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ECONOMIC FEASIBILITY OF SMALL SCALE BUTTON MUSHROOM PRODUCTION IN PAKISTAN

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ABSTRACT:- Mushroom is widely cultivated as a proteineous vegetable in many countries of the world including Pakistan. Its cultivation requires less space, care, equipment and cost compared to many other crops and livestock. The present study was conducted in 2010 to estimate the profitability of small scale button mushroom production at National Agricultural Research Centre (NARC) Islamabad, Pakistan. The cost of production methodology was used for this study. The yield and gross return of mushroom was estimated at 155.6 kg ha^{-1} and Rs.77,800 ha^{-1}, respectively. The results indicated the fact that mushroom production is very much remunerative to its producers as it can give maximum net return by reducing their cost of production as its cultivation is dependent on the agricultural raw material which is cheaply available.

Key Words: Button Mushroom; Cost of Production; Economic Feasibility; Pakistan.

INTRODUCTION

In the developed countries, mushrooms have become one of the most important of all the horticultural crops. The production of mushrooms is increasing rapidly throughout the world, which is available all round the year and is used in many kinds of dishes. There are about 6,000 different species of which at least 1,290 are edible. The cultivable varieties are oyster mushrooms grown in a moderate temperature, paddy straw mushrooms, button mushroom, (a variety which grows on specially prepared compost and has a distinct taste aroma) and oak-tree mushroom (grown on wood logs of oak tree). Mushrooms can also be cultivated on compost material made from sawdust, rice and wheat bran. Mushrooms are used as food as well as medicine since time immemorial. The edible variety contains a high percentage of protein, all indispensable amino acids, vitamins B-complex and other biochemical compounds (Pakpost, 2005).

Button mushroom (*Agaricus* spp.) is the most popular mushroom variety grown and consumed the world over. Its production earlier was limited to the winter season, but with technology development, these are produced almost throughout the year in small, medium and large farms, adopting different levels of technology. The species being grown in most farms is the white button mushroom belonging to class Basidiomycetes and family Agaricaceae (nhb. 2010). The white button mushrooms or crimini or portabella or portobello mushrooms have commercial value (Jiskani, 2005).

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Economic Importance

The economic importance of the mushroom lies primarily in its use as food for human consumption. Mushrooms are highly proteinaceous and are used as food. The white button mushroom is sold as fresh mushroom or is canned and made into soups, sauces and other food products. Protein in mushrooms have 60-70% digestibility and contains all the essential amino acids. It has medicinal properties also. A high amount of retene is present in the button mushroom which is supposed to have an antagonistic effect on some forms of tumours (nhb. 2010). According to Dawar (2008) button mushrooms are fairly rich in vitamins and minerals. The mushroom contains an especially high amount of vitamin B and potassium. Raw mushrooms are naturally cholesterol, fat, and sodium free. The mushrooms also have very low energy levels. Five medium sized button mushrooms added together only have 20 calories (Dawar, 2008).The mushrooms can be cultivated in green houses, growth chambers, ditches, caves, huts, hovels, cottages, garages, sheds or shelters, bee hive shaped huts, thatched or meted roofs, thick tree groves and gardens, kitchens, bathrooms or other extra rooms of a house or any other vacant building (Jiskani, 2006).

Status of Mushroom Production in Pakistan

According to Jiskani (1999) different agricultural and/or industrial straw wastes can be used for cultivation of mushrooms. Mostly the wheat, paddy, barley, oat and gram straw, banana, sugarcane and maize leaves, empty millet heads and corn cobs, cotton waste, manure etc., can be used as substrate (medium) for cultivation. As Pakistan is an agricultural country, therefore a huge quantity of the crop waste is easily available at low cost, which could be converted into edible mushrooms by using separately or in combination.

Its cultivation in Pakistan is in its teething stage and its pace of development is very slow because of the insufficient public and private sector support. Their cultivation has tremendous potential although, at present only some wild types are eaten by rural folk, modern technology however, has made it possible to grow them under control and semi-control conditions. Nature has gifted Pakistan with variety of environmental conditions suitable for their cultivation from sea level to high mountains, where different types can easily be grown round the year. The species *Agaricus rodmani*, *Amanita nano, Inocybe ceophylla*, *Lepiota procera*, *Phellorina inguinence*, and *Podoxis pistillaris*, are grown in Balochistan, Sindh, Punjab and Khyber Pakhtoonkhaw of mountainous Swat valley and Murree hilly areas. These areas are suitable for growing white button mushroom. A. *khumbhi* mushroom is very common in the rural areas of Sindh, a white umbrella type known as *khamiri* is also consumed by the local inhabitants of Balochistan, Sindh and the Punjab (Pakpost, 2005).

In Pakistan, mushroom cultivation has not been given due importance, because of many reasons; whereas, the nature has gifted favorable environmental conditions with a huge quantity of waste material required for obtaining

beneficial food and efficient medicine through artificial cultivation of straw mushroom. No doubt, the most easy and economical mushroom cultivation technology is also developed by the scientists but still the nation is consuming/ depending only up on the mushroom grown naturally (Jiskani, 2005).

In Pakistan, profitable cultivation of button mushroom requires closer attention, experience and skill. If it is developed as a cottage industry in villages and on business lines, near towns and cities, the delicacy can become a common diet item to provide cheap source of proteins, vitamins and other nutrients. It is necessary to take proper steps to popularize and use of edible mushroom as the items of food and export. Different interventions and experiments have been conducted which are assumed to improve the livelihood of poor low income farmer groups. Among these experiments the cultivation of button mushroom at a small scale has also been initiated.

The present study is conducted to estimate the profitability of small scale button mushroom production for small scale farmers.

The basic objectives are to know the cultivation method of button mushroom; estimate the profitability of small-scale button mushroom production and make some policy recommendations for small scale farmers in Pakistan.

MATERIALS AND METHOD

This study was conducted during 2010 at Horticultural Research Institute, National Agricultural Research Centre (NARC) Islamabad, Pakistan. Maximum efforts were made to gather the relevant information and literature on economics of button mushroom. The existing literature on its production has been reviewed. The study was based on a primary data and the data were collected through face-to-face interview from the relevant departments. It was three month crop and the authors visited the experimental button mushroom shed frequently and also participated in button mushroom picking and packing to ensure the accuracy of data possible. The standard cost of production methodology was followed for this study. The details about the methodology could be found in Ahmad et al. (1994) and Cheema et al. (1994).

Data Analysis

The collected data were analyzed by using MS EXCEL for calculation of cost of production of button mushroom. The researchers calculated total cost, total revenue, percentages, net returns and return per rupee investment.

The net returns were calculated by subtracting total cost (TC) from total revenue (TR).

Net Returns = TR-TC---------- (1)

Similarly, return per rupee investment was calculated by dividing net returns with total cost

Return per
Rupee Investment = Net Returns /
Total Cost---------- (2)

The mushroom crop is of three months duration, so from annual deprecation of fixed assets the same is calculated for three months by using the following equation:

Annual Depreciation = (Costs of

Assets-Salvage Value) / No of Years---------- (3)

Cultivation Method for Button Mushroom

The white mushrooms, resembling with the shape of button are mostly known as button mushroom, but as these are naturally grown in meadow, therefore are called meadow mushrooms, also known as European mushroom, town or street mushroom in Europe. These are largely grown and greatly consumed throughout the world with almost 80% share among growing mushrooms (Raven and Johnson, 1992). A simple and economical methodology for cultivation of button mushroom has been experimented at NARC. The cultivable button mushroom has been grown on specially prepared compost. The best spawn can be prepared on sorghum grain but other cereal grains as well as all agricultural and industrial wastes can also be used (Jiskani, 1999; 2001). Different agriculture and industrial waste such as poultry waste, gypsum and wheat straw have been used as source of food for mushroom cultivation. The cultivation needs are (i) preparation of substrate and compost (ii) preparation of spawn (iii) substrate for mycelium growth and (iv) production of fruiting bodies. It is commonly grown in areas having naturally high humidity and low temperature.

Mushroom growing involves culturing mushroom spawn on a substrate and harvesting the mushrooms. The substrate must be sterilized by boiling in water in a drum. The material used is typically wheat straw, gypsum and poultry waste which was readily available locally and at low cost. After the substrate is sterilized and cooled, it is inoculated with spawn inside polythene bags and shelved. The bags were tied with threads and shelves were covered with polythene sheets in growing room for two to three weeks. During that period the mushrooms start to develop. When the young mushrooms start to push out the walls of the plastic bag, the bags were ripped open and polythene sheets were removed from the shelves to allow normal growth.

To ensure top quality product, mushrooms picking started at the time when they were fully mature but before they start to turn brown and before the edges start to turn black. The substrate blocks continued to produce new mushrooms for nine weeks and they were picked regularly. Room where experiment was conducted could not maintain the desired temperature for mushroom production. The developing mushrooms were watered regularly thrice a day to ensure healthy growth. To obtain the good quality button mushroom light, temperature, and humidity must be carefully controlled but the excess of CO_2 in the room can ruin the desired shape of the mushrooms. Temperature and humidity were tried to maintain by boiling water in drums, flow water on the floor and by using the exhaust fan. The grown mushrooms were sold out at the NARC sale point at Rs.100 and Rs.200 g^{-1} packets.

RESULTS AND DISCUSSION

The data for this analysis has been taken from the experiment conducted at Organic Farming Institute, NARC, Islamabad. The

experiment has been conducted in a small room. To calculate the cost of production the fixed and variable costs components were incorporated for three months.

Cost of Button Mushroom Production

Raw Material

The materials used for mushroom cultivation were typically wheat straw, gypsum and poultry waste which were readily available locally and at low cost. Amongst the raw materials, wheat straw at the total cost of Rs.5,000 was used which was the major raw material incurring 17.77% of the total cost (Table 1).

Water

Water was very important for the mushroom crop. The developing mushrooms were watered regularly thrice a day to ensure healthy growth. The cost of water was Rs.1080 which

Table 1. Cost of button mushroom production for three months

Particular	Value (Rs)	% of total cost
Room rent	1125	4.00
Wheat straw	5000	17.77
Gypsum	600	2.13
Poultry farm waste	550	1.95
Triangle for compost turning	17.5	0.06
Polythene sheets	350	1.24
Drums	100	0.36
Bricks	12	0.04
Polythene bags	160	0.57
Gas/fire wood	900	3.20
Thread	25	0.09
Frame	50	0.18
Casing material	325	1.16
Spawn price	7500	26.66
Sharp knives used for picking	2.5	0.01
Disposable gloves for picking	40	0.14
Hand pump	8	0.03
Water	1080	3.84
Labor	3375	11.99
Packing material	2000	7.11
Miscellaneous	3900	13.86
Interest on operating capital rate @15%	1017	3.61
Total cost (Rs. ha^{-1})	28137	100
Total Revenue (Rs. ha^{-1})	77800	-
Net Return (Rs. ha^{-1})	49663	-
Returns per rupee investment	1.77	-

was 3.84% of the total cost (Table 1).

Spawn

The cost of spawn Rs.7,500 was the highest among the other costs which was 26.66% of the total cost (Table 1).

Labor

One labor was hired on daily wages. Labor was involved in watering of mushroom crop and picking of the crop. The labor cost was Rs.3375 which was about 12% of the total cost (Table 1).

Total Cost

The total cost estimated for mushroom crop was thus Rs.28,137 (Table 1).

Returns per Rupee Investment

The net return of the total investment was Rs.49663 and the return

Table 2. Input cost of button mushroom production

Particular	Unit	Price (Rs.)	Qty	Value
Cost of raw materials				
Room rent	No	1125	1	1125
Wheat straw	kg	8.33	600	5000
Gypsum	Bags	200	3	600
Poultry farm waste	kg	1.22	450	550
Triangle for compost turning	Rs	350	1	350
Polythene sheets	Meters	35	10	350
Cost of pasteurization				
Drums	No	2000	2	4000
Bricks	No	4	3	12
Polythene bags	kg	160	1	160
Gas/fire wood				900
Thread	Packet	25	1	25
Frame used inside drums	No	1000	1	1000
Casing material				6500
Spawn	kg	500	15	7500
Sharp knives used for picking	No	50	2	100
Disposible gloves for picking	Packet	40	1	40
Hand pump	No	1700	1	1700
Labor Cost				
Labor*	Hours	25	135	3375
No of times water the crop per application per day	Liter/90day	1	1080	1080
Packing material	Rs	2.57	778	2000
No of pickings	No	-	26	-
Miscellaneous	Rs			3900
Packets sold (200 gm each)	No	100	778	77800
Total production	kg	-	155.6	-

per rupee investment (BCR) was Rs.1.77. It implies that mushroom cultivation is much more remunerative to its growers (Table 1).

Returns from Mushroom Production

Production

The total production of mushrooms was 155.6 kg ha^{-1} and 778 packets each of 200g were sold @ Rs.100 per packet (Table 2).

Total Revenue

The total revenue of the production of 155.6 kg of mushrooms was estimated at Rs.77800 ha^{-1} (Table 2).

Depreciation

The depreciation of fixed assets was calculated by equation (3). The mushroom crop was of three months, the depreciation value obtained from equation (3) was further calculated for three months by dividing the values of depreciation by four. The total value of depreciation was Rs.580 for three months. The salvage value of the assets was taken for five years (Table 3).

RECOMMENDATIONS

The study has been conducted to estimate the cost of production of button mushroom and to find the economic feasibility of mushroom cultivation for small scale farmers. The results of the study have indicated that the mushroom production is economically feasible as it can give maximum net return to the farmers by reducing their cost of production. Its cultivation is dependent on the agricultural raw material which is cheaply available to the farmers. It involves less investment but can give the farmer the more return on per rupee investment.

It is recommended that the button mushroom cultivation should be carried out at farmer's field as it is economically feasible for the low resource constraint farmers. The mushroom can successfully be grown in small houses and requires no land. Concerted and collaborative effects of all concerned stakeholders of mushroom are to be made for managing the extension and replicate this activity on sustainable basis on a large scale.

Table 3. Depreciation cost of button mushroom production

Depreciation	Cost (Rs)	No. of years	Annual value	Value for 3 months
Triangle for Compost turning	350	5	70	17.5
Drums	2000	5	400	100
Frame used inside drums	1000	5	200	50
Casing material	6500	5	1300	325
Sharp knifes used for picking	50	5	10	2.5
Hand pump	1700	5	340	85
Total			2320	580

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