom as a delicacy is highly rich in protein relative to other type of food and as such recommended by Food and Agricultural Organization as a healthy food for bridging the protein malnutrition gap when mixed with soybean (Mala, 2018). Beside its nutritional value, mushrooms have potential medicinal benefits and are also an ideal food for the diabetics as they are low-energy diet (Nagdeve, 2019), which is suitable for obese people. About 700 species are considered to possess medicinal properties (Wasser, 2014). The health benefit of mushroom includes immunological strengtheners, which can be used to cure viral hepatics. Hence, most people consume mushrooms partly due to their nutritional and medicinal benefits.

Mushrooms can be commercially grown both for local consumption and export market. They can be cultivated on a part time basis, and require little maintenance. Indirectly, mushroom cultivation also provides opportunities for improving the sustainability of small farming systems. Mushrooms can strengthen livelihood assets through the provision of income and improved nutrition. Successful cultivation has potential of earning and can be a good income generating activity for unemployed people (Shakil, Tasnia, Munim and Mehedi, 2014).

The nutritional and health benefits of mushroom notwithstanding, farmers' involvement in its production is low due to some obvious factors, one of which is observed the inability to distinguish between edible and non-edible or poisonous mushrooms. For this reason, some people usually take extra care when trying to identify the edible type, while others are completely put off by the fear of consuming a poisonous type. This is a matter of poor awareness or ignorance, which led to some curious notions among some communities in Nigeria about its cultivation. This has affected efforts of commercial cultivation of mushrooms in Nigeria (ATPS, 2013), thereby limiting its availability in local markets. According to official statistics from the National Farmers Information Service (NAFIS, 2016), Nigeria produces 300 tonnes of mushrooms per year, against the demand of 1200 tonnes.

This therefore means that buyers like homes and hotels have to import from elsewhere as local farmers cannot sustain the demand for mushrooms. Partly due to human activities, some mushrooms are becoming critically endangered (Earth Buddies, 2017).

Despite several trainings on mushroom production embarked upon by research institutes (Forest Research Institute of Nigeria (FRIN), Institute of Agricultural Research and Training (IAR&T)), Agricultural Development Programmes (ADP), as well as many non-governmental organisations (NGOs), there exists need for further awareness on the benefits of mushroom production (IAR&T, 2018). This is needed to encourage production, and boost supply. It is therefore necessary to assess the training needs of mushroom farmers in Oyo State.

The general objective of this study was to assess the training needs of mushroom farmers in Oyo State. The specific objectives were to:

- identify the respondents' sources of information on mushroom production;
- identify the benefits derived by the respondents from mushroom production;
- assess the respondents' training needs on different stages of mushroom production and
- identify the respondents' constraints to mushroom production

Methodology

The study was carried out in Oyo State which is located in the South West Geopolitical Zone of Nigeria. It lies between latitudes 7⁰N - 9⁰N and longitudes 2.5⁰E. The State covers an area of approximately 28,454 square kilometres, representing approximately 4.08% of Nigeria's total area and is ranked 14th by size. It has a population of 6,617,720. The Climate is equatorial, notably with dry and wet seasons and relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25°C. Agriculture is the main occupation of the people of Oyo State. The climate in the state favours the cultivation of crops like maize, yam, cassava, millet, rice, plantains, cocoa, palm produce, cashew etc.

Multistage sampling procedure was used to select the respondents. Two Agricultural Development Programme (ADP) zones (Ibadan/Ibarapa and Ogbomoso) where mushroom production is prevalent purposely selected. Two locations were randomly selected from each ADP zone: Ogbomoso south and Surulere from Ogbomoso zone; and Oluyole and Akinyele from Ibadan/Ibarapa zone. Using proportionate sampling method, 40% of mushroom farmers were randomly selected from each LGA; Oluyole (44), Akinyele (38), Ogbomoso south (33) and Surulere (28), to give a total sample size of 143 respondents. Interview schedule was used to obtain data, which were subjected to analyses using descriptive (percentages, mean scores) and inferential (Chi-square, PPMC) statistics at 0.05 level of significance. The major variables of the study were measured as follows:

Source of information was measured on a 2-point scale of "yes" and "no", with scores of 1 and 0 assigned, respectively. The percentages of each of the information sources were used to determine their importance to the respondents.

Perceived benefits of mushroom production was measured on a 2-point scale of “yes” and “no”, with scores of 1 and 0 assigned, respectively. The percentages of each of the benefit items were used to determine their importance to the respondents. The composite benefit score was obtained along with the mean score, which was used to categorise respondents into high and low level of perceived benefits of production.

Constraint to mushroom production was measured on a 3-point Likert-type scale of “not a constraint”, “mild constraint” and “severe constraint”, with scores of 0, 1 and 2 assigned, respectively. The mean scores for each of the items were obtained and used to rank them in order of severity.

Training needs was measured based on the generic steps of mushroom production as adapted from Marshall and Nair (2009), Royse and Beelman (2013). A list of twenty-nine items on A 5-point scale of “very high need”, “high need”, “moderate need”, “low need” and “not a need”, with scores of 5, 4, 3, 2 and 1 assigned, respectively was used to measure the extent of needs. The mean scores of the responses for each of the items were obtained and used to identify the needs that were more exigent to the respondents. Mean scores ≥ 3 were rated as exigent needs. Furthermore, the composite score of the various needs were obtained and the mean score was used to categorise the respondents into high and low training needs.

Results and Discussion

Sources of Information on Mushroom Production

Information sources are fundamental tools for increased agricultural productivity and development to famers. Table 1 shows that radio (96.5%) was the most popular source of information available to the mushroom farmers. Radio has proven useful in communicating agricultural technologies to farmers, with the objective of increasing agricultural production (Nwankwo and Orji, 2013). Interpersonal communication is quite common in rural areas and occurs on a daily basis among farmers. Hence, interpersonal means of communication such as family and friends (86.0%) ranked second. Training workshops (83.2%), farmers’ association (76.2%) and extension agents (68.5%) were also useful to the mushroom farmers. Farmers’ associations or groups are important means of getting across information to farmers. Accordingly, Oster and Thornton (2012) stated that farmers depend on their peers for useful information on their farming enterprises. Similarly, Mala (2018) observed that regular contact with extension agents lead to a significant knowledge gain by mushroom farmers in India.

Table 1: Sources of information

Sources of information	Yes (%)	Rank
Radio	96.5	1 st
Family and friends	86.0	2 nd
Trainings	83.2	3 rd
Farmers' associations	76.2	4 th
Extension agents	68.5	5 th
Television	62.9	6 th
Newspaper	62.2	7 th
Agricultural magazines	51.0	8 th
Workshops	49.7	9 th
Internet	17.5	10 th

Source: Field Survey, 2018 *Multiple responses

Perceived Benefits of Mushroom Production

Table 2 reveals that nutritious food (99.3%), source of income (98.0%), good health status (97.2%), substitute for vegetables/meat (96.5%) were the most important benefits the respondents derived from the cultivation of mushroom. This implies that they derive financial, nutritional and health benefits from mushroom production. This is partly in tandem with results in Table 1 and also with that of Shakil *et al.* (2014) who stated that mushroom cultivation has the potential of earning and can be a good income generating activity for unemployed people. Mushroom can serve as an alternative to vegetables or meat as they can also nourish the body by supplying a wide range of essential nutrients (Ali, 2014). Beside its nutritional value, mushrooms have potential medicinal benefits. They do not only contain enzymes which assist in reducing body cholesterol, but also contain natural insulin and enzymes which are involved in breaking down sugar in food (Nagdeve, 2019). It suffices to say that the majority of people consume mushroom basically for their nutritional and health benefits.

Table 2: Perceived benefits of mushroom production

Benefits	Yes (%)
Source of income	98.0
Good health status	97.2
Nutritious food	99.3
Food/vegetable substitute	96.5
High dietary fibre	91.6
Strong bone formation	90.9
Meat substitute	96.5
Reduces the risk of diabetes	93.7
Nourishes the skin	83.9

Source: Field Survey, 2018 *Multiple responses

Training Needs of Mushroom Farmers

The training need of the respondents was measured across five categories: growing medium; sterilisation of medium; seeding of medium with spawn; mushroom house practices; and harvesting and processing (Table 3). Infection-free medium of mushroom (\bar{X} = 3.64), canning (\bar{X} = 3.59), chemical preservation (\bar{X} = 3.57) and quick freezing (\bar{X} = 3.31) were the most paramount needs of the mushroom farmers. These findings signify that the respondents' training needs border mainly on maintaining a clean medium and adequate processing. Accordingly, contamination of cultivation medium is considered the main problem associated with mushroom production, which often occurs due to improper sterilisation (Fungi Academy, 2018). Hence, there is a high need to maintain a proper culture environment in terms of air and ground temperatures, humidity, light conditions and air exchange which may predispose contamination the source added. Likewise, upon harvesting, the quality of mushroom deteriorates or decays quickly just like most agricultural produce. Consequently, there is need for proper refrigeration or immediate marketing after harvesting (Kimole, 2012).

Table 3: Training needs for mushroom production

Training needs	Mean
Growing medium	
Measurement of additives to substrate	1.87
Mixing and exposure period of the substrate	2.16
Level of compactness	2.52
Thoroughness of mixture	2.60
Types of composting (short/long)	2.05
Types and standard of additives	2.54
Temperature level area	2.50
Sterilisation of medium	
Isolation of contaminated bags	2.61
Exposure of bags	1.91
Sanitary environment	2.66
Infection-free medium	3.64***
Seeding of medium with spawn	
Sprouting period/duration	2.61
Incubation area period	2.26
Mushroom house practices	
Duration of the heat	2.37
Hour of cooling down	2.03
Essentiality of darkness after inoculation	2.06
Watering process	2.27
Access to fresh air and wind/climatic condition	2.72
Light intensity	2.70
Humidity of the sawdust	2.42
Harvesting and processing	
Equipment for harvesting	2.62
Harvesting hour/timing	2.35
Uprooting process	2.30
Sorting/packaging	2.29
Quick freezing	3.31***
Cold processing	2.68
Drying methods	2.71
Canning	3.59***
Chemical preservation	3.57***

Source: Field Survey, 2018. ***Most paramount needs of the farmers

Relationship between Personal Characteristics and Training Needs on Mushroom Production

Results in Table 4 indicate that significant relationships exist between education ($\chi^2= 9.347$), monthly income ($\chi^2 = 19.184$), scale of production ($\chi^2 = 34.493$), household size ($r = -0.220$), farming experience ($r = -2.243$) and respondents' training needs on mushroom production.

The influence of education on training needs may be explained by the fact that more educated mushroom farmers are likely to be more enlightened on mushroom production activities and thus have fewer production needs than those who are less educated. More educated farmers would readily understand any technical aspect of mushroom production. This is because education affords farmers the ability to think and make necessary decisions associated with their farming enterprises (Barmon, Sharmin, Abbasi, and Mamun (2012)).

The scale of enterprise determines the level of income that will accrue from mushroom production. The higher the income the farmers realise from their enterprise, the higher their ability to acquire and adopt recommended technologies on mushroom production. This is expected to translate to respondents' having fewer training needs.

Household size influences training needs as household members, who can serve as source of family labour, can also serve as social capital/network that can provide salient insights on mushroom production activities hence a reduction in production needs. Since experience is associated with accumulation of knowledge in mushroom production (Mala, 2018), it implies that more experienced mushroom farmers are likely to have less production training needs than those who are less experienced.

Table 4: Relationship between personal characteristics and training needs of mushroom farmers

Variables	χ^2	Df	r – value
Educational level	9.347*	3	
Household size	-	-	-0.220*
Farm size	0.003	1	-
Farming experience	-	-	-2.243*
Monthly income	19.184*	5	-
Scale of production	34.493*	3	-

* $P \leq 0.05$ Source: Field Survey, 2018.

Relationship between Respondents' Knowledge, Perceived Benefits, Constraints and Training Needs on Mushroom Production

Table 5 reveals significant relationships between respondents' knowledge ($r=-0.362$), benefits derived ($r=-0.200$), constraint ($r=0.452$) and training needs on mushroom production.

This finding can be explained by the fact that respondents' who have more knowledge on mushroom production processes, which they may have acquired through experience or

training, will tend to have less needs than those who do not have as much of the knowledge. Adequate knowledge is expected to not only enhance their capability/skill on mushroom production, but also make them take necessary actions to improve their productivity and hence result in them having fewer production training needs.

The higher the benefits the farmers derive from their mushroom enterprise, the lower the number of production needs they are likely to have. The scale of production and income accruing from their mushroom enterprise can be limited if the training needs are many. When the production needs are beyond what they can cope with, it can make them abandon their mushroom enterprise. It simply implies that they have been doing it right thus less training needs. Similarly, the more the constraints the farmers face in their enterprise, the higher the number of training needs they are likely to have. Constraint in any form limits the potential of any activity including mushroom production. Therefore, more training (knowledge and skill acquisition) will be needed in order to overcome the constraint(s) and for efficient production.

Table 5: Correlation between knowledge, perceived benefits, constraints and training needs of mushroom farmers

Variable	r - value
Knowledge	-0.362*
Benefits	-0.200*
Constraint	0.452*

* $P \leq 0.05$ Source: Field survey, 2018.

Constraints to Mushroom Production

Results in Table 6 indicate that poor marketing/sales ($\bar{x} = 1.69$), lack of capital/credit ($\bar{x} = 1.67$), and inadequate information on mushroom cultivation ($\bar{x} = 1.63$) were the main constraints to the production of mushroom among the farmers. These findings are in line with Thilakarathna and Pathirana (2018), who identified lack of market and information as major constraints to mushroom production. Availability of market for agricultural produce is quite crucial for farmers not to run into losses. However, available market for mushroom is often limited to big supermarkets and hotels that demand high standards of hygiene and strict on the delivery of ordered volumes on time (Kimole, 2012), requirements which the farmers may not be able to keep up to. Also, capital/credit is essential for farmers, which they can use to procure inputs or adopt new farming technologies. Farmers will be unwilling to embrace or invest in newly introduced agricultural technology because of limited capital (Odozi, 2014). Information is required by farmers in order to understand the technical nature of mushroom enterprise practices. Inadequate information can lead to knowledge gap or poor understanding of any activity. Accordingly, Kimole (2012) opined that, farmers would

be unable to commence mushroom farming if they do not clearly understand the different steps of its production.

Table 6: Constraints to mushroom production

Constraints	Mean	Rank
Poor marketing/sales	1.69	1 st
Lack of capital/credit facilities	1.67	2 nd
Inadequate information on mushroom cultivation	1.63	3 rd
Inadequate knowledge on how to cultivate mushroom	1.52	4 th
Poor availability of viable spawn	1.47	5 th
Labour intensiveness	1.24	6 th
Inadequate manpower	1.22	7 th
Lack of storage facilities	1.19	8 th
Lack of production skill	1.08	9 th

Source: Field Survey, 2018.

Conclusion and Recommendations

Farmers' training needs on mushroom production was generally high as they do not have most of their enterprise needs met, particularly with respect to obtaining mushroom mediums devoid of infection, canning, chemical preservation and quick freezing. The high need of respondents was due to certain limitations such as poor marketing/sales, lack of capital/credit and inadequate information on mushroom farming. However, the farmers' knowledge on mushroom production was high, so also the benefits derived (nutritional, medicinal and economic).

Research institute, government agencies and NGOs with mushroom production mandate should prioritize mushroom training programme with training on growing medium coming first followed by linkage with market and capital sourcing methods for increase production. Extension agents should make more effort in training the mushroom farmers on up –to- date principles and practice of mushroom cultivation. Training should be organised on methods to identify other edible species of mushroom in order to have varieties aside oyster specie currently being cultivated.

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