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Mushroom Cultivation as a Small-Scale Family Enterprise for the Alternative Income Generation in Rural Bangladesh

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Abstract

The study presents the overall scenario of mushroom enterprises and its potentiality as a small -scale family business in generating supplementary income. Data were collected from 20 of the 100 total mushroom enterprises located at the Dogamora of Savar upazila in Dhaka using a semi-structured questionnaire. The study reveals that mushroom farming was the secondary or tertiary source of income for the entrepreneurs, most of which were young (less than 30 years old) comprising 70% man and 30% woman. The amount of investment on this farming was low ranging from BDT 5000 to ≥100,000 (US$65 to ≥US$1285), consequently the production rate was also low, maximum 10 kg per day for the higher investment while 1-2 kg for the lowest. The corresponding monthly profit against the investment ranged from BDT 2400 to 20,000 (30-256 US$). Financial analysis of mushroom farming in a bamboo made shade (15′× 6′) showed an average monthly profit of BDT 12,339 and a benefit-cost ratio of 2.24. Despite of the potentiality of this sector, Bangladesh is in back foot due to lack of popularity, labeling, attractive packaging and spawn packets for seeding. Absence of organized marketing and market structure was found to force the entrepreneurs to sell the product to the middlemen. Considering the country's limited land and unemployed or underemployed population, strengthening the mushroom farming sector could be one of the viable options. Flourishing the sector would boost the rural economy and diversifying business and employment opportunities in the rural areas, and providing income opportunities for disadvantaged group and small family farms.

Keywords

Profitability, Farm Size, Investment, Training, Spawn Packet

1. Introduction

Development of a densely populated country like Bangladesh depends on rural economy which is mostly agriculture oriented and seasonal in nature [17]. For diversification of the rural economic composition and structure, mainstreaming of rural people into the process of development through entrepreneurial activity is crucial [39]. Cultivation of mushroom is a vibrant example of small-scale family farming in many developing countries that has alleviated rural poverty and improved diversification of agricultural production [18] which is more appropriate for Bangladesh where hardly any land left for further farming [2]. Mushroom, a soft delicate white fruiting body of fleshy fungi, is the most popular delicious, nutritious and medicinal

vegetable in the world [1, 13]. Farming it requires no extra land and can be grown in room by racking vertically on locally available cheap substrate materials. The farming also requires little capital, short time, low technology and no chemicals [35]. Thus, it is a lucrative and profitable cottage industry for low income rural households [29] providing full and part time employment to rural and urban poor and marginal people in many developing countries [15]. In Bangladesh mushroom cultivation was initiated in 1979 with the assistance of Japanese Overseas Cooperative Volunteer (JOCV) whereas the commercial mushroom cultivation was started by Bangladesh Agricultural Research Council (BARC) and Mushroom Culture Centre at Savar in early 1980s [5]. There is a huge prospect of mushroom cultivation in the country because of its climatic condition which is fairly favorable for high volume of mushroom production [11]. It supplements farm income for the small family farms not having enough land to produce crops and raise animal while making use of by products or co-products from other crops. Intensive type of mushroom production could be an alternative job opportunity that would provide substantial amount on low investment to lead a descent life style in Bangladesh.

In many developed and developing countries of the world, mushroom as already been occupied a significant position in the food menu. Researches on different aspects of its farming and marketing have got a good foot in many developing courtiers. For examples, a large number of researchers have conducted research on mushroom cultivation system and management [9, 20, 27] in India, Nepal, China, Philippines, Thailand, Taiwan, Hong Kong and Pakistan. Studies are also conducted in other countries on mushroom's contribution in human health, nutrition and diseases [1, 19, 13, 22]. However, despite having huge potentiality of its farming in Bangladesh, it has got less attention as a food item among the mass people. Compared to the other farming countries, only a few studies have been conducted on production system [6, 7, 26, 43], poverty alleviation role [5, 10, 35], nutritional composition [3, 4] and substrates effect on the growth of mushroom [8]. More research efforts should be given to explore the average financial return on the investment, selection of mushroom strains, production efficiency, extension of its farming, marketing scope and constrains. Exploring the potentiality of mushroom farming particularly as a small-scale family business to supplement the family income and identification of associated problems in farming and marketing in context of Bangladesh are lacking in the previous research studies. Thus, the objective of this study was to analyze the monetary return of mushroom farming on small-scale family investment, existing market and marketing constrains and formulation of a set of recommendation to flourish this enterprise.

2. Methodology

Study area

Mushroom farming currently covers 25 districts in Bangladesh of which Savar upazila of Dhaka was selected purposively for the present study (Fig. 1). It is geographically located at 23.8583°N and 90.266°E about 24 kilometres to the northwest of capital Dhaka city. It is bounded by Kaliakair and Gazipur Sadar upazilas on the north, Keraniganj upazila on the south, Mirpur, Mohammadpur, Pallabi and Uttara thanas of Dhaka City on the east, and Dhamrai and Singair upazilas on the west. It has 66,956 units of household in a total area of 280.13 square kilometres having total population of 124885; male 53.03%, female 46.97% [40]. Main occupations of the inhabitants are agriculture, agricultural laborer, wage laborer, service, cattle breeding, forestry and fishing's [40]. The government of Bangladesh established Mushroom development institute in Savar under the ministry of agriculture whih is imparting training, supplying spawn, buying mushroom from the entrepreneurs for selling to the retailers or consumers.

Research methods

The population of interest in this explorative study was the small-scale mushroom farms run by the family members at Dogamora of Savar. A reconnaissance survey was conducted prior to the final survey to identify the number of successful enterprises and the range of investment to select the ultimate sampling unit. Enterprises were then categorized to 4 groups based on investment and production from which 20% ultimate sample unit was drawn randomly. Data were collected directly interviewing the entrepreneurs using a semi-structured questionnaire focusing questions on age and educational attributes of entrepreneurs, amount of investment, production, training period, marketing and profits of the farm. Market surveys were also carried out at Mirpur and Dhanmondi area of Dhaka city by taking 10% sample regarding types of mushroom used in the restaurants and their sources (many Chinese restaurants and shops available in these areas buy/sell mushroom as food item).

The financial evaluation was carried out taking account of primary investment (culture house construction, making shelf, and buying sprayer, drum, trays and other accessories and interest on loans), operating costs (spawn packet. Labour, poly bags, transportation cost, electricity and others) and return from the sales of mushroom. As none of the entrepreneurs maintained record book for periodic cash flow, a group meeting of the entrepreneurs were organized to comprehend the financial performance of a small culture house made of bamboo (15ft x 6ft). Considering five years service life of a bamboo shade culture house, financial analysis was done for a period of five years. As mushroom production cycle is 3 months from seeding to harvesting and not uniform all the year round, particularly in winter, three production cycles in a year was considered.

Investment project appraisal was adopted in the present study as suggested by Harrison and Herbohn [21] for the small scale investment. Individual labor cost was calculated based on the total hours spent for the three-month cycle and then divided it by 8 to get the total man days. As all the selected mushroom enterprises were run by the family members (not by hired labor), opportunity cost of this

expense was calculated taking into consideration of the local labor selling price. On the other hand, the return from the sale of mushroom was calculated based on the price sold at farm spot (farm gate) to the intermediate agents. Since the investment can get back by the first cycle of production, financial analysis was done considering the price constant over the five years while no compounding of the investment or depreciation cost of the farm house were taken into account. Apparently no sunk cost was found to be associated with such small investment and extra room of house or small shade constructed in the unused land of the home yard used for mushroom cultivation, hence, no opportunity cost of the land was considered. Finally the financial performance of the enterprises presented as monthly net profit, investment-return ratio and benefit-cost ratio. Throughout the study, national money unit Bangladesh taka (BDT) is used, the exchange rate of which was 78 for 1 dollar (US$). As the study was exploratory in nature, no rigorous statistical technique was used in analyzing the data, only a two-sample t-test ($P<0.05$) was performed to find out if there any significant difference of net profit due to differences of investment or days of training received by the entrepreneurs.

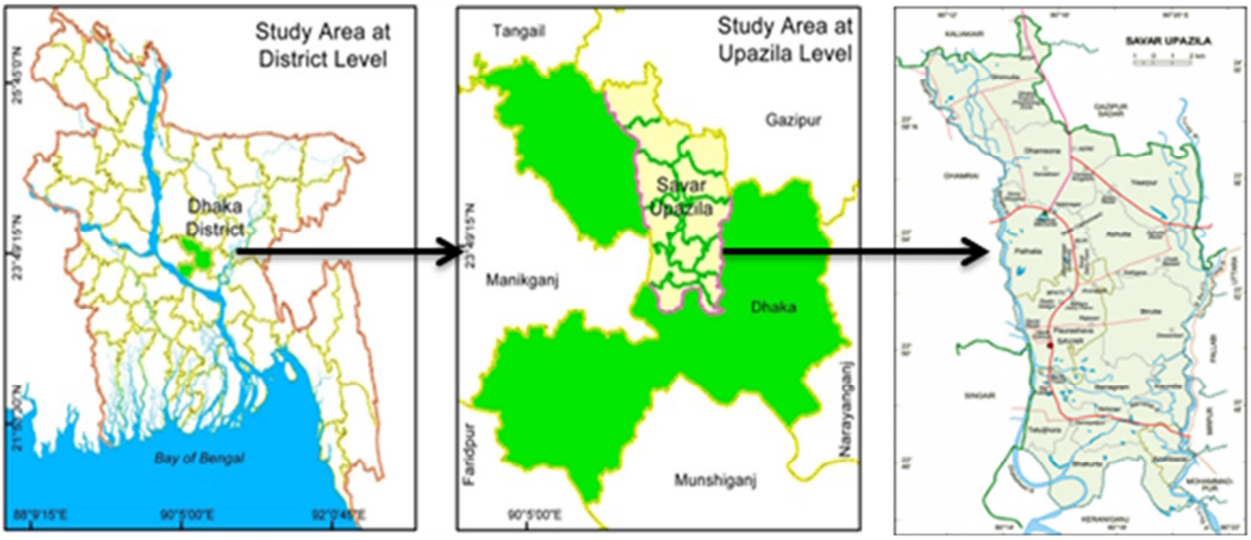

Fig. 1. *Map of the study area (adopted from Jahan et al., 2016).*

3. Results

General attributes of entrepreneurs

Attempts have been made to explore general attributes of the entrepreneurs of mushroom in the study areas (Table 1). The results show that mushroom entrepreneurs have come from a wide range of ages, predominantly having 20 to 30 years of age (40%) followed by 30 to 40 years (28%). Besides, above age 40 or below 20 years entrepreneurs occupies the mentionable percentage (16% each). Regarding the involvement of gender specificity, the male entrepreneurs (70%) were more than their female counterparts (30%). With respect to the occupational status, almost all the farmers/entrepreneurs run this farming as secondary (50%) or tertiary (40%) source of income while only 10% has taken it as a primary source of income indicating that they were generally involved in this business using their part time or as a side business which aided for their extra income. When share of income from mushroom was compared with the non-mushroom income sources (agriculture, service, auto rickshaw puller, grocery, daily labors), it was found to vary from 12% to 68% depending on the investment. The amount of investment on this farming was found to be very low, BDT 5000 (BDT 78 for 1 US$) for the majority farms (40%) followed by 30% and 15 % with BDT 5000 to 10,000 and BDT 10,000-50,000 respectively while only 5% farms invested ≥BDT 10,000 (Table 1) Consistently, the production per day was also low, 1 to 4 kg in 80% farms and remaining 20% had 5 to -10 kg (Table 1). Considering the educational attributes, majority (60%) of the entrepreneurs had secondary level of education followed by primary and higher secondary education comprising 20% each (Table 1). None of the entrepreneurs were found illiterate which is very significant considering to other cottage industries where many illiterate persons are involved.

Table 1. *General attributes of mushroom entrepreneurs in the study area.*

Attributes	Category	% of entrepreneurs
Age-class (years)	<20	16
	20-30	40
	30-40	28
	40>	16
Educational status	Illiterate	-
	Primary	20
	Secondary	60
	Higher secondary	20
Amount of investment (BDT) (BDT 78 for 1 US$)	< 5000	40
	5000-10000	30
	10000-50000	15
	50000-100000	10
	>100000	5
Production Range/day(kg)	1-2	40
	2-3	30
	3-4	10
	5-10	20

Profitability of mushroom cultivation at small scale stage

Primary investment is one of the major factors determining the capacity to produce mushroom. Unusually high investment yielded high production and minimize the running cost, and thus the farmers make good profit as can be seen from figure 2. The study reveals that when primary investment was more than BDT 50,000, the income was above BDT 16,000 per month while investment below BDT 10,000 is fair enough to have an income of BDT 5000. Low invested entrepreneurs in the study area found to avoid the cost of construction using the space of their living or rest houses. A breakdown cost and benefit analysis of farming in a 15′×6′ bamboo made shade (Table 2) shows a fixed cost of BDT 15800 and operation cost of BDT 64050 that could yield a return of BDT 216000 in the first year. Moreover, fixed cost is one time investment for the next 5 years, thus the monthly profit margin will be increased in next every cycle of production. Eventually, in five year, the total cost of BDT 345632 could generate a profit of BDT 1080000 representing the net profit of BDT 734368 (BDT 12239 per month). Cost benefit analysis shows a b/c ratio of 2.12 and investment-return ratio of 312.47% indicating it as a highly profitable business. Maximum share of fixed cost is the construction of house (51%) followed by the shelf (21%). Maximum operation cost was found to be associated with spawn packet for seeding followed by the labor cost comprising 56% and 21% respectively.

As it is almost run by family members, extra labor cost could be excluded and anticipated profit would be much higher than the calculated profit. Thus, investing a small capital which is affordable to many poor people would generate a substantial income that supplement the family income.

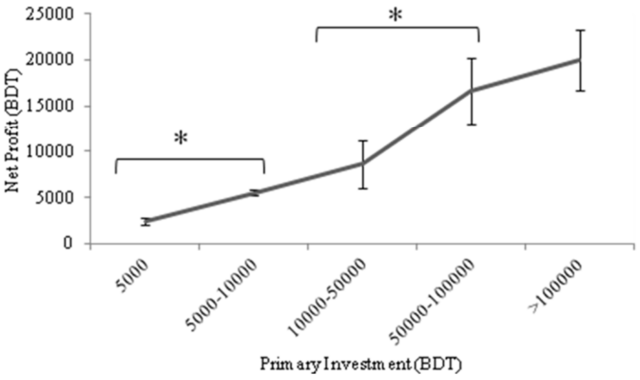

Fig. 2. *Net benefit of the farms (BDT) based on primary investment (BDT 78 for 1 US$). * indicates a significant difference of net profit of higher investment from immediate lower investment according to a two-sample t-test (P<0.05), values are the means ±SD of sampled entrepreneur's net profit.*

Table 2. *Financial performance of mushroom cultivation in a bamboo made culture house (15′×6′).*

Capital Outlay	Number/Quantity	Amount (BDT) (BDT 78 for 1 US$)
Culture House (bamboo made, 15ftx6ft)	1	8000
Shelf (bamboo made, 12ftx1ft)	4	4500
Sprayer	5	900
Drum	2	1750
Tray	2	150
Others (Thread, blade, knife, Heating machine)	4	500
Sub-total		15800
Operating Cost (for 3 production cycles in a year)		
Spawn packet	6000	36000
Labor	45 man days	13500
Poly Bag	3 rim	750
Labeling	-	1500
Preservation Cost	-	600
Transportation Cost	-	10800
Electricity Bill	-	900
Sub-total		64050
Total cost		79850
Net cost in a year (Assuming 12% bank interest)		89432
Net cost in 5 years	89432 (1st yr total cost)+64050x4 yrs operating cost	345632
Production/Revenue		
Total Production/cycle	900kg	
Net Marketable Production*/cycle	800kg	
Net Market Value/kg (Farm Gate price)	90 BDT	
Net Return in a year (3 cycles)	3(800x90)	216000
Return in 5 years	216000x5	1080000
Net profit (5 year project)		734368
Net profit per month		12239.46
Investment-return ratio (i/r)		312.47%
Benefit-Cost ratio (b/c)		2.12

*Net production is calculated considering 10% rotten or damaged as reported by Siddiqui, [36],

Relation between income and training

The level of prior experience in terms of training was investigated in the present study. The Figure 3A shows that the percentage of untrained people in the mushroom business was very low (5%). The percentage of entrepreneurs having three days training was 50% followed by 30% having 7 days training (Fig. 3A). Generally for quality production and to be successful entrepreneur, 45 days training from Mushroom training centre at Saver is very significant. During this 45 days period, a farmer can substantially learn about production, preservation and marketing of different types of mushroom. But the participation in 45 days training in the sampled entrepreneurs was found only 15% (Fig. 3A). A close relation of income and training was found from the study: higher the days of training received, higher the profit margin (Fig. 3B). The higher the production efficiency in spite of smaller farm (15 sq ft) compared to the larger ones (32 sq ft) could be attributed to the difference of experience (Fig. 3C). In general, the larger entrepreneurs received longer days training (45 days), most of which mushroom is the primary source of income. Participating in longer training aids them to avoid any risk of the investment and earned more profit by increasing the production efficiency

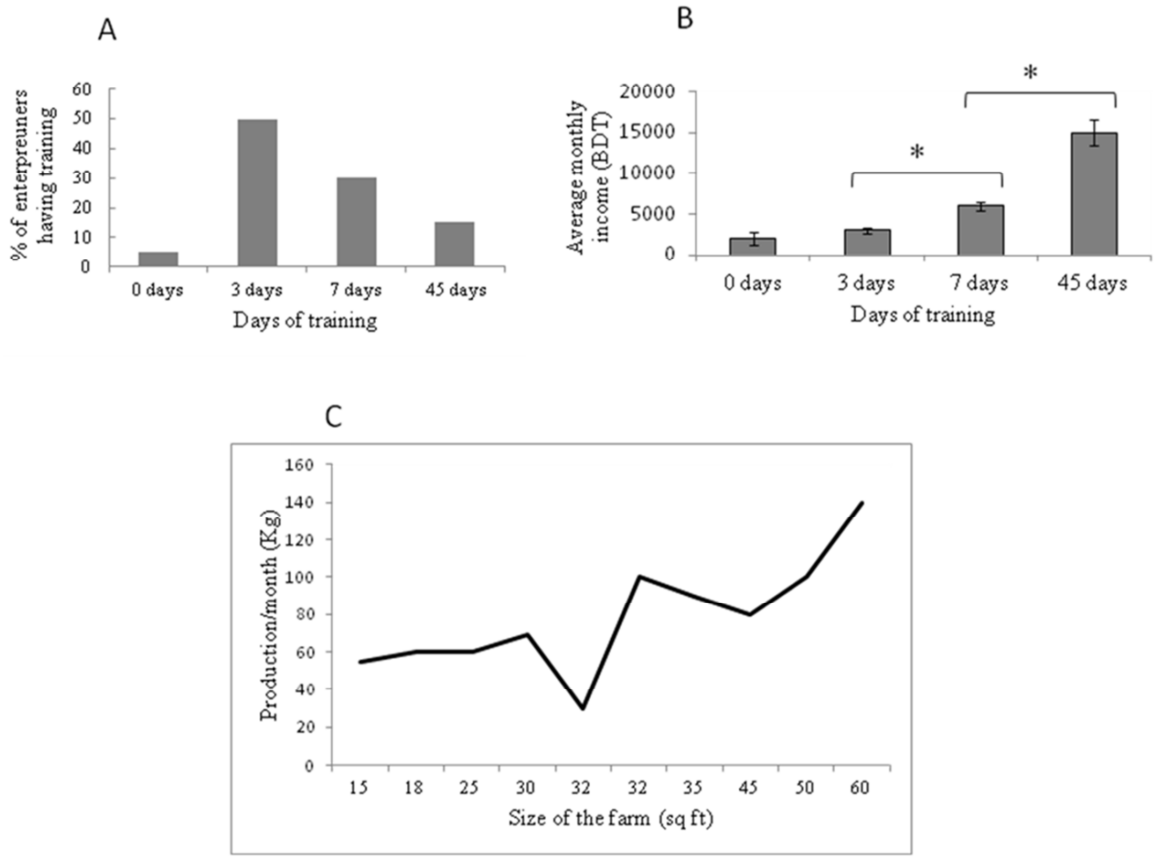

Fig. 3. *Training as a factor of average monthly income from mushroom farming; Shown in (A) is the percentage of entrepreneurs having training from 0 to 45 days, (B) is the average monthly income based on training and (C) is production in 10 randomly chosen different sizes enterprises with or without training (15-60 square feet). * indicates a significant difference of average monthly income (BDT 78 for 1 US$) due to differences in training received according to a two-sample t-test (P<0.05), values are the means ±SD of sampled entrepreneur's net profit.*

Market and Marketing

The existing marketing channel in the study area reveals involvement of three intermediaries; such as middlemen, mushroom training centers and wholesalers who move the product from farmers to ultimate consumers (Fig. 4). The ultimate consumer is the local people or the restaurant who hardly buy mushroom from the producers. Mushroom training centers act as a single intermediate agent to sell directly to the consumer while the wholesalers buy mushroom directly from producers and mushroom office and sell it to retailers or sometimes directly to consumers so to do by the middlemen. When the selling price of the farmer at the farm gate is compared to the price paid by middleman, it appears that the marketing margin of 33% of the price that the consumer pays did not reach the producer (Table 3). When the prices paid by ultimate consumer at the grocers, supermarkets and large consumer centers are taken into consideration, marketing margins increase further to 67% (Table 3). A part of the male entrepreneurs could avoid the middleman by selling directly to the retailers, whereas all the women entrepreneurs that comprise 30% of the total were found to be exploited by the middlemen and bound to sell at lower price.

The types of mushroom used in the restaurants and

shopping mall were mainly Button (Agaricus bisporus), Oyster (*Pleurotus spp)* and Rishi (Ganoderma lucidum) which were mostly imported except Oyster (Table 4). The market survey revealed that the major constrains of local mushroom marketing were low longevity, unexpected smell, poor packaging and labeling. The results were found to be coincided with the survey of enterprises, as found most of the entrepreneurs (80%) sold their products in fresh and wet conditions i.e. just after harvesting while only 20% sold dry mushroom. Locally produced dry mushroom (Oyster) can be preserved more than one year as reported by the entrepreneurs. Absence of using formal packets and label was also observed; only 25% producers used structured packets and labels while rests of the producers sold their products mostly to the middlemen in poly bags.

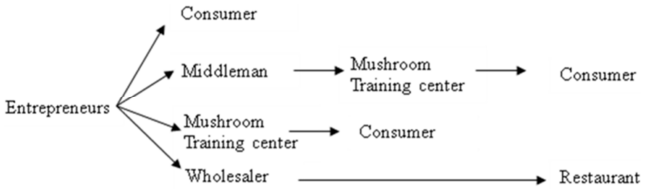

Fig. 4. *Existing marketing channel of mushroom in the study area.*

Table 3. *Marketing margin of mushroom at different channels.*

	price	Marketing margin	% increase
Farm gate	90		
Wholesalers/Middleman	120	30	33%
Retailers	150	30	67%

Table 4. *Types and sources of mushroom used by different consumers.*

Main consumers	Types of mushrooms	% of use
Chinese restaurants	Button mushrooms (*Agaricus bisporus*)	100% Button mushroom of mostly imported source
Shopping Mall in Mirpur,Dhanmondi	Oyster (*Pleurotus*) and Button mushroom (*Agaricus bisporus*)	25% Oyster of local source and 75% Button (imported)
Shopping Mall in Gulsan, Banani, Baridhara	Oyster (*Pleurotus*) and Button mushroom (*Agaricus bisporus*)	75% Oyster of local source and 25% imported Button
Pharmaceutical companies	Reishi mushroom(*Ganoderma lucidum)* and others	40% Reishi of mostly importedsurces and 60% others

4. Discussion

The present study shows the young, moderately educated entrepreneurs are involved in mushroom farming and entrepreneurs with sufficient training earns more profit by investing low amount of money. The involvement of most young people (below 30 years) in mushroom farming are in agreement with other study conducted in Bangladesh [5]. However, contrasting with the scenario of Turkey where most of the mushroom entrepreneurs (around 70%) are of above 40 years age [12]. There is a contradictory of the ages to conclude which group is more successful. A study conducted in India by Sinha [37] disclosed that the successful entrepreneurs were relatively younger in age while Reynolds et al. [33] found individuals ranging from 25 to 44 years are the most entrepreneurially active. Around one third of the total entrepreneurs were female indicating an impressive participation compared to the other sectors. Usually female are less likely to be founders of new business than male [31]. Similarly, Kolvereid [28] found that male had significantly higher entrepreneurial intentions than the female. Indeed, women and elders can actively engage in the cultivation of mushroom as it is indoor and labor intensive especially in filling substrate into plastic bags and harvesting [30, 44]. This will empower women in decision making, gaining other farming skills and becoming financially independent [44]. The importance of entrepreneur's age, gender, education and former work experience are in agreement with several other studies [16, 24, 38]. Despite the exploitation of profit by middleman in case of marketing, the potentiality of this small-scale enterprise to generate substantial amount of income on low investment is very high. Marketing of mushroom mostly resemble the scenario of non-timber forest products (NTFPs) marketing in Bangladesh which is characterized by the absence of organized marketing and uniform pricing, and exploitation by middleman [41, 32]. Financial analysis of mushroom farming in a bamboo made shade (15′× 6′) showed an average monthly profit of BDT 12,239 (BDT 78 for 1 US$) and a benefit-cost ratio of 2.12 (Table 2). Similarly, Shakil et al., [35] reported that investing an average of BDT 4-5 thousand one can earn BDT 10-15 thousand. The impacts of the mushroom farming on livelihoods and poverty reduction are well documented in several studies throughout the world [4, 10, 12, 23, 30, 34, 35]

5. Conclusion and Recommendation

Mushroom also known as 'vegetable meat', has occupied a favorite position in the food menu in many countries of the world. Its cultivation and consumption is environment friendly that can aid in solving the malnutrition problem of developing countries [14]. It has not got mass attention as a food materials in Bangladesh due to negative attitudes of the people thinking it as 'toad-stool' and feeling doubt whether it is *Halal* or not (*Halal* means permitted food items in Islamic law). The farmers have the ability to produce more mushrooms as its production technologies are simple and require low investment while the demand in the domestic market is low. Mushroom is an export oriented product and its demand is very high in the international markets. However, due to lack of exporting facilities, information and quality products, it is lagging behind the exporting sector. At the post harvest level, measures should be taken in preserving, packaging, labeling and dating of expiration. Most of the farmers are not able to produce spawn packets themselves due to financial and technical problems. They are mostly depended on Mushroom center which produces only a limited number of spawn packets daily. Strengthen the Mushroom centre development project and BSCIC (Bangladesh Small Cottage Industries Corporation) to impart

the proper training to the entrepreneurs and to ensure the supply of spawn. For large scale production, farmers should get the financial support from the government and non-governmental organizations (NGOs) at low interest. Information on genus and its species of mushroom is necessary for screening and identifying the high yielding strains to ensure quality yield in Bangladesh that has yet to be done [3, 42]. Co-operative market could be established to collect quality mushrooms and then can export it to other countries. Government can help to establish such type of market and can provide exporting facilities through agreement with other countries.

References

[1] Agrahar-Murugkar D, Subbulakshmi G (2005) Nutritional Value of Edible Wild Mushrooms collected from the Khasi Hills of Meghalaya. Food Chemistry, 89: 599-603.

[2] Ahmed AU (2006). Bangladesh climate change impact and vulnerability: a synthesis. Dhaka: climate change cell, Bangladesh Department of Environment.

[3] Ahmed M, Abdullah N, Ahmed KU, Bhuyan MHMB (2013) Yield and nutritional composition of oyster mushroom strains newly introduced in Bangladesh. Pesq. agropec. bras., Brasília 48(2):197-202.

[4] Alam N, Khan A, Hossain MS, Amin SMR. Khan LA (2007) Nutritional analysis of dietary mushroom Pleurotus florida Eger and Pleurotus sajor-caju (Fr.) Singer. Bangladesh Journal of Mushroom 1(2):1-7.

[5] Alom MM, Bari MW (2010) Investment in Mushroom Cultivation at Savar Upazila: A Prospective Sector for Bangladesh ASA University Review 4(2): 57-63.

[6] Amin S, Ruhul M (2008) Mushroom in Bangladesh: Past, Present, and Future. Abstract of the Annual Botanical Conference 2007, March 7-9, Abstract No –122, JU, Savar, Dhaka, 61p.

[7] Amin SR (2002) Performance of Different Oyster Mushroom (Pleurotus spp.) Varieties. M.S. Thesis, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, 1-50 pp.

[8] Ashraf J, Ali MA, Ahmad W, Chaudhry MA, Shafi J (2013) Effect of Different Substrate Supplements on Oyster Mushroom (*Pleurotus spp*.) production. Food Science and Technology 1: 44-51.

[9] Bano L, Rajarathnam S, Nagraja N (1979) Some Aspects on the Cultivation of Cultivation of *Pleurotus flagellates* in India, Mushroom Science 10(2): 597-608.

[10] Barmon BK, Sharmin I, Abbasi PK Mamun A (2012) Economics of Mushroom (Agaricus bisporus) Production in a Selected Upazila of Bangladesh. The Agriculturists 10(2): 77-89.

[11] Begum SA (2008). "Mushroom a potential new sector in Bangladesh", The Financial Express, 31 January 2008, Dhaka.

[12] Celik Y, Peker K (2009) Benefit/cost analysis of mushroom production for diversification of income in developing countries. Bulgarian journal of agricultural science 15(3): 228-237.

[13] Cheung LM, Cheung PCK (2005) Mushroom Extracts with Antioxidant Activity against Lipid Peroxidation. Food Chemistry, 89:403-409.

[14] Eswaran A, Ramabadran R (2010) Studies on some physiological cultural and postharvest aspects of oyster mushroom, *Pleurotus eous* (Berk.) sacc. Tropical Agricultural Research 12: 360-374.

[15] Ferchak JD and Croucher J (2001) Prospects and Problems in Commercialization of Small-Scale Mushroom Production in South and Southeast Asia, Appropriate Technology International, Washington DC, USA, 321-329 pp

[16] Glancey K, Greig M, Pettigrew M (1998) Entrepreneurial Dynamics in Small Business Service Firms. International Journal of Entrepreneurial Behaviour & Research, 4(3): 249–268.

[17] GOB (1999) National Agriculture policy, (1999). Ministry of Agriculture, Government of the Peoples Republic of Bangladesh, Dhaka.

[18] Godfrey EZ, Siti MK, Judith ZP (2010) Effects of temperature and hydrogen peroxide on mycelial growth of eight Pleurotus strains. Scientia Horticulture, 125:95-102.

[19] Gunde-Cimerman N (1999) Medicinal Value of the Genus Pleurotus (Fr.) P. Karst (Agaricles SR, Basidiomycetes), International Journal of Medicinal Mushrooms, 1:69-70.

[20] Han YH, Chen KM, Cheng S (1977) Characteristics and Cultivation of New Pleurotus In Taiwan. Mushroom Science 9(2):167-173.

[21] Harrison S, Herbohn J (2016) Financial Evaluation of Forestry Investments: Common Pitfalls and Guidelines for Better Analyses. Small-scale Forestry, DOI 10.1007/s11842-016-9334-1.

[22] Hawksworth DL (2001) Mushrooms: The Extent of the Unexplored Potential, International Journal of Medicinal Mushrooms 3:333-340.

[23] Imtiaj A and Rahman SA (2008) Economic viability of mushrooms cultivation to poverty reduction in Bangladesh. Tropical and Subtropical Agroecosystems, 8: 93-99.

[24] Islam MA, Khan MK, Obaidullah AZM, Alam MS (2011) Effect of Entrepreneur and Firm Characteristics on the Business Success of Small and Medium Enterprises (SMEs) in Bangladesh. International Journal of Business and Management Vol. 6, No. 3; March 2011.

[25] Jahan I, Ali ML, Haydar MA, Ali MI, Paul D, Islam, SMA (2016) Distribution of Natural and Probable Artificial Radioactivity in the Sediment and Water Samples Collected from Low-Lying Areas of Savar Industrial Zone, Bangladesh. Journal of Nuclear and Particle Physics 6(2): 25-34.

[26] Kamal AS, Begum F, Khair S (2009) Mushroom Production in Bangladesh: Scenario and Potentialities. SAARC Journal of Agriculture 7(2):91-105.

[27] Khan SM, Kausar AG, Ali MA (1981) Yield Performance of Paddy Straw in Pakistan. Mushroom Science 2(1):675-687.

[28] Kolvereid L (1996) Prediction of Employment Status Choice Intentions. Entrepreneurship Theory and Practice, Fall, 47-57.

[29] Lelley J (1988) Growing Edible Mushrooms- Still a Generally Neglected Opportunity. Gate 4, 30-34 pp

[30] Marshall E, Nair NG (2009) Make money by growing mushrooms. Food and Agriculture Organization (FAO) of the United Nations, Rome.

[31] Mazzarol T, Volery T, Doss N, Thein V (1999) Factors influencing small business start-ups. International Journal of Entrepreneurial Behavior and Research 5(2), 48-63.

[32] Rana MP, Mukul SA, Sohel MSI, Chowdhury MSH, Akhter S, Chowdhury MQ, Koike M (2010) Economics and employment generation of Bamboo-based enterprises: A case study from eastern Bangladesh. Small-scale Forestry 9:41–51.

[33] Reynolds PD, Hay M, Bygrave WD, Camp SM, Autio E (2000) Global Entrepreneurship Monitor 2000 Executive Report: Babson College, Kauffman Center for Entrepreneurial Leadership, and London Business School.

[34] Rosmiza MZ, Davies WP, Rosniza Aznie CR, Jabil MJ, Mazdi M (2016) Prospects for Increasing Commercial Mushroom Production in Malaysia:Challenges and Opportunities. Mediterranean Journal of Social Sciences 7(1):406-415.

[35] Shakil1 MH, Tasnia M, Munim, HZ Mehedi KHM (2014) Mushroom as a Mechanism to Alleviate Poverty, Unemployment and Malnutrition Asian Business Review, 4, 3(9):31-34.

[36] Siddiqui AB (2002) Mushroom Production Technology. IHAND project, GOB/UNDP/ FAO, Rangdhanu Printers, pp. 1-14.

[37] Sinha TN (1996) Human Factors in Entrepreneurship Effectiveness. The Journal of Entrepreneurship 5(1), 23-39.

[38] Stewart WH, Watson WE, Carland JC, Carland JW (1999) A Proclivity for Entrepreneurship: A Comparison of Entrepreneurs, Small Business Owners, and Corporate Managers. Journal of Business Venturing 14(2): 189–214.

[39] Uddin MA, Hossain S Ahamed S (2006) Entrepreneurship Development in Small-Scale Enterprises of the Rural Areas in Bangladesh: A Case Study on Some Areas of Chittagong and Rajshahi. The Social Sciences 1: 51-59.

[40] Uddin MN, Rashed MA, Rahaman MT, Islam MA Mobin MN (2014) A Survey Study On Eco-Friendly Gokulnagar Village of Savar, Dhaka. Journal of Environmental Science. & Natural Resources 7(1): 241–247.

[41] Uddin MS, Mukul SA, Khan MASA, Alamgir M, Harun MY Alam MS (2008) Small-scale agar (*Aquilaria agallocha* Roxb.) based cottage enterprises in Maulvibazar district of Bangladesh: production, marketing and potential contribution to rural development. Small-scale Forestry 7(2), 139-149.

[42] Uhart M, Piscera, JM, Alberto E (2008) Utilization of new naturally occurring strains and supplementation to improve the biological efficiency of the edible mushroom Agrocybe cylindracea. Journal of Industrial Microbiology and Biotechnology 35:595-602.

[43] Zamil MF, Cadilhon JJ (2009) Developing Small Production and Marketing Enterprise: Mushroom Contract Farming in Bangladesh. Development in Practice 19(7): 923-932.

[44] Zhang Y, Geng W, Shen Y, Wang Y, Dai Y (2014) Edible mushroom cultivation for food security and rural development in China: bio-innovation, technological dissemination and marketing. Sustainability 6, 2961-2973.