

MUSHROOM CULTIVATION & PROCESSING

1.0 INTRODUCTION

Mushroom is a nutritious vegetarian delicacy and has many varieties. Most of them are edible. It contains many vitamins and minerals but very low on sugar and fat. It can be grown in a temperature between 20 and 30 C and required relative humidity is 55 to 75%. Hence, North-East region has very good prospects of cultivation as well as processing. Fresh mushrooms can be sold in the market. There is also growing market for processed - dried and packed - mushrooms as their shelf life is longer. There are two main varieties of mushroom viz. button type and oyster. Oyster mushrooms are easy to cultivate and process and do not require huge investment. Hence, this note deals with cultivation and processing of oyster mushrooms.

2.0 PRODUCT

2.1 Applications

Mushroom is an exotic and nutritious source of vegetarian food. It is a major horticulture product all over the world and is also becoming popular in India. Fresh mushrooms have very limited shelf life but dried and packed mushrooms have considerable shelf life. This project can be commenced any where in the country and this note considers Assam as the prospective location.

2.2 Availability of technology and Compliance

CFTRI, Mysore, has successfully developed the technical know-how. Compliance under the PFA Act is mandatory.

3.0 MARKET POTENTIAL

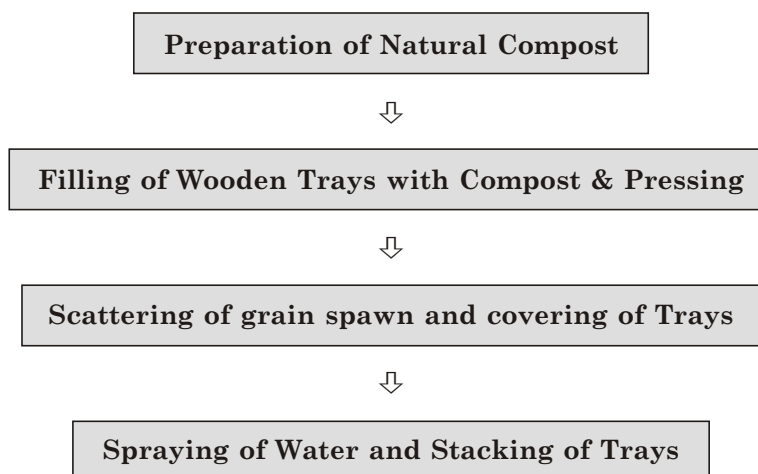
Mushroom is a vegetarian delicacy and a suitable substitute for meat and eggs. It is easily digestible as well. It is very popular in most of the developed countries and being accepted in

many developing countries like India. Market for mushrooms is growing rapidly because of their nice aroma, subtle flavour, nutritious values and special taste. Many exotic preparations are made from them like soup, pickles, vegetables etc. It is also used for stuffing several food preparations and for garnishing. But its consumption is still confined to urban and semi-urban population. Mushrooms have very short life after harvesting and hence they are sold in fresh form. Their shelf life can be enhanced by processing them. Processed mushrooms are packed in special quality polythene bags or Canned. This variety can be sold to far off places. Consumption of mushrooms is increasing in the North-East region and Guwahati, Shillong, Kohima etc. are potential markets.

4.0 MANUFACTURING PROCESS

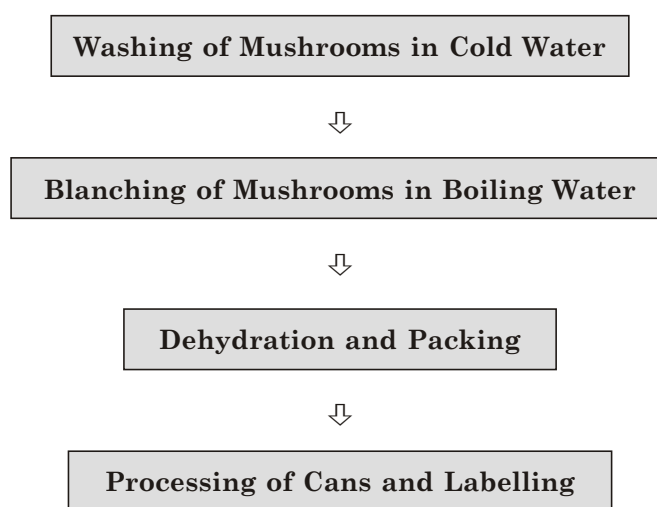
4.1 Process of Cultivation

For successful cultivation, careful attention has to be paid to three aspects viz. good compost, reliable spawn and right temperature during growing period or else partial or complete failure of the crop may result. Natural compost is prepared from horse dung and wheat or barley straw. Some quantity of chicken manure and 3 kgs. urea per ton of compost may be added. Compost preparation is very crucial and advise from an expert may be taken. Mushrooms are grown in wooden trays or boxes of 100 cm x 50 cm x 15 cm. They are filled well with the compost and pressed firmly leaving 3 cm clear space on top of the tray. The grain spawn is scattered on the surface of the compost which is then covered with a thin layer of compost. After that the trays are covered with old newspaper sheets and water is sprayed to provide humidity. The trays are then stacked vertically. At a temperature of around 24 - 25 °C white cottony mycelium spreads and permeate through the compost. It takes around 12 to 15 days for the complete spawn running. Ultimately, the surface of the compost is covered with half to one inch level of casing soil. It is sterilised to kill insects, nematodes and molds. The casing soil is spread over plastic sheets and treated with formalin and stirred frequently for a week to remove formation fumes. After casing, the temperature has to be maintained at 24-25 °C for 3 days after which it must be lowered to 18 °C. Thus, batches of trays must be arranged in such a way that there is a regular daily production. The process flow chart is as follows:



4.2 Mushroom Processing

Fresh mushrooms have very limited life and hence processing is recommended to enhance their shelf-life. Initially, fresh mushrooms are washed in cold water and then blanched in boiling water for about 3-4 minutes. Then they are dehydrated in a drier and packed. It is advisable to pre-treat fresh mushrooms in a solution containing brine to prevent discoloration. Packing is very critical as formation of moisture contaminates mushrooms very quickly. Yield after drying depends upon many factors like moisture content in fresh mushrooms, type of dryer, process employed, moisture content required in the finished product etc. Hence average yield is taken at 25%. Plain cans and a brine of 2% salt and 0.2% citric acid are used for packing. The cans are exhausted at 19 °C for 7-8 minutes, sealed and processed under pressure for 20-25 minutes. The process flow chart is as follows:



5.0 CAPITAL INPUTS

5.1 Land and Building

Land admeasuring to around 200 sq.mtrs. with built up area of 100 sq.mtrs. is adequate. Land may cost Rs.60,000/- whereas cost of building could be Rs.2.50 lacs.

5.2 Plant and Machinery

It is advisable to undertake thorough market survey before finalising actual capacity. Assuming capacity of 600 kgs. Per day, the annual capacity would be 180 tonnes considering 300 working days. Following machines shall be required.

| Item | Qty. | Price (Rs.) |
|--|------|-----------------|
| Tray-type Dehydrator | 1 | 70,000 |
| Steam-jacketted Kettle | 1 | 65,000 |
| Can Steamer | 1 | 20,000 |
| Blanching Equipments | 1 | 25,000 |
| Straight-line Exhaust Box with electric motor, gear box etc. | 1 | 45,000 |
| Canning Retort with attachment | 1 | 35,000 |
| Stacking Trays | 200 | 80,000 |
| Baby Boiler | 1 | 60,000 |
| Laboratory Equipments | -- | 35,000 |
| Total | | 4,35,000 |

5.3 Miscellaneous Assets

Some other assets like furniture & fixtures, working tables, storage racks, SS utensils, plastic tubs, etc. shall be required for which a provision of Rs. 60,000/- is made.

5.4 Utilities

The power requirement will be 30 HP whereas per day water requirement will be 1000 ltrs. including that for potable and sanitation purposes.

5.5 Raw and Packing Materials

Materials like spawn, wheat or barley straw, formaline, insecticides etc. shall be required for cultivation whereas small quantity of salt and citric acid will be required for processing. Packing materials like cans for processed mushrooms and plastic bags for fresh mushrooms and corrugated boxes, lables, box strappings etc. shall be required.

6.0 MANPOWER REQUIREMENTS

| Particulars | Nos. | Monthly Salary (Rs.) | Total Monthly Salary (Rs.) |
|----------------------|------|----------------------|----------------------------|
| Skilled Workers | 2 | 2,250 | 4,500 |
| Semi-skilled Workers | 2 | 1,650 | 3,300 |
| Helpers | 4 | 1,250 | 5,000 |
| Salesman | 1 | 2,500 | 2,500 |
| | | Total | 15,300 |

7.0 PROJECT IMPLEMENTATION

With adequate funds, the project can be implemented in about 20-22 weeks.

7.1 Tentative Implementation Schedule

| Activity | Period (in months) |
|--|--------------------|
| Application and sanction of loan | 2 |
| Site selection and commencement of civil work | 1 |
| Completion of civil work and placement of orders for machinery | 4 |
| Erection, installation and trial runs | 1 |

8.0 DETAILS OF THE PROPOSED PROJECT

8.1 Land and Building

| Particulars | Area (Sq.Mtrs) | Cost (Rs.) |
|-------------|----------------|-----------------|
| Land | 200 | 60,000 |
| Building | 100 | 2,50,000 |
| | Total | 3,10,000 |

8.2 Machinery

The total cost of machinery will be Rs. 4.35 lacs as explained earlier.

8.3 Miscellaneous Assets

A provision of Rs.60,000/- is adequate under this head as explained before.

8.4 Preliminary & Pre-operative Expenses

There will be many pre-production expenses like market survey expenses, registration expenses, establishment, administrative & travelling expenses, trial run expenses etc. A provision of Rs.75,000/- is made towards them.

8.5 Working Capital Requirements

The capacity utilisation in the first year is expected to be 60% for which the working capital needs will be as under.

(Rs. in lacs)

| Particulars | Period | Margin | Total | Bank | Promoters |
|---|---------|--------------|-------------|-------------|-------------|
| Stock of Packing Materials | 1 Month | 30% | 0.50 | 0.35 | 0.15 |
| Stock of Finished Goods (Canned Mushrooms) | 1 Month | 25% | 1.00 | 0.75 | 0.25 |
| Receivables | 1 Month | 25% | 1.40 | 1.05 | 0.35 |
| Working Expenses | 1 Month | 100% | 0.40 | -- | 0.40 |
| | | Total | 3.30 | 2.15 | 1.15 |

8.6 Cost of the Project & Means of Financing (Rs. in lacs)

| Item | Amount |
|--|--------------|
| Land and Building | 3.10 |
| Plant and Machinery | 4.35 |
| Miscellaneous Assets | 0.60 |
| P&P Expenses | 0.75 |
| Contingencies @ 10% on Land and Building & Plant & Machinery | 0.75 |
| Working Capital Margin | 1.15 |
| Total | 10.70 |
| Means of Finance | |
| Promoters' Contribution | 3.20 |
| Term Loan from Bank/FI | 7.50 |
| Total | 10.70 |
| Debt Equity Ratio | 2.33 : 1 |
| Promoters' Contribution | 30% |

Financial assistance in the form of Grant is available from the Ministry of Food Processing Industries, Govt. of India, towards expenditure on technical civil works and plant and machinery for eligible projects subject to certain terms and conditions.

9.0 PROFITABILITY CALCULATIONS

9.1 Production Capacity & Build-up

The rated capacity will be 180 tonnes whereas the actual utilisation is assumed to be 60% and 75% during first 2 years. It is also assumed that proportion of fresh and canned mushrooms will be equal.

9.2 Sales Revenue at 100%

(Rs. in lacs)

| Product | Qty. (Tonnes) | Price/Ton (Rs.) | Sales Value |
|------------------|---------------|-----------------|--------------|
| Fresh Mushrooms | 60 | 22,000 | 13.20 |
| Canned Mushrooms | 30 | 50,000 | 15.00 |
| | | Total | 28.20 |

9.3 Raw & Packing Materials Required at 100%

(Rs. in lacs)

| Product | Qty. | Price (Rs.) | Value |
|--|-------------|--------------|--------------|
| Spawn | 10,500 Kgs | 55/Kg | 5.77 |
| Wheat/Barley Straw | -- | -- | 2.50 |
| Formaline | -- | -- | 0.40 |
| Insecticides | -- | -- | 0.50 |
| Cans | 1.0 Lac Nos | 3/Tin | 3.00 |
| Plastic Bags, Cartons, Lables, Box-strapping, etc. | -- | -- | 2.00 |
| | | Total | 14.17 |

9.4 Utilities

Expenditure on power and water at 100% activity level is expected to be Rs. 1.00.

9.5 Selling Expenses

Selling prices are taken on lower side as it is envisaged that the promoters would directly cater to some bulk consumers like star hotels, restaurants, clubs, caterers etc. Retailing, to some extent, will be undertaken of canned mushrooms only. Hence, selling expenses are taken at 5% of total sales value.

9.6 Interest

Interest on term loan of Rs.7.50 lacs is calculated @ 12% per annum assuming repayment in 4 years including a moratorium period of 1 year. Interest on working capital loan from bank is calculated @ 14% per annum.

9.7 Depreciation

The method applied is WDV and rates assumed are 10% on building and 20% on machinery and miscellaneous assets.

10.0 PROJECTED PROFITABILITY

(Rs. in lacs)

| No. | Particulars | 1st Year | 2nd Year |
|----------|--|----------------|--------------|
| A | Installed Capacity | -- 120 Tons -- | |
| | Capacity Utilisation | 60% | 75% |
| | Sales Realisation | 16.92 | 21.15 |
| B | Cost of Production | | |
| | Raw and Packing Materials | 8.50 | 10.62 |
| | Utilities | 0.60 | 0.75 |
| | Salaries | 1.84 | 2.10 |
| | Stores and Spares | 0.18 | 0.30 |
| | Repairs & Maintenance | 0.30 | 0.50 |
| | Selling Expenses @ 20% | 0.58 | 1.05 |
| | Administrative Expenses | 0.36 | 0.48 |
| | Total | 12.36 | 15.80 |
| C | Profit before Interest & Depreciation | 4.56 | 5.35 |
| | Interest on Term Loan | 0.84 | 0.63 |
| | Interest on Working Capital | 0.30 | 0.38 |
| | Depreciation | 1.25 | 1.03 |
| | Profit before Tax | 2.17 | 3.31 |
| | Income-tax @ 20% | 0.42 | 0.65 |
| | Profit after Tax | 1.75 | 2.66 |
| | Cash Accruals | 3.00 | 3.69 |
| | Repayment of Term Loan | -- | 2.30 |

11.0 BREAK-EVEN ANALYSIS

(Rs. in lacs)

| No | Particulars | Amount | |
|-----|----------------------------|--------|-------|
| [A] | Sales | | 16.92 |
| [B] | Variable Costs | | |
| | Raw amd Packing Materials | 8.50 | |
| | Utilities (65%) | 0.39 | |
| | Salaries (70%) | 1.29 | |
| | Stores & Spares | 0.18 | |
| | Selling Expenses (75%) | 0.64 | |
| | Admn Expenses (50%) | 0.18 | |
| | Interest on WC | 0.30 | 11.48 |
| [C] | Contribution [A] - [B] | | 5.44 |
| [D] | Fixed Cost | | 3.34 |
| [E] | Break-Even Point [D] ÷ [C] | | 62% |

12.0 [A] LEVERAGES

Financial Leverage

$$= \text{EBIT/EBT}$$

$$= 3.04 \div 1.90$$

$$= 1.60$$

Operating Leverage

$$= \text{Contribution/EBT}$$

$$= 5.44 \div 1.90$$

$$= 2.86$$

Degree of Total Leverage

$$= \text{FL/OL}$$

$$= 1.60 \div 2.66$$

$$= 0.56$$

[B] Debt Service Coverage Ratio (DSCR)

(Rs. in lacs)

| Particulars | 1st Yr | 2nd Yr | 3rd Yr | 4th Yr |
|-----------------------|-------------------------|-------------|-------------|-------------|
| Cash Accruals | 2.75 | 3.69 | 4.18 | 4.78 |
| Interest on TL | 0.84 | 0.63 | 0.35 | 0.09 |
| Total [A] | 3.59 | 4.32 | 4.53 | 4.87 |
| Interest on TL | 0.84 | 0.63 | 0.35 | 0.09 |
| Repayment of TL | -- | 2.50 | 2.50 | 2.50 |
| Total [B] | 0.84 | 3.13 | 2.85 | 2.59 |
| DSCR [A] ÷ [B] | 4.27 | 1.38 | 1.54 | 1.97 |
| Average DSCR | ----- 2.29 ----- | | | |

[C] Internal Rate of Return (IRR)

Cost of the project is Rs. 10.70 lacs.

(Rs. in lacs)

| Year | Cash Accruals | 24% | 28% | 32% |
|------|---------------|--------------|-------------|-------------|
| 1 | 2.75 | 2.22 | 2.15 | 2.08 |
| 2 | 3.69 | 2.40 | 2.25 | 2.12 |
| 3 | 4.18 | 2.19 | 1.99 | 1.82 |
| 4 | 4.78 | 2.02 | 1.78 | 1.57 |
| 5 | 5.27 | 1.80 | 1.53 | 1.32 |
| | 20.67 | 10.63 | 9.70 | 8.91 |

The IRR is around 24%.

Some of the machinery and packing suppliers are as under

1. Gardener Corporation,158, Golf Links, New Delhi-110003
2. Rayon Metal Works,JB Nagar, Andheri(E), Mumbai-400059
3. BSen Barry and Compnay, 65/11, Rohatak Rd., Karol Baug, NewDelhi-110005
4. Cowel Can Ltd., Po Barotiwala, Dist. Solan, HP.
5. Narang Corporation, P-25, Cannaught Place, New Delhi 110001
6. FMC Technology Hong Kong Ltd., 2 Bhubhaneshwar Housing Society, Pashan Road, Pune - 411 008. Ph: 25893700. Fax: 25893701
7. Laxicon Engg, Sita Bardi, Nagpur 440 012