ज्ञानम् आत्म प्रदीपाय THE NEOTIA UNIVERSITY

Programme name: Experiential Learning Programme

Course code: EL-AGP 803, EL-AGP802, EL-AGP 809

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CHAPTER I: Introduction

1. Objective of the programme

The Experiential Learning Programme (ELP) was a unique course, first time introduced to the 4th year under graduate students of Neotia University. The major objectives of the programme was to impart hands on training and enrich their knowledge for preparation of viable bankable projects. The course outcome of the programme was that the students will be learning preparation of project its evaluation, implementation and assessment in relation to viability, profitability and applicability with realistic approach of an entrepreneurship.

Detail Project Report (DPR)

A project report is a document which contains the information about the proposed project and it contains all the details of the project. The project report details the project proposal in order to assess the feasibility of the planned activity. In other words, we can say that a project report is a written document that is related to a particular project. It includes information to evaluate the proposal and determine whether the proposal is technically feasible and economically viable. The project report consists the evaluated data on economical, technological, financial, managerial, and manufacturing issues that may happen while the project is being implemented.

The project report includes comprehensive information on the necessary land and buildings, annual production and manufacturing capacity, process, machinery and equipment prices and specifications, raw material requirements, power and water requirements, manpower requirements, project marketing costs, efficiency, financial assessments, and economic viability.

Project Report's Contents

1. General Information

The General information must provide information on the history, current state, challenges and future prospects.

If the proposed company is a manufacturing unit, it must provide details about the product to be produced as well as the reasons for choosing the product. The General information must describe the product's demand in the local market as well as in national market and in the global markets. It should clearly define business alternatives as well as the motivations for startup.

2. Executive Summary

The business's goals and strategies for achieving results must be stated in a project report. This report must consist the overall picture of the business organizations which must be in terms of capital that holds, operations going on in the company, operating methods and business execution. It must include the assumptions and risks that are common in the business.

3. Project Description

A brief overview of the project must be given, including information on the following:

- The place of the project where it is being build.
- Raw material requirements,
- Target of production,
- Area required for the working
- Requirement of the Electricity
- Fuel requirements,
- Water requirements,
- Employment requirements of skilled and unskilled labour,
- Technology selected for the project,
- Production process,
- Projected production volumes, unit sale prices,
- Pollution treatment plants if any required.

4. Marketing Plan

The marketing plan must specify the selling price at which the commodity/ product can be sold. It should also include the tactics that will be used to penetrate the market.

5. Capital Structure and operating cost

The report must specify the source of funding as well as the extent of the owner's contribution and borrowed funds. Working capital specifications must be specified, as well as the source of funds in the project.

Land, building and civil works maintenance, plant and equipment, miscellaneous fixed assets, preliminary and preoperative costs, and working capital must all be factored into the overall project cost estimate. This segment must also include a breakdown of the operating costs.

6 Technical Aspects

A project report contains details about the project's technologies and strategic aspects. It includes information on the project's chosen technology, the manufacturing process, machinery capability, pollution control plants, and so on.

7. Financial Aspects

This portion of the project report covers the accounting system and inventory management system that will be used. The financial and economic viability of the business must be stated in the project report.

8. Project Implementation

The project implementation in the report must specify when the activities associated with establishing the business will be completed. The timeline for project planning and execution is seen in the implementation schemes.

9. Social responsibility

The Social responsibility units or projects are based on societal inputs. As a result, it makes a significant contribution to society in terms of jobs, revenue, exports, and infrastructure. The business's performance must be listed in the project report.

A techno-economic feasibility study report is referred to as a feasibility study report. It is the main study used to develop the investment plan.

A detailed project report serves as the foundation for project preparation and execution.

CHAPTER 2: Important Definitions

1. Discounting Factor (DF)

The discount factor is used most commonly when doing valuation using DF analysis to compute the present value of future cash flow of each year. It is also used to calculate the net present value which can be used to determine the net future value of an investment.

In financial modeling, once we obtain the undiscounted cash flows for the projected years or the years to come, we need to calculate their present value to evaluate whether the investment is profitable or not and how much is that organization's worth. The advantage of using the discount factor is that it makes financial modeling more accurate.

Mathematical Formula

The discount factor is used by analysts when carrying out financial modeling in excel. The formula to calculate it is stated below:

Discount Factor = 1/{(1 + Discount Rate) ^ Year or Period Number}

2. Net Present Value (NPV)

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyze the profitability of a projected investment or project. NPV is the result of calculations used to find today's value of a future stream of investments and income.

3. Benefit Cost Ratio (BCR)

The benefit-cost ratio (BCR) is a ratio used in a cost-benefit analysis to summarise the overall relationship between the relative discounted costs and benefits of a proposed project. BCR can be expressed in qualitative terms. When a project has a BCR greater than 1.0, the project is expected to deliver a positive net present value.

4. Internal Rate of Return (IRR)

The internal rate of return (IRR) in financial analysis to estimate the profitability of potential investments. IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero in a discounted cash flow analysis.

Generally, the higher an internal rate of return, the more desirable an investment is to undertake. IRR is uniform for investments of varying types and as such can be used to rank multiple prospective projects on a relatively even basis. When comparing investment options with other similar characteristics, the investment with the highest IRR probably would be considered the best

5. Break Even Point (BEP)

The breakeven point (break-even price) for a trade or investment is determined by comparing the market price of an asset to the original cost; the breakeven point is reached when the two prices are equal.

In corporate accounting, the breakeven point is determined by dividing the total fixed costs associated with production by the revenue per individual unit minus the variable costs per unit. Fixed costs refer to those which do not change depending upon the number of units sold. Put differently, the breakeven point is the production level at which total revenues for a product is equal to total expenses.

6. Debt Service Coverage Ratio (DSCR)

The debt-service coverage ratio (DSCR) is a measurement of a firm's available cash flow to pay current debt obligations. The DSCR shows investors whether an organization has enough income to pay its debts.

CHAPTER 3: Subsidy programmes

Different subsidy schemes of State & Central Govt.

A. Subsidy schemes under Agriculture

Sr. No	Name of the Scheme	Eligible Activity	Financial Assistance (Subsidy)
1	Agriculture Infrastructure Fund (AIF)	Primary processing activities under agriculture (except Animal Husbandry & fishery)	3% interest subvention
2	**Integrated schemes for Agricultural Marketing (ISAM)**		
i	Gramin Bhandaran Yojana (GBY)	Storage godown	33% & 25% capital subsidy
ii	Agri Marketing Infrastructure, Gradings & Standardisation (AMIGS)	Storage with processing machineries	33 % & 25 %
3	**Horticulture development schemes**		
i	Mission for Integrated Development of Horticulture (MIDH, NHM)	All horticulture activities, cold storages, mushroom production, tissue culture lab, seed production units, green house, shade net, organic farming, bee keeping, farm mechanisation equipment	25%, 40% & 50%
ii	National Horticulture Board (NHB)	Commercial Horticulture, Cold storage, technology & transfer for promotion of horticulture (mother plant, root stock nursery, refer van	40% & 50 %
4	**Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**		
i	Accelerated Irrigation Benefit Programme (AIBP)	For Central & State Govts	
ii	PMKSY- Har Khet ko Pani		45% & 55%
iii	PMKSY – Per drop more crop		45% & 55%
iv	PMKSY – Watershed Development		45% & 55%
5	**Jaivik Kheti (Organic cultivation)**		50%

B. Animal Husbandry & Dairy activities

Sr. No	Name of the Scheme	Eligible Activity	Financial Assistance (Subsidy)
1	**National Programme for Dairy Development**	Clean & quality milk production under Cooperatives, SHG, Govt. sectors	100%
2	**National Livestock Mission (NLM)**	Fodder, Poultry, Piggery, small ruminants	50%
i	Poultry venture capital Fund		25% & 33%
ii	Integrated Development of Small Ruminants & Rabbits		25% & 33%
iii	Pig development		25% & 33%
iv	Salvaging of male Buffalo calves		25% & 33%
3	**Animal Husbandry Infrastructure Development Fund(AHIDF)**	Dairy processing, Value added dairy product manufacturing, meat processing and value addition, feed manufacturing	3% interest subvention
4	**Dairy Processing & Infrastructure Development Fund (DIDF)**	Milk processing plant & machinery,	2.5% interest subvention

C. Fishery activities

Sr. No	Name of the Scheme	Eligible Activity	Financial Assistance (Subsidy)
1	**Pradhan Mantri Mastya Sampada Yojana**	Hatchery, New rearing pond (brackish & inland), Biofloc, marine hatchery, open sea cages, bivalve cultivation (mussels, clams & pearls), ornamental & recreational fisheries, cold storages, refer van, insulated vehicle, Fish feed mills & plants, deep sea vessels, safety kits, communication & tracking devices	40 % & 60 %
2	**Fisheries & Aquaculture Infrastructure Development Fund (FIDF)**	Fishing harbour, ice plants, cold storages, cold chains, modern fish market, fish processing units etc.	3% interest subvention
3	**Blue Revolution**	NFDB activities, Dev. Of inland & marine fisheries, Welfare schemes for fishers	50%

D. Farm Mechanisation scheme of WB Govt.

Sr. No	Name of the Scheme	Eligible Activity	Financial Assistance (Subsidy)
1	**Financial Support Scheme for Farm Mechanization (FSSM)**	Farm machinery / equipment	50-60 % max 3.0 lakh / beneficiary
2	**One Time Assistance to Small and Marginal Farmers for purchase of Small Farm Implements (OTA – SFI)**	Small implements	50% or Rs. 10000/ beneficiary
3	**Credit Linked Subsidy Scheme for Rural Entrepreneurs to set up Custom Hiring Centres (CHC) of Farm Machinery**	Tractors, power tillers, sprayers. Harvesters, transplanter, pump sets etc.	40% or max. 100 lakh

Appendix I

Frequently Asked Questions (FAQs) regarding project financing

1. How many type of bank loans is there?

Ans- Two. Long term & Short term bank loans.

2. What is a long term loan?

Ans- More than 18 months project period is considered as long term.

3. How is the short term loan provided by the bank?

Ans- Scale of finance (per ha cost of production) has been fixed for each short term crop. Under KCC, banks provide short term loans which is for less than 18 months.

4. How long term loans are provided by the bank?

Ans- Banks provide long term loans on the merit of the project for a period of more than 2 years. Therefore, project submission is required under a long term loan. This is not required (project submission) under short term loan.

5. Under the long term, how working capital is provided?

Ans- Generally, one cycle of working capital is provided as a long term loan. Rest of the working capital is provided as a cash credit (CC) limit for which banks charge higher rate of interest (12-13 per cent). For long term loans, banks charge 8-9 percent interest.

6. Why do we calculate the economics of long term project financing?

Ans- To ascertain the economic viability of the project.

7. What are the economic viability terms used in long term projects?

Ans – Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR), Debt Service Coverage Ratio (DSCR).

8. Why do we use the Discounting Factor in calculation of project viability?

Ans- Inflation factor is taken into account for both the future costs and incomes parameters to calculate present day viability.

9. What is the minimum cutoff value of IRR?

Ans - 15 per cent

10. What is the significance of BCR value?

Ans- It should be more than 1. Means, benefits must be more than costs.

11. What is the average DSCR value for ideal projects?

Ans - Above 1.5

12. What is margin money?

Ans- Borrower's contribution is known as margin money, down payment or equity in banking language.

13. Whether income tax implications are there in Agricultural projects?

Ans- No. It is tax free. However, any processing activity, nursery activities are taxable.

14. What is the moratorium period on long term loans?

Ans- The project implementation or establishment period is known as moratorium period.

15. Whether interest is charged during the moratorium period?

Ans- Yes, interest is charged.

16. How do banks treat interest during moratorium periods?

Ans- Either borrower has to pay from his other sources, or it is capitalised with outstanding principal in the next year.

Appendix II

Checklist of Documents

1. Bank's loan application form / Customer Request Letter for Loan duly filled and signed
2. Passport size photographs of the beneficiary/promoter/partners/director
3. Identity proof – Voter ID card/PAN card/Aadhaar card/Driving license
4. Address Proof:
    - Residence: Voter ID card/Passport/Aadhaar card/Driving license/Electricity Bill/Latest property Tax Bill
    - Business Office/Registered Office: Electricity Bill/Latest Property Tax Receipt/Certificate of Incorporation in case of Companies/Certificate of Registration in case of partnership Firms
5. Proof of Registration:
    - In case of Company: Article of Association
    - In case of Partnership: Certificate of Registration of Firm with Registrar of Firm
    - In case of MSMEs: Certificate of Registration with District Industries Centre (DIC)/Udyog Aadhar Copy
6. Income Tax Return for last three years, If available.
7. Audited Balance Sheet of last 3 Years, If available.
8. GST Certificate, if applicable.
9. Land ownership records – title deed/lease deed. If applicable, then Permission to mortgage the Immovable Property from the Lessor in case the Property is Leasehold (for primary security)
10. ROC Search Report of the Company
11. KYC documents of the promoter/firm/company
12. Copy of Bank Statement for last one year (If available)
13. Repayment track record of existing loans (Loan Statement)
14. Net Worth Statements of promoter
15. Detailed Project Report
16. As applicable - Local authority permissions, Layout plans/estimates, Building sanction

Appendix III A

DPR ON OYSTER MUSHROOM PRODUCTION

1. INTRODUCTION

Oyster mushroom (*Pleurotus* sp.) belonging to Class Basidiomycetes and Family Agaricaceae is popularly known as 'dhingri' in India and grows naturally in the temperate and tropical forests on dead and decaying wooden logs or sometimes on dying trunks of deciduous or coniferous woods. It may also grow on decaying organic matter. The fruit bodies of this mushroom are distinctly shell or spatula shaped with different shades of white, cream, grey, yellow, pink or light brown depending upon the species.

It is one of the most suitable fungal organisms for producing protein rich food from various agro-wastes or forest wastes without composting.

2. OBJECTIVE

The main objective of the exercise is to present a small scale viable bankable model production unit using modern technology.

3. BACKGROUND

3.1 Origin

Cultivation of a sp. of oyster mushroom (*Pleurotus ostreatus*) was initiated on experimental basis in Germany by Flack during the year 1917 on tree stumps and wood logs. Growing technology was perfected in USA by Block, Tsao and Hau.

Cultivation of different varieties of oyster mushroom was initiated in India in the early sixties. Commercial cultivation began in mid-seventies.

3.2 Botanical Description

The oyster mushrooms have three distinct parts- a fleshy shell or spatula shaped cap (*pileus*), a short or long lateral or central stalk called *stipe* and long ridges and furrows underneath the pileus called gills or *lamellae*. The gills stretch from the edge of the cap down to the stalk and bear the spores. The spores are smooth, cylindrical and germinate very easily on any kind of mycological media within 48-96 hrs. The mycelium of *Pleurotus* is pure white in colour.

3.3 Production

Oyster mushrooms are the third largest cultivated mushroom. China, the world leader in Oyster production, contributes nearly 85% of the total world production of about a million tonnes. The other countries producing oyster mushrooms include Korea, Japan, Italy, Taiwan, Thailand and Philippines. The present production of this crop in India is only around 1500 tonnes due to low domestic demand. Another inhibiting factor is that export demand orders are large and can be met only if a linkage is developed between producer, cooperatives and exporters.

3.4 Economic Importance

The economic importance of the mushroom lies primarily in its use as food for human consumption. It is rich in Vitamin C and B complex and the protein content varies between 1.6 to 2.5 percent. It has most of the mineral salts required by the human body. The niacin content is about ten times higher than any other vegetables.

The folic acid present in oyster mushrooms helps to cure anemia. It is suitable for people with hyper-tension, obesity and diabetes due to its low sodium : potassium ratio, starch, fat and calorific value. Alkaline ash and high fibre content makes them suitable for consumption for those having hyperacidity and constipation. A polycyclic aromatic compound pleurotin has been isolated from *P. griseus* which possess antibiotic properties.

The spent straw can be re-cycled for growing oyster mushroom after supplementing with wheat or rice bran @ 10-15 % and also for preparing compost of white button mushroom after suitable supplementation with nitrogen rich horse or chicken manure (sun-dried before use). The spent straw can be used as cattle feed and also for bio-gas production, the slurry can be used as manure.

4. MARKET ANALYSIS AND STRATEGY

4.1 Demand and Supply Patterns

This mushroom is not as popular as white button mushroom in the domestic market. A few units are cultivating it commercially for export market. Cultivation of this mushroom on commercial basis would be more profitable as compared to white button mushroom as capital costs are low.

The cultivation of this variety of mushroom is very simple and economical in rural areas where raw materials and facilities required are easily available.

Marketing of fresh oyster mushroom does not pose any problem at present due to very low production. However, as production increases linkage of producers with domestic markets and export oriented processing units will need to be developed to ensure remunerative prices to the producers.

Generally, export orders are too big to be met by a single grower and as such co-operatives have to be encouraged to pool their produce for trading the crop in a dried powder form in international markets.

4.2 Import / Export Trends

About 11,797 tonnes of fresh mushrooms and 4,099 tonnes of preserved mushrooms were exported to foreign countries viz. U.S.A., France, Ireland, U.A.E., Russia etc. during the period 2001-2002. The quantity of oyster mushroom exported is much lower than that of button mushrooms which constitute the major share of exports.

4.3 Analysis and Future Strategy

Species of *Pleurotus* are cheapest and easiest to grow among all the cultivated edible mushrooms. Cultivation does not require complicated substrate preparation technique as in case of button mushroom. The former can be grown on non-fermented, almost fresh plant residues (agri-wastes containing lignin and cellulose). Substrate preparation does not require controlled environmental conditions as in case of button mushroom.

The crop has got a number of varieties varying in shape, colour, texture and aroma which can be cultivated throughout the year under varied agro-climatic conditions. Faster growth rate and early cropping is observed. About 5 to 6 crops can be taken in a year as the total cropping period is 60 days.

5. PRODUCTION TECHNOLOGY

5.1 Agro-climatic Requirements

Oyster mushroom can grow at moderate temperature ranging from 20 to 30^0 C and humidity 55-70% for a period of 6 to 8 months in a year. It can also be cultivated in summer months by providing the extra humidity required for its growth. In hilly areas above 900m. (m.s.l.), the best growing season is during March/April to September/October and in the lower regions from September/October to March/April.

5.2 Growing and Potential Belts

The major states in India producing this mushroom are Orissa, Karnataka, Maharashtra, Andhra Pradesh, Madhya Pradesh, West Bengal and most of the North Eastern hill states.

5.3 Varieties Cultivated

Among all the cultivated mushrooms *Pleurotus* has maximum number of commercially cultivated species suitable for round the year cultivation. All the varieties or species of oyster mushroom are edible except *P. olearius* and *P. nidiformis* which are poisonous. Species

commercially cultivated all over the world during summer months includes *P. flabelltus, P. sajor cajo, P. sapidus, P.membranaceous, P.citrinopileatus, P.eous etc. and those produced during winter are P.ostreatus, P.florida, P.cornucopiae, P.fossulatus, P.eryngii etc.*

5.4 Cultivation Technology

The procedure for oyster mushroom cultivation can be divided into following four steps:

(i) Preparation or procurement of spawn
(ii) Substrate preparation
(iii) Spawning of substrate
(iv) Crop management

5.4.1 Spawn Preparation

A pure culture of *Pleurotus* sp. is needed for inoculation on sterilized substrate. It takes 10-15 days for mycelial growth on cereal grains. It has been reported that jowar and bajra grains are superior over wheat grains.

5.4.2 Substrate Preparation

Oyster mushroom can be cultivated on a large number of agro-wastes having cellulose and lignin which helps in more enzyme production of cellulose that is correlated with more yield. These include straw of paddy, wheat and ragi, stalk and leaves of maize, millets and cotton, used citronella leaf, sugarcane bagasse, saw dust, jute and cotton waste, dehulled corncobs, pea nut shells, dried grasses, sunflower stalks, used tea leaf waste, discarded waste paper and synthetic compost of button mushrooms etc. It can also be cultivated by using industrial wastes like paper mill sludges, coffee by products, tobacco waste, apple pomace etc.

The popular methods of substrate preparation are:

Steam Pasteurization;
Hot Water Treatment;
Sterile Technique (Till method);
Fermentation or Composting; and
Chemical Sterilization.

5.4.3 Spawning of Substrate

Freshly prepared (20-30 days old) grain spawn is best for spawning. Old spawn (3-6 months) stored at room temperature (at 20-30^0 C) forms a very thick mat like structure due to mycelium aggregation and sometimes young pinheads and fruit bodies start developing in the spawn bottle itself. The spawning should be done in a pre-fumigated room (48 hrs. with 2% formaldehyde).

5.4.4 Crop Management

(A) Incubation

Spawned bags, trays or boxes are arranged in a dark cropping room on raised platforms or shelves for mycelium colonization of the substrate. Although mycelium can grow from 10 to 33^0 C, but the optimum temperature for spawn running lies between 22 to 26^0 C.

(B) Fruiting

When the mycelium has fully colonized the substrate, the fungus is ready for fruiting. Contaminated bags with moulds may be discarded while bags with patchy mycelial growth may be left for few more days to complete mycelial growth.

While various species require different temperature regimes all require high humidity (70-85%) during fruiting. Frequent spraying of water is required in the cropping room depending upon the atmospheric humidity. Fruit body produced under humid conditions (85-90%) is bigger with less dry matter while those developed at 65-70% relative humidity are small with high dry matter.

CO_2 concentration during cropping should be less than 600 ppm. or 0.6%. Sufficient ventilation has to be provided during fruiting.

5.5 Plant Protection Measures

5.5.1 The crop is suspect to attacks from flies (sciarid, cecid) spring tails and mites. Timely spraying with insect specific insecticides is needed.

5.5.2 The crop is prone to fungal diseases. Several competitor moulds e.g. *Aspergillus* sp., *Cladosporium* sp. and *Fusarium* sp., *Rhizopus* sp. have been reported to occur in the substrate used for cultivation. Spraying with Bavistin or Benomyl is a recommended control measure.

5.5.3 The crop is also subject to diseases like yellow blotch, brown spot and bacterial rot, control measures which are needed include:

Proper management of temperature and humidity during growing period.
Regular application of chlorinated water containing 100 – 150 ppm of freely available chlorine at an interval of 3 – 5 days
Application of oxytetracycline and streptocycline.

5.6 Harvesting and Yield

The right shape for picking can be judged by the shape and size of the fruit body. The fruit bodies should be harvested before spore release, by twisting so that the stubs are not left on the beds (straw). It is advisable to pick all the mushrooms at one time from a cube and the next flush will appear at one time.

More than 500 kg. of fresh mushrooms per ton of dry wheat or straw can be obtained in case of crop produced in 45-60 days.

6. POST HARVEST MANAGEMENT

6.1 Storage

(A) Short-term Storage

Fresh mushrooms are packed in perforated polythene bags which are directly sent to the local market situated nearby. Freshly harvested mushrooms can be stored at low temperature (0-5^0 C) for 1-2 weeks without loss in quality in case it is to be sent to the distant markets.

(B) Long-term Storage

Dried mushroom with 2-4% moisture, can be stored for 3-4 months in sealed pouches without any change in taste. The dried produce can be rehydrated in luke warm water (40-50^0 C) within 20-30 mins. giving 80-90% of original weight.

6.2 Packing and Transportation

Fresh mushrooms are packed in perforated polythene bags. Poly pouches containing crushed ice and overwrapped in paper are put in trays/baskets which are then covered with thin polythene sheet with sufficient perforation for proper aeration. The pre-packed pouches (250 or 500 g.) can be transported by roadways in trucks, buses depending upon the quantity to be transported.

6.3 Marketing

Domestic marketing does not pose a problem at present because only small quantities are being traded. As production develops, marketing promotion measures will need to be undertaken to bolster the demand.

Export potential exists and needs to be taken advantage of by organizing cooperatives of producers linked to commercial units for processing fresh mushroom into dehydrated powder for export.

7. SOURCES OF TECHNOLOGY

(i) National Centre for Mushroom, Chambaghat, Solan, Himachal Pradesh-173213, [Tel: (01792) 30451,30767]

(ii) Plant Pathology Division, Dr. Yashwant Singh Parmar, University of Horticulture & Forestry, Solan, Nauni – 173230, Himachal Pradesh, [Tel: (01792) 225 2315, 225 2344]

8. ECONOMICS OF A SMALL SCALE MODEL

8.1 High quality commercial cultivation of the crop even on a small scale is a viable proposition as it is in good demand both in domestic and foreign markets. The economics of a small unit with annual production of 400 kg is brought out below:

8.2 Costs & Returns

The cost components of such a model along with the basis for costing are exhibited in ***Annexures I***. A summary is given in the figure below. Inclusive of 5% contingencies, the project cost works out to around Rs.50 thousand.

(Rs. In thousands)

Project Cost	**Amount**
Land & Site Development	21.47
Building	15.00
Plant & Machinery	11.90
Contingency	1.42
Total	**49.79**

8.3 The major components of the model are:

Land Acquisition & Development: (Rs. 21.47 thousand)**:** On an average the cost of land can be put at Rs. 20 thousand in rural areas/forest areas in States like Uttaranchal, NE Hilly States etc.

Building (Rs. 15.00 thousand): This is the cost of high density polythene sheet growing room of 300 sq.ft.

Plant & Machinery (Rs. 11.90 thousand per annum): This is the cost of setting up a sprayer room acquiring galvanised tubs, iron racks and thermometers.

8.4 **Recurring Production Cost (**Rs. 6.83 thousand): Recurring production costs are brought out in ***Annexure II***. The main components are raw material like wheat straw or rice bran, chemicals, cost of power & water and packaging material etc. Labour costs have been computed at Rs. 80 per man-day. These can, however, vary from location to location depending upon prevailing wage level or minimum statutory wages fixed. Recurring costs work out to Rs. 6.83 thousand per annum.

8.5 Returns from the Project:

The yield from this unit would be 400 kgs. per annum. Valued at Rs. 40 per kg. the gross return would be Rs. 16000 per annum. ***Annexure III*** gives profitability calculations.

8.6 Project Financing:

Balance Sheet: The projected balance sheet of the model is given at ***Annexure IV***. There would be three sources of financing the project as below:

Source	**Rs.Thousand**
Farmer's share	24.9
Capital subsidy	10.0
Termloan	14.9
Total	**49.8**

8.7 Profit & Loss Account: Annexure V presents the cash flow statement and ***Annexure VI*** projects the profit and loss account. Gross profit works out to Rs. 9.2 thousand per annum.

8.8 Repayment of Term Loan: The term loan will be repaid in 11 equated 6 monthly installments of Rs.1.36 thousand with a moratorium of 12 months. ***(vide Annexure VII)***. The rate of interest would have to be negotiated with the financing bank. It has been put at 12% in the model. The repayment schedule is given in ***Annexure VII-A***.

8.9 Depreciation calculations are given in ***Annexure VIII***.

8.10 IRR/BCR: The viability of the project is assessed in ***Annexure IX*** over a period of 10 years. The IRR works out to 17.14 and the BCR to 1.1.

8.11 The Debt Service coverage ratio calculations are presented in ***Annexure X***. The average DSCR works out to 2.42.

8.12 Payback Period: On the basis of costs and returns of the model as assessed above, the pay back period is estimated at 6.36 years ***(vide Annexure XI)***.

8.13 Break-even Point: The breakeven point will be reached in the 3rd year. At this point fixed cost would work out to 58.1% of gross sales - ***vide Annexure XII***.

Annexure-I

ESTIMATED PROJECT COST

(Rs. in thousand)

Sr. No.	Particulars	Scale	Unit Cost (Rs.)	Total	
				Qty	Cost
1	**LAND & SITE DEVELOPMENT**				
	LAND	ACRE	20000	1.00	20.00
	Cost of Development				
	Land Development				
	Levelling & Dressing	Mandays	70	21 .0	1.47
			Sub Total		**21.47**
2	**BUILDING**				
	High Density Polythene Sheet Growing Room	Sq. Ft.	50	300	15.00
			Sub Total		**15.00**
3	**PLANT & MACHINERY**				
	Sprayer Room	Nos.	1500	1	1.50
	Galvanised Tubs	Nos.	250	4	1.00
	Iron Racks	Nos.	1000	9	9.00
	Thermometers	LS	400	1	0.40
			Sub Total		**11.90**
				TOTAL	**48.37**

CONTINGENCIES

Particulars	Total	%	Firm	Non Firm	Total	Total Cost
Land	20.00	0	20.00	0.00	0.00	20.00
Development / Building	16.47	5		16.47	0.82	17.29
Plant & Machinery	11.90	5		11.90	0.60	12.50
Horticulture	0.00	5		0.00	0.00	0.00
				Sub Total	**1.42**	**49.79**
				Total		**49.79**

Aannexure-II

RECURRING PRODUCTION COST

(Rs. in thousand)

PARTICULARS	Scale	Rate in RS.	Recurring Expenses					
			Year I		Year II		Year III	
			Units in Nos. / Kg.	Amt.	Units in Nos. / Kg.	Amt.	Units in Nos. / Kg.	Amt.
A. RAW MATERIAL								
Wheat Straw	Qtl.	150.0	5	0.75	5	0.75	5	0.75
Wheat of Rice Bran for Supplementation	Kg.	2.5	50	0.13	50	0.13	50	0.13
Polythene Bags (125-150 Gauze thick)	Kg.	80.0	15	1.20	15	1.20	15	1.20
Spawn Bottles	Nos.	0.0	100	0.80	100	0.80	100	0.80
				2.88		2.88		2.88
B. CHEMICALS								
Bavistin	Kgs.	500	0.20	0.10	0.20	0.10	0.20	0.10
Formaldehyde	Litre	30	3.50	0.11	3.50	0.11	3.50	0.11
				0.21		0.21		0.21
C. LABOUR COST								
Spawning	Man days	80	6	0.48	6	0.48	6	0.48
Cropping	Man days	80	34	2.72	34	2.72	34	2.72
				3.20		3.20		3.20
D. OTHER COST								
Water/Electricity/Bag for packing	Ls	300.00	1	0.30	1	0.30	1	0.30
				0.30		0.30		0.30

Annexure-II (Contd…)

E. CONTINGENCY & UNFORSEEN EXPENSES								
General Expenses	Lump sum	250.00	1	0.25		0.25		0.25
				0.25		0.25		0.25
Grand Total				**6.83**		**6.83**		**6.83**
Revenue								
Oyster Mushroom								
Yield (Kg.)	70% BE			400.00		400.00		400.00
Sales	Rs/Kg.	40.00		16.00		16.00		16.00
Grand Total				**16.00**		**16.00**		**16.00**

Annexure-III

COST OF PRODUCTION & PROFITABILITY

(Rs. in thousand)

Particulars	**Year-I**	**Year-II**	**Year-III**
Income	**16.00**	**16.00**	**16.00**
Sales	**16.00**	**16.00**	**16.00**
Cost	**6.80**	**6.80**	**6.80**
Fixed	**6.80**	**6.80**	**6.80**
Raw Material	2.90	2.90	2.90
Chemicals	0.20	0.20	0.20
Direct Labour cost	3.20	3.20	3.20
Other cost	0.30	0.30	0.30
General expenses	0.30	0.30	0.30
Gross profit	**9.20**	**9.20**	**9.20**
Depreciation	1.20	1.20	1.20
Interest -term loan	1.80	1.50	1.20
Profit before tax	**6.10**	**6.40**	**6.70**
Taxes	-	-	-
Profit After Taxes	**6.10**	**6.40**	**6.70**
Retained Profit	**6.10**	**6.40**	**6.70**
Net cash Accrual	**7.40**	**7.60**	**7.90**

Annexure-IV

PROJECTED BALANCE SHEET

(Rs. in thousands)

Particulars	**Year 0**	**Year I**	**Year II**	**Year III**
LIABILITIES				
Farmer's Share	24.90	24.90	24.90	24.90
Capital Subsidy	10.00	10.00	10.00	10.00
Reserves & Surpluses	-	6.10	12.50	19.20
Term Loan	14.90	14.90	12.20	9.50
Total	**49.80**	**55.90**	**59.60**	**63.60**
ASSETS				
Fixed Assets	49.80	49.80	48.60	47.30
Less Depreciation	-	1.20	1.20	1.20
Net Block	49.80	48.60	47.30	46.10
Cash & Bank Balance	-	7.40	12.30	17.50
Total	**49.80**	**55.90**	**59.60**	**63.60**

Annexure-V

CASH FLOW STATEMENT

(Rs. in thousand)

PARTICULARS	**Year 0**	**Year I**	**Year II**	**Year III**
SOURCES OF FUNDS				
Increase in Farmer's Share	24.89	-	-	-
Net Profit	-	6.14	6.38	6.71
Increase in Subsidy	9.96	-	-	-
Depreciation	-	1.24	1.24	1.24
Preliminary Exp. W/O	-	-	-	-
Increase in Term Loan	14.94	-	-	-
Total	**49.79**	**7.38**	**7.62**	**7.95**
DEPLOYMENT				
Increase in Fixed Assets	49.79	-	-	-
Decrease in Term Loan	-	-	2.72	2.72
Total	**49.79**	**-**	**2.73**	**2.73**
Opening Balance	-	-	7.38	12.26
Surplus/Deficit	-	7.38	4.90	5.22
Closing Balance	**-**	**7.38**	**12.26**	**17.49**

Annexure-VI

PROJECTED PROFIT AND LOSS ACCOUNT

(Rs. in thousands)

Particulars	**Year I**	**Year II**	**Year III**
Sales Realisation	16.00	16.00	16.00
Total Costs	**6.80**	**6.80**	**6.80**
Gross Profit	**9.20**	**9.20**	**9.20**
Depreciation	1.20	1.20	1.20
Interest on Term Loan	1.80	1.50	1.20
Profit before Tax	6.10	6.40	6.70
Taxes	-	-	-
Profit after Tax	6.10	6.40	6.70
Dividend	-	-	-
Retained Profit	6.10	6.40	6.70
Net Cash Accruals	7.40	7.60	7.90
PROFIT & LOSS ACCOUNT			
Opening Balance	0.00	6.10	12.50
Closing Balance	6.10	12.50	19.20

Annexure-VII

REPAYMENT OF TERM LOAN

Term Loan - Rs.14.94 thousand
Moratorium - 12 Months
Repayment - 5 Years
Gestation Period - 6 Months
Installment Amount - Rs.1.36 thousand
Installment Nos. - 11
Interest Rate - 12%

(Rs. In thousand)

Year	Principal Amount	Instalment	Outstanding	Interest	
				Half	Yearly
Year 0	14.94	0.00	14.94	0.90	0.90
1		0.00			
2					
Year 1	14.94	0.00	14.94		1.79
1		1.30			
2			13.58	0.81	1.55
Year 2	13.58	1.36	12.22	0.73	
1	12.22	1.36	10.86	0.65	1.22
2					
Year 3	10.86	1.36	9.51	0.57	0.90
1	9.51	1.36	8.15	0.49	
2					
Year 4	8.15	1.36	6.79	0.41	0.57
1	6.79	1.36	5.43	0.33	
2					
Year 5	5.43	1.36	4.07	0.24	0.24
1	4.07	1.36	2.72	0.16	
2					
Year 6	2.72	1.36	1.36	0.08	0.00
1	1.36	1.36	0.00	0.00	0.00
2					
Year 7	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	
2					
		14.94			

Annexure-VII **(A)**

REPAYMENT SCHEDULE

(Rs. in thousand)

Particulars	**Year 1**	**Year 2**	**Year 3**
Net Accruals	**9.17**	**9.17**	**9.17**
Interest Added Back			
Loan- Balance at Year End	13.58	10.86	8.15
Bank Loan	14.94	12.22	9.51
Repayment (6years, half yearly)	**3.15**	**4.26**	**3.94**
Principal	**1.36**	**2.72**	**2.72**
Bank Loan	0.00	2.72	2.72
Interest	**1.79**	**1.55**	**1.22**
Bank Loan	1.79	1.55	1.22
Net Surplus	**6.02**	**4.91**	**5.23**

Annexure-VIII

DEPRECIATION

(Rs. in thousand)

Particulars	**Value**	**Total**	**Depreciation**	
			(%)	**Amount**
Buildings	17.29	17.29	3.34	0.58
Plant & Machinery	12.50	12.50	5.58	0.66
Total	**29.79**	**29.79**		**1.24**

Annexure-IX

DISCOUNTED CASHFLOW STATEMENT

(Rs. in thousand)

Particulars	**Yr I**	**Yr II**	**Yr III**	**Yr IV**	**Yr V**	**Yr VI**	**Yr VII**	**Yr VIII**	**Yr IX**	**Yr X**	**Total**
Capital Cost	49.80										
Gross Revenue	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	
Prod & Other Costs	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.83	
Salvage Value											
Gross Surplus	-40.60	9.20	9.20	9.20	9.20	9.17	9.20	9.17	9.17	9.20	
DF @ 15%	0.870	0.756	0.658	0.572	0.497	0.432	0.376	0.327	0.284	0.247	
PW @ 15%	-35.30	6.90	6.00	5.20	4.60	4.00	3.40	3.00	2.60	2.30	2.73
DF @ 30%	0.769	0.592	0.455	0.350	0.269	0.234	0.204	0.177	0.154	0.134	
PW @ 30%	-31.20	5.40	4.20	3.20	2.50	2.10	1.90	1.60	1.40	1.20	-7.69
IRR		17.14									
DF @ 11%	0.901	0.812	0.731	0.659	0.593	0.535	0.482	0.434	0.391	0.352	
PW of Operational Cash flow	8.30	7.40	6.70	6.00	5.40	4.90	4.40	4.00	3.60	3.20	54.00
NPV of Operational Cash flow	**54.00**										
Initial Investment	**49.80**										
Benefit Cost Ratio	**1.10**										

Annexure-X

DEBT SERVICE COVERAGE RATIO

(Rs. in thousand)

Particulars	**Year I**	**Year II**	**Year III**
Net Profit after tax	6.10	6.40	6.70
Depreciation	1.20	1.20	1.20
Preliminary Exp. W/O Added Back	0.00	0.00	0.00
Interest	1.80	1.50	1.20
Total	**9.20**	**9.20**	**9.20**
Term Loan Interest	1.80	1.50	1.20
Term Loan Repayment	1.40	2.70	2.70
Total	**3.20**	**4.30**	**3.90**
DSCR	**2.90**	**2.20**	**2.30**
AVERAGE DSCR	**2.42**		

Annexure-XI

PAY BACK PERIOD

(Rs. in thousand)

Particulars	**Year I**	**Year II**	**Year III**
Capital Investment	49.80		
Net Cash Accruals	7.40	7.60	7.90
Cumulative Income	7.40	15.00	22.90

Payback Period - 6.36 Years

Annexure-XII

BREAK EVEN ANALYSIS

(Rs. in thousands)

Particulars	**Year III (At Optimum Level)**
Gross Sales	16.00
Fixed Cost (incl. Dep. & Int.)	9.30
Variable Cost	0.00
Contribution	16.00
Break Even Point (%)	58.10
Cash BEP (%)	58.10

Appendix III B

INTEGRATED PROJECT ON PRODUCTION AND PROCESSING OF BUTTON MUSHROOM

Introduction

Mushrooms are fruiting bodies of some members of a lower group of plants, known as fungi. The fungi are characterised by the absence of chlorophyll (pigment responsible for green colour of plants) and undifferentiated bodies, except the spore bearing structures. The fruiting bodies, mushrooms, are fleshy spore bearing structures of the fungi. They contain numerous spores, which are functionally similar to seeds of higher plants, and are created for prorogation of fungi.

The economic importance of mushroom lies primarily in their use as food for human consumption. The exotic flavour and taste and fleshiness of mushroom have made it an important delicacy in human diet. Nutritionally, it is rich in proteins, vitamins (B, C and D) and minerals. Cholesterol and sodium content of mushroom is low. It is also known to have medicinal values and certain varieties of mushrooms can inhibit growth of cancerous tumour. The productivity of mushroom is higher than any crop. Food, nutritional and medicinal values apart, mushroom growing can be efficient means of waste disposal (agricultural, industrial and family wastes), since it can use then wastes as medium of growth. Hence, it could be considered as eco-friendly.

Further, mushroom growing is highly labour intensive and requirement of land is comparatively low.

Types of Mushrooms

Of the various types of mushrooms presently cultivated in the world, eight are important. These are: button, oyster, straw, shitake, woody ear, winter, silver ear and nameko. These account for 99 per cent of the total world production of mushrooms.

In India only three types, namely, button, oyster and straw mushrooms are commercially cultivated.

The present model is on button mushroom (*Agaricus bisporus*), which accounts for 90 percent of India's production of mushrooms. About 38 percent of the total world production of mushrooms is button mushroom.

Objectives

The primary objective of this model is to serve as an introduction on the techno-economic aspects of preparation/approval of bankable projects on button mushroom. The model will also be helpful to the banks in considering projects for production of canned mushroom for exports.

Climate Requirements

Though cultivation of button mushroom is carried on as an indoor activity and it is grown on a carefully prepared medium, which is considered as synthetic, prevalence of a conducive climate may lead to higher productivity, lesser production cost and better quality. The optimum temperature for the growth of button mushroom varies from 15^0C to 25^0C depending on states of growth. Similarly, the optimum RH varies from 85 to 95%.

Selection of Location

In view of the button mushroom's susceptibility to climate conditions, hilly areas such as Nilgiris in the South and Shimla in the North were favoured as suitable sites for commercial ventures on button mushrooms. However, experience over the years has shown that location for projects on agricultural commodities, including mushrooms, for export purposes is guided by three basic factors: -

Cost of production,

Cost of transportation and

Quality of product.

Therefore, many large scale export oriented units are now coming up in places near Madras, Hyderabad, Delhi, Chandigarh and Pune where abundant quantities of raw materials (agricultural wastes), water and labour are available and infrastructures such as road, electricity and communication are well developed. Both production and investment costs could be cheaper and reasonably good quality mushrooms could be produced under climate controlled houses. Even the investment cost could be cheaper in these locations because of the lower cost on civil works.

Beneficiaries

The beneficiaries could be individual entrepreneur / partnership firms / Companies / Cooperatives. Technical / marketing tie-up with foreign firms / Indian Research Institutes / export houses could be considered as additional advantages.

At present, in India most of the export oriented units on button mushrooms are being set up by large corporate houses under tie-up arrangement for technology and marketing with foreign companies. However, some successful units have also been set up importing culture of button mushroom and processing machinery and also engaging foreign consultant, but without tie-up with foreign companies.

Unit size

The size of the units that are being set up in India have production capacities ranging from 250 to 3500 tonnes of fresh button mushrooms per year. The model has been prepared for an installed capacity of 360 tonnes of fresh button mushroom production per year. Assuming 90% utilisation of the capacity, 324 tonnes of fresh button mushroom may be produced of which 88% may be processed to produce about 200 tonnes of canned mushroom.

Technology

An account of mushroom production and processing technologies has been given in Annexure VIII(A).

Requirements of a project on mushroom for export.

The major components of a high-tech mushroom project include the following.

Land

Land is required for the construction of mushroom houses, composting unit, spawn laboratory, cannery, office, parking space etc.

In the present model, which does not include spawn laboratory, the requirement of about one-acre land has been estimated. It has been assumed to be a developed land. Therefore, no land development work other than internal road and boundary wall has been proposed.

Mushroom House

For the production of 360 tonnes of fresh button mushroom, the estimated requirement of built-up area is 2000 M^2 including corridors (Annexure-XVIII(B).

Each room (24 m x 8 m) may have two rows of shelves (size 20 m x 1.8 m) and distance between two shelves 60 cm numbering six in each row i.e. a growing area of 432 M^2 in each room and the capacity to hold about 44.5 tonnes of compost. There could be altogether 9 such rooms. Brick mortar construction plastered with cement and RCC roof have been envisaged in the model.

The construction quality should facilitate environmental control. Rooms should be airtight and insulated. Each room should have its own air handling unit so as to maintain the different growing conditions.

Composing Unit

The compost making unit may comprise the following components:

Stacking shed for wetting of raw materials.

Stacking platform for mixing up the various raw materials of compost and undertaking Phase I of the composting.

Straw storage shed for storing of 700 tonnes wheat straw for 9 months.

Bulk pasteurisation tunnel, 64 tonnes capacity, for controlled fermentation of compost in Phase II under fully environment controlled condition. The insulated tunnel should have facilities for steam inlet and air circulation.

Watering recycling or goody pits for re-use of drained water from wetting of straw.

Dispatch platform for pasteurized compost.

The estimated space requirements for each component has been shown in Annexure XVIII(B).

Cannery

The mushroom cannery may consist of pre-canning cold storage (20m2), for storage of 5 days' production i.e. about 5 tonnes fresh mushroom at 4-5^{0}C, canning area (60 M^2) for processed

product of 200 tonnes and post-canning storage (88 M^2) for 30 days' production of 20 tonnes canned mushroom.

Water Supply System

The estimated water requirement is about 10,000 kilo litres for composting, growing of mushroom, canning, drinking etc. Since an assured water supply is essential, a bore well, pump house and overhead tank have been considered in the model.

Power Supply

Assured uninterrupted power supply is essential for hi-tech button mushroom project. The estimated requirement is 180-190 KW (Annexure XVIII(C)). A transformer of 500 KVA and a standby generator of 320 KVA have been included.

Miscellaneous Facilities

The various other facilities to be built up in such project include casing tunnel, boiler room, store room, office, pre-entrance shower (Annexure XVIII(B)).

Plant and Machinery

A hi-tech mushroom project requires air conditioning equipment such as water chilling plant, air handling equipment, cooling coils, air filter, blower, environment sensors (for temperature and CO_2 level) and steam supply system. It would also require cold storage equipment and complete canning line. The list of such machineries with their estimated requirements and cost has been showing in Anneuxre XVIII(D). Environmental sensors may be imported. The rest of the equipment are available in India.

Office Equipment

Fax machine, telephone etc., have been proposed to facilitate deals with buyers.

Raw Materials

Raw materials for the unit include wheat straw, chicken manure, gypsum, spawn, packing materials etc. (Annexure XVIII(E)). Most of these materials are easily available. Spawn can be procured from the laboratories of ICAR / State Agricultural Universities. Import of spawn

of high yielding strains may also be possible. A 10 OTS cans are in short supply in India, but can be imported.

Skilled Manpower

Mushroom growing is a highly skilled activity. A number of units are already operating in India. Therefore, experienced workers could be available. Training can be given at the National Centre for Mushroom Research and Training (NCMRT), Solan or abroad. A provision for training abroad has been kept in the model.

Source of Technology

NCMRT has standardized the growing of button mushroom under controlled condition. They provide consultancy for setting up of project. Foreign technicians can also be hired for the project.

There are manufacturers in India for canning line suitable for mushroom who may set up the same on turnkey basis.

Estimated Cost

The estimated cost of the model project is indicated below: -

		Rs. lakh
A.	Capital Cost (Annexure XVIII(F))	213.32
B.	Recurring Cost (Annexure XVIII(G))	
	Year 1	Nil
	Year 2	58.06
	Year 3	73.75
	Year 4	71.71

The capital cost includes 25% of the working capital requirement (Annexure XVIII(H)).

However, it may be noted that the estimated costs are subject to actual drawing and rate analysis by a competent architect for all civil structures and quotations from accredited dealers for all requirements, plant and machinery etc.

Project Yield

In this model an average yield of about 18.5 Kg per M^2 has been projected. In terms of compost conversion, it is 18% since compost may be applied at the rate of about 103 kg per M^2. Thus the model has an installed capacity of 360 tonnes of fresh mushroom. Assuming 90% capacity utilisation from the third year onward, gross yield is 324 tonnes. If 88-89% of the fresh mushroom is processed, 200 tonnes of canned mushroom may be expected since about 30% of the fresh mushroom is wasted during canning (Anneuxre XVIII(I)).

Sale Price

Sale price of mushroom depends on quality, importer countries, size of can etc.

In the present model, sale price of Rs.40 per kg fresh mushroom in the domestic market and Rs.65/kg, F.O.B., for canned mushroom in the foreign market has been assumed.

This amounts to US $ 23.7 per case (six A 10 cans make 1 case. Each A 10 can has a weight of 3.1 kg and contains 1.92 kg net drained weight of mushroom).

Projected Benefit

The projected benefit, based on the assumptions indicated in the two proceeding paras, is given below: (for details see Annexure XVIII(I)).

	Domestic Sales	**Export**
Year 1	Nil	Nil
Year 2	10.00 lakh	102.70 lakh
Year 3	15.60 lakh	130.00 lakh

Marketing Strategy

Canned Mushroom

The entrepreneurs of large size units usually enter into buyback arrangement with their foreign collaborators. This usually includes import of costly equipment, plant and machinery and payment for know-how and foreign technicians. If legally enforceable performance and buyback guarantees are available, the arrangement may prove to be beneficial. In the present

model it has been assumed that the entrepreneurs will develop their overseas markets by visits, publicity, distribution of free samples etc.

Fresh Mushroom

As regards sale of fresh mushrooms in the domestic market, the entrepreneurs may have tie-up with star hotels, defence units, and also may venture into popularising mushroom in the neighbourhood of the production centre.

Financial Analysis (Annexure XVIII(J))

Results of financial analysis are as under:

IRR	31%
DSCR	1.7
BEP (Capacity)	64%
BEP (Cash)	46%

Sensitivity Analysis	IRR
(i) with 25% reduction in yield (14 kg/M^2)	16%
(ii) with 30% reduction in yield (13 kg/M^2)	12%

Financial Assistance

NABARD accords top priority to this activity for providing refinance support. Banks may, therefore, avail themselves of the facility to provide term loans to location specific projects subject to their technical feasibility, financial viability, and bankability.

Margin Money

The entrepreneurs should normally meet 25% of the project cost out of their own resources. However, NABARD may consider margin money assistance in suitable cases as per guidelines contained in circular No.D0D.67/92-93(Ref.3708/NFS-85/92-93 dated 27 February 1993).

Repayment

In the present model, the interest and principal is repayable in 8 years with moratorium for the first year (Annexure XVIII(K)).

The banks may prescribe the repayment schedule based on the cash flow in individual projects.

PRODUCTION TECHNOLOGY [ANNEXURE - XVIII(A)]

There are about ten broad aspects of mushroom production technology. These are: -

- Spawn production / procurement,
- Compost preparation,
- Spawning and spawn running,
- Casing,
- Frutification,
- Environment control,
- Pests and disease control,
- Harvesting, grading and storage,
- Mechanisation and
- Computer control.

Spawn production / procurement

The fungal bodies (mycelia) along with the medium of growth (cereal grains), which are used as planting material / seed for the production of mushrooms, are known as spawn. Spawn production is a highly specialized activity. It is produced from fruiting culture / stocks of selected strains (races or varieties of mushrooms) under sterile conditions. The strains vary in yield, flavour, texture, fruiting time etc. The strains which are being cultivated in India include S-11, TM-79 and recent strain, Horst U3.

Stock culture can be obtained from a reliable source or produced in the laboratory by single spore culture / multiple spore culture / tissue culture technique. Spawn can also be procured from the laboratories of the State Agricultural Universities / ICAR (Annexure-L). However, many export oriented units import fruiting culture, which reportedly give higher yield than

India strains, and produce the spawn in their own laboratory. A few units even import spawn directly from foreign sources.

A good spawn should have potential for high yield and good quality (flavour, texture, size). It should be free from contamination and have good survival in storage.

Compost preparation

Mushroom need nutrients such as carbon compounds, nitrogen source, minerals, trace elements, vitamins and water. Button mushroom draws its sustenance for growth, development and fruiting from compost which meets its nutritional requirement. In other words, compost is the substrate (medium) on which button mushroom grows. It is prepared from a mixture of plant wastes (cereal straw / sugarcane bagasse etc.), salts (urea, super phosphate / gypsum etc.), supplements (rice bran / wheat bran etc.) and of course water.

According to a suggestion, each ton of compost should contain 6.6 kg nitrogen, 2.0 kg phosphate and 5.0 kg potassium, which gives and N:P:K ratio of 33:10:25 and converts to 1.98% N, 062%P and 15%K on a dry weight basis. This ratio can be used as a guide while selecting the composition of the mixture for compost. The carbon: nitrogen ratio of 25-30:1 at the time of staking and 16-17:1 in the final compost may be considered as a good substrate. It has been estimated that to produce one kg of mushrooms, 220 g of dry substrate material are required.

The compost, technically a complex Ligno-cellulosic material, is the product of microbe mediated fermentation process, known as composting. For achieving high productivity of button mushroom. the compost needs to be pasteurized so as to kill undesirable microbes and competitors of button mushroom and to convert ammonia into microbial protein.

The compost for button mushroom should finally be free from ammonia, insects and nematodes, contain 70% moisture, should have dark brown colour, sweet un-obnoxious small, a pH of about 7.5 and granular structure.

Spawning and spawn running

The pasteurized compost is taken either in polythene bags or shelves (made of steel or RC) or trays. Polythene bags (90 cm x 60 cm, 150 gauge thick) which contain about 25 kg compost

per bag can be placed on shelves. Trays are expensive. Beds can also be directly prepared on shelves by applying compost about 100-105 kg / M^2 pressed to about 20 cm thickness.

Spawning is the planting (inoculation) of the spawn into the compost. The spawn is mixed through the whole mass of compost at the rate of 7.5 ml / kg compost or 500 to 750 g/100 kg compost (0.5 to 0.75%). Thereafter, the fungal bodies grow out from the spawn and take about two weeks to permeate (colonise) the entire mass of compost-the process is known as spawn running.

Casing

On completion of the spawn run, the compost is uniformly covered with an unpacked shallow layer, 3-4 cm thickness of casing soil. The process is called casing. It is necessary to induce the initiation of fruiting primordia, to support growth and development of fruiting bodies (mushroom), to provide it anchorage, to promote growth of desirable mycellia, to prevent drying up of top layer of the compost and to regulate water exchange.

The desirable characteristics of the casing material include neutral to alkaline reaction (pH 7.0 to 7.5) high water holding capacity, stable and crumbly structure, absence of heavy and toxic metals and deficiency of nutrients. Peat moss mixed with ground limestone is preferred casing material. However, it is not available in India. A mixture of FYM and loam soil could be used. It needs to be sterilised before use.

Frutification

The promotion of Frutification i.e., the formation of fruiting bodies, which ensures high yield of mushroom, is the ultimate goal of mushroom cultivation.

For a week after casing, the growth of fungal bodies is continued. Thereafter, by manipulation of the environment the initiation of fruiting is encouraged.

Fruiting of button mushrooms occurs as flush at weekly intervals. The first pick or flush takes about three weeks to appear after casing. Watering of beds at the rate of 1 litre per kg of mushroom picked is done. The first three flushes account for about 75% of the total yield. Picking may be continued upto fourth flushes, thereafter it may not be economic.

Environment Control

In modern mushroom growing, environment control has assumed a great deal of importance. It is essential to achieve high productivity and quality. At almost every state of mushroom growing, spawn production, compost making, spawn running, fruiting, cropping, storage of mushrooms, the environment control could lead to better results. The factors which are needed to be controlled are temperature, humidity, aeration, CO_2 concentration, pH, and light. Their specific requirement varies according to the stages.

Pest and disease control

Button mushroom is vulnerable to many pests and disease. Ideally, their incidence should be prevented by appropriate hygienic measures, which include sanitation, disinfection, use of good quality spawn and pasteurized compost, maintenance of optimum environment, filtration of air (which does not permit entry of anything above 2-micron size into growing houses), scientific growing, proper disposal of spent compost, segregation of infected materials etc. Fumigation of growing rooms with methyl bromide with proper precaution (toxic to human beings) could be practiced. Formalin may be used for disinfection of shelves, rooms, equipment etc. Spraying pesticides and fungicides may be undertaken as a last resort.

Harvesting, grading and storage

Button mushroom may be harvested holding the cap between thumb and forefingers and upward twisting movement from left to right.

The stage of harvesting of button mushroom is influenced by the grades used in marketing, which mainly buttons., caps and opens.

Button mushrooms are highly perishable. They can be stored for 3-4 days at 4-5^{0}C in polyethylene bags.

Mechanisation

The large sized mushroom growing units, especially in the West, are highly mechanised. Compost turner, compost filling line, conveyer, spawn application machine, ruffler, tunnel filling machine, environment control, fumigation, disinfection, picking line and grading are all mechanised activities.

Computer control

Computers for control of environmental factors are also being imported by some units in India. For maximising mushroom growth, optimum levels of temperature and CO_2 are determined by the computers. The environment sensors send the signals to the computers to activate the concerned equipment so that the optimum levels are established.

Yield

The yield of button mushroom depends on the following factors:

- strain
- spawn
- compost
- environment in the growing house
- casing material and
- crop management practices

The mushroom yield is expressed either in terms of kg per square meter or as kg mushroom per 100 kg of compost at filling. It can also be expressed as kg mushroom per 100 kg of dry organic matter of substrate.

Under sub-optimal management conditions, yield could be 8-10 kg per 100 kg compost or per M^2 (assuming 100 kg compost per M^2).

Irish farms are reportedly harvesting yield of 30-40 kg per M^2. However, in the developed countries, yield of 23-26 kg per M^2 is common. A few large farms in India have harvested yield of 16-18 kg per M^2.

Processing Technology

High moisture content (90%) and absence of protective cover render mushroom perishable. Deterioration (loss or moisture, respiration, oxidation, browning etc.) under normal conditions start almost immediately after harvest. Therefore, processing of mushrooms is essential for export. There are mainly four methods of processing buttoning mushrooms - drying, freeze drying and canning.

Dehydration at 67-70^{0}C is very slow and retains about 12% moisture. The cost is low, but the quality of end product is not high. The product may have a shelf life of 2-3 months. Freezing at - 25^{0}C can give the product a shelf life of 2-3 months.

Freeze drying is relatively a recent innovation and the most capital and energy intensive technology. The button mushrooms after cleaning and washing are frozen at -20^{0}C and the dehydrated through sublimation – solid ice is directly changed to steam without passing through the liquid state - by slowly heating under very low vacuum for about 15 hours. The product still retains 7-8% moisture. Further, reduction in moisture develops rancidity. The quality of the product is very high, as good as fresh button mushrooms. The volume almost remains the same, but density is ten times lower than the fresh. The product is utilised by fast food chains as supplement to various products. Being very expensive the market is limited. One well-known industrial group has established a successful freeze drying unit with imported machineries (Rs.8.9 crores).

However, about 90% of the world trade is in the form of canned mushroom. The Canning process is given in Annexure XVII(M).

A few large size units, 2500 TPA canned mushrooms, have been set up in India for export of canned mushrooms. The cost of imported canning line (2.5 tonnes / hr.) in one unit is Rs.90 lakhs. However, canning lines are also being manufactured in India. The canned products are of four types. Whole (the diameter of closed caps is less than length of stems), buttons (stem cut below the level of veil), sliced (cut longitudinally) and pieces and stems (with at least 50% caps).

CIVIL WORKS [ANNEXURE XVIII(B)]

	Particulars	Length (M)	Width (M)	Height (M)	Area (M^2)	Rate (M^2)	Per Estimated cost (Rs. lakhs)
1	Mushroom house	24	8	5	1,728	2,000	34.56
2	Working corridors in Mushroom house	-	-	-	272	1,500	4.08

3	Growing racks (concrete)	-	-	-	3,888	400	15.55
4	Cannery	20	10	3.5	200	2,000	4.00
5	Pasteur tunnels	20	4	3	80	3,500	2.80
6	Stacking shed	53	8	-	424	1,000	4.24
7	Stacking platform	26	12	-	312	500	1.56
8	Straw storage shed	20	15	-	300	1,000	3.00
9	Water recycling pits (Goody)	8	2.5	1.5	20	700	0.14
10	Dispatch platform	10	8	-	80	2,000	1.60
11	Casing soil tunnel	3	1.5	3	4.5	3,500	0.16
12	Boiler and generator room and A.C. Room	12	5	5	60	2,000	1.20
13	Store	10	4	3.5	40	2,000	0.80
14	Pre-entrance shower	5	4	3.5	20	3,500	0.70
15	Office	10	5	3.5	50	2,000	1.00
16	Toilets	5	3	3.5	15	3,500	0.53
17	Insulation	-	-	-	4238	200	8.48
18	Insulated Doors						
	i. Mushroom house					12000/pc	1.08
	ii. Pasteur Tunnel					30000/pc	0.30
	iii.Casing soil Tunnel					20000/pc	0.20
	iv. Precanning & cold storage					20000/pc	0.20
						Total	**85.98**

ESTIMATED COST OF ELECTRICITY/FUEL CONSUMPTION [ANNEXURE XVIII(C)]

Sl. No.		Quantity (lakh KWH)
A.	Electricity	
1	Mushroom houses - 132 KW (Avg.) x 325 x 24	Rs.10.30 lakh
	(Assuming 325 operational days)	
2	Cold storage - 10 HP x 0.75 KW x 135 x 24	Rs.0.24 lakh
	(Assuming 135 operational days)	
3	Canning Line - 10 HP x 0.75 KW x 135 x 4	Rs.0.04 lakh
	(135 Operational days)	
4	Lighting in mushroom house - 27 KW x 325 x 3	Rs.0.26 lakh
	(325 Operational days)	
5	Air handling unit in Pasteur Tunnel	Rs.0.02 lakh
	5 KW x 315 x 1(315 Operational days)	
6	Misc. Load - 5 KW x 365 x 8	Rs.0.15 lakh
		Rs.11.01 lakh
	Estimated cost @ Rs.2.00 per KWH	Rs.22.02 lakh
B.	Fuel oil for composting boiler	Rs. 1.28 lakh
	(Assuming 315 operational days on 2.5 hrs./day)	
	Fuel consumption 27 litre/hr. and Rs.6 per litre	
		Total Rs.23.30 lakh

PLANT AND MACHINERY [ANNEXURE XVIII(D)]

(Rs.lakh)

1	Air conditioning of nine mushroom houses, 120-140 tonnes refrigeration capacity (air handling equipment cooling coils, air filter, blower, humidifier, still water chilling, excluding excise being 100% EOU)	45.00
2	Environmental sensors	5.00
3	Steam system 450 kg steam/hour	2.50
4	Cold storage equipment (5m x 4m 5m), 4.8 tonnes mushroom, 1 lakh BTU/hour, (harvest temp 16-17^{0}C, storage temp 4-5^{0}C) Refrigeration capacity required 8 tonnes	10.50
5	Canning line (capacity, tonnes/day)	18.00
6	Generator, 320 KVA	11.20
7	Under stack Blower	0.50
8	Wiring and Electrical works	3.00
9	Transformer, 500 KVA	5.00
10	Compost making and handling equipment	1.00
11	Bore well and pumps	0.70
12	Pipelines for water, steam, etc.	1.00
	TOTAL	**103.40**

COST OF RAW MATERIALS AND PACKING (AT FULL CAPACITY) [ANNEXURE XVIII(E)]

Sl. No.		Quantity	Rate (Rs./ton)	Amount (Rs. lakhs)
A.	Raw Material			
i.	Wheat Straw	900 tonnes	700	6.30
ii	Chicken manure	450 tonnes	500	2.25
iii	Gypsum	30 tonnes	1,000	0.30
iv	Urea	15 tonnes	3,000	0.45
v	Water	6300 Kilo litre		
vi	Spawn @ 0.5% 250 g per container	36,000 containers	Rs.8 / container	2.88
vii	Casing soil	600 m^3	Rs.150/m^3	0.90
viii	Limestone	25 tonnes	Rs.400/ton	
ix	Chemicals for canning	L.S.		0.30
x	Pesticides and disinfectants	L.S.		0.18
B.	Packaging			13.66
xi.	A 10 OTS cans 520 cans/ton of blanched mushroom	104000 cans	Rs.12/can	12.48
xii	Cardboard boxes, 87 boxes / ton of blanched mushroom	17400 boxes	Rs.22/box	3.83
xiii	Tapes			0.25
				16.56

PROJECT COST [ANNEXURE XVIII(F)]

(Rs. lakh)

1	Land and Land Development	2.76
2	Civil Works	85.98
3	Plant and Machinery	103.40
4	Office Equipment	1.55
5	Pre-operative Expenses	7.50
6	Training abroad	3.00
7	Working Capital Capitalisation (25%)	7.13
8	Contingency	2.00
	Total	**213.32**

SUMMARY OF RECURRING EXPENDITURE (AT FULL CAPACITY) [ANNEXURE XVIII(G)]

(Rs. Lakh)

1	Raw Materials	13.66
2	Packaging	16.56
3	Power and fuel	23.30
4	Wages and salaries	9.92
5	Marketing	2.75
6	Administrative expenses	1.20
7	Repairs and Maintenance	3.82
8	Insurance	0.50
	Total	**71.71**

WORKING CAPITAL REQUIREMENT [ANNEXURE XVIII(H)]

Sl. No.	Items	No. of Cycle (months)	Amount (Rs.)
1	Compost		
	1. Wheat Straw	9	441,000
	1. Chicken manure	5	90,000
	1. Gypsum	5	12,000
	1. Urea	5	18,000
2	Spawn	5	115,200
3	Miscellaneous chemicals	5	19,200
4	Casing soil		

	(a) Soil	5	40,000
	(b) Lime stone	5	
5	Packaging		
	(a) A 10 cans	5	394,368
	(b) Card board boxes	5	120,965
6	Salary & wages	5	396,800
7	Marketing	5	26,400
8	Power & Fuel	5	932,000
9	Administrative expenses	5	48,000
	Total		**2,853,933**

25% = 713,483

say Rs.7.13 lakh

PROJECTED PRODUCTION AND SALES [ANNEXURE XVIII(I)]

Sl. No.	**Particulars**	**2 yr.**	**3 yr. & onwards**
1	Installed capacity (tonnes)	360	360
2	Capacity utilisation	70%	90%
3	Yield (conversion rate)	18%	18%
4	Projected Production (tonnes)	252	324
5	Processing	227	285
6	Processed production (70%) (tonnes)	158	200
7	Sale (in tonnes)	158	200
	a. Fresh - domestic	25	39
	b. Canned - export	158	200
8	Price realisation (Rs. lakh)		
	a. Domestic @ Rs.40/kg	10.00	15.60
	b. Foreign @ Rs.65/kg	102.70	130.00
	Total	112.70	145.60

FINANCIAL RATE OF RETURN [ANNEXURE XVIII(J)]

Sr. No.		1 yr.	2 yr.	3 yr.	4 - 15 yrs.
1	Fixed Cost	213.32	-	-	-
2	Recurring Cost	-	58.06	73.75	71.71
3	Total Cost	213.32	58.06	73.75	71.71
4	Benefit	-	112.70	145.00	145.00
5	PW of cost at 15% DF	185.59	43.89	48.53	255.57 = 533.58
6	PW of benefit at 15% DF	-	85.20	612.04	= 697.24
7	Incremental benefit	-213.32	54.64	71.25	73.29
8	PW of incremental benefit at 30% DF	-164.04	32.35	32.42	106.92 = 7.15
9	PW of incremental benefit at 35% DF	-158.07	30.00	28.93	82.74 = -16.4

BCR at 15% DF = 1.31 : 1, NPW = Rs.163.66 lakh

IRR = 32%

REPAYMENT SCHEDULE [ANNEXURE XVIII(K)]

	Repayment Schedule - Model Project on Processing of fruits Canned Mango Pulp						
						(Amount in Rs.)	
Year	**Bank Loan**	**Surplus available for repayment**	**Interest @ 12 % p.a.**	**Principal**	**Total Outgo**	**Bank Loan Out standing**	**Surplus available after Repayment**
1	3800000	-	456000	-	456000	3800000	868700
2	3800000	1324700	456000	633000	1089000	3167000	501900
3	3167000	1590900	380040	633000	1013040	2534000	577860
4	2534000	1763400	304080	633000	937080	1901000	826320
5	1901000	2163000	228120	633000	861120	1268000	1301880
6	1268000	2163000	152160	633000	785160	635000	1377840
7	635000	2163000	76200	635000	711200	0	1451800
	Average DSCR	**1.908**					
	(Repayment Period is 7 years with one year grace period)						

SOURCES OF SPAWN [ANNEXURE XVIII(L)]

1. Haryana Agriculture University, Hissar -125 004

2. Himachal Pradesh Krishi Vishwa Vidhyalaya, Palampur - 176 062

3. Dr.Y.S.Parmar University of Horticulture and Forestry, Solan - 173 230.

4. Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar - 190 001.

5. Punjab Agriculture University, Ludhiana - 141 001.

6. Banaras Hindu University, Varanasi - 221 005.

7. Department of Agriculture, J&K, Srinagar and Jammu.

8. V.P.K.A.S. Almora - 263 601

9. ICAR Research Complex for NEH Region, Shillong - 793 003.

10. IIHR, Hessaraghatta, Bangalore - 560 089.

11. IARI, Pusa, New Delhi - 110 012.

12. CSIR Research Complex, Palampur - 176 061.

13. Department of Agriculture, Meghalaya.

14. Department of Agriculture, Rajasthan

15. Regional Research Laboratory, Jammu and Srinagar

16. National Centre for Mushroom Research and Training (NCMRT), ICAR, Chambaghat, Solan - 173 230.

FLOW CHART FOR CANNING BUTTON MUSHROOM [ANNEXURE XVIII(M)]

CLEANING AND WASHING

(in water containing 0.1% citric acid / 0.3% sodium meta bi-sulphate)

|

BLANCHING

(cooking in steam or hot water at about 98^0 C for 7-8 minutes in water containing 1% sodium chloride and 0.1% citric acid).

CANNING (FILLING, WEIGHING, BRINING AND EXHAUSTING)

(in brine solution, 1% sodium chloride and 0.25% citric acid or ascorbic acid -Temp 78 -98^0C

|
SEALING
|
SEAMING
|
STERILIZATION
|
COOLING
(to bring down the temperature to 35^0C)
|
LABELING
|
PACKAGING

Appendix III C

Vermicomposting

1. Introduction

Vermicomposting is basically a managed process of worms digesting organic matter to transform the material into a beneficial soil amendment. As per the USDA guidelines for compost practices (with effect from Oct 21, 2002), vermicomposts are defined as organic matter of plant and/or animal origin consisting mainly of finely-divided earthworm castings, produced non- thermophilically with biooxidation and stabilization of the organic material, due tointeractions between aerobic microorganism and earthworms, as the materialspass through the earthworm gut.

Good quality compost production in ambient temperature can be accomplishedin shorter time by the process of vermicomposting that involves use of proper species of earthworms. The native cellulase activity of earthworms and microorganisms in earthworm gut promote faster decomposition of ingested organic material. The combined effect of enzymatic activity and grinding of organic materials to fineness by earthworms produces the vermicomposting and this is not observed in compost pits without earthworm.

The earthworms being voracious eaters consume the biodegradable matter andgive out a part of the matter as excreta or vermi-castings. The vermi-casting containing nutrients is a rich manure for the plants. Vermicompost, apart from supplying nutrients and growth enhancing hormones to plants, improves the soil structure leading to increase in water and nutrient holding capacities of soil. Fruits, flowers and vegetables and other plant products grown using vermi- compost are reported to have better keeping quality. A growing number of individuals and institutions are taking interest in the production of vermicompost utilising earthworm activity. As the operational cost of production of this compost works out to less than ` 2.0/Kg., it is quite profitable to sell the compost even at 4.00 to 4.50/Kg.

2.**Process**

The process of composting crop residues / agri wastes using earthworms comprise spreading the agricultural wastes and cow dung in gradually built up shallow layers. The pits are kept shallow to avoid heat built-up that could kill earthworms. To enable earthworms to transform the material relatively faster a temperature of around 30^0C is maintained. The final product generated by this process is called vermicompost which essentially consist of the casts

made by earthworms eating the raw organic materials. The process consists of constructing brick lined beds generally of 0.9 to 1.5 m width and 0.25 to 0.3 m height are constructed inside a shed open from all sides. For commercial production, the beds can be prepared with 15 m length, 1.5 m width and 0.6 m height spread equally below and above the ground. While the length of the beds can be made as per convenience, the width and height cannot be increased as an increased width affects the ease of operation and an increased height on conversion rate due to heat built up.

Cow dung and farm waste can be placed in layers to make a heap of about 0.6 to 0.9 m height. Earthworms are introduced in between the layers @ 350 worms per m^3 of bed volume that weighs nearly 1 Kg. The beds are maintained at about 40-50% moisture content and a temperature of 20–30^o C by sprinkling water over the beds.

When the commercial scale production is aimed at, in addition to the cost of production, considerable amount has to be invested initially on capital items. The capital cost may work out to about `5000 to `6000 for every tonne of vermicompost production capacity. The high unit capital cost is due to the fact that large units require considerable expenditure on preparation of vermi beds, shed to provide shelter to these beds and machinery. However, these expenditures are incurred only once.

Under the operational cost, transportation of raw materials as also the finished product are the key activities. When the source organic wastes and dung are away from the production facility and the finished product requires transportation to far off places before being marketed, the operational cost wouldincrease.

However, in most of the cases, the activity is viable and bankable. Following are the items required to be considered while setting up a unit for production of vermi-compost.

3. About the worms

Of about 350 species of earth worms in India with various food and burrowing habits *Eisenia fetida, Eudrilus eugeniae* and *Perionyx excavatus* are some of the species that are reared to convert organic wastes into manure. A combination of epigeic species that form no permanent burrows and live on the surface, anecic that form semi-permanent and vertical burrows extending from the surface and endogeic that typically live throughout the deeper layers may be considered.

The worms feed on any biodegradable matter and vermicomposting units are ideally suited for locations / units with generation of considerable quantities of organic wastes. One earthworm reaching reproductive age of about six weeks lays one egg capsule (containing 7 embryos) every 7-10 days. Three to seven worms emerge out of each capsule. Thus, the multiplication of worms under optimum growth conditions is very fast. The worms live for about 2 years. Fully grown worms could be separated and dried in an oven to make 'worm meal' which is a rich source of protein (70%) for use in animal feed.

4. Location

Rural areas with predominance of agriculture, suburbs of cities and peri urban villages are considered ideal locations for setting up of vermicomposting units on alarger scale from the view point of availability of raw material and marketing of the produce. As use of the compost is said to have ameliorative effect more particularly on fruit, vegetable, plantation and ornamental crops, vermi- composting units may be located in areas with concentration of fruit and vegetable growers and floriculture units. Further, the nearness to a commercial dairy unit or large concentration of cattle population will have an added advantage of cheap raw material i.e. cow dung.

5. Components of a Commercial Unit

Commercial units have to be developed based on availability of cow dung locally.If some big dairy is functioning, then such unit will be an associated activity. Commercial units must not be designed based on imported cow dung. The philosophy is in-situ development using “Natural Resources”.

6. Sheds

For a vermi-composting unit, whether small or big, this is an essential item and is required for securing the vermi beds. They could be of thatched roof supported bybamboo rafters and purlins, wooden or steel trusses and stone/ RCC pillars.Locally available roofing materials or HDPE sheet may also be used in roofing to keep the capital investment at reasonably lower level. If the size is so chosen as toprevent wetting of beds due to rain on a windy day, they could be open sheds. While designing the sheds adequate room/pathways has to be left around the bedsfor easy movement of the labourers attending to the filling and harvesting the beds.

7.Vermi-beds

Normally the beds have 0.3 to 0.6 m height depending on the provision for drainage of excess water. Care should be taken to make the bed with uniform height over the entire width to avoid low production owing to low bed volumes. The bed width should not be more that 1.5 m to allow easy access to the centre ofthe bed.

8. Land

About 0.5-0.6 acre of land will be needed to set up a vermiculture production. Thecentre will have at least 6-8 sheds for convenience and a dedicated area for finished products. It should also have a bore well and pump set or watering arrangement and other equipment as described in the scheme economics. The land can be taken on lease for at least 10-15 years.

9.Buildings

When the activity is taken up on a large scale on commercial lines, considerable amount may have to be spent on buildings to house the office, store the raw material and finished product, provide minimum accommodation to the Manager and workers. The cost of the buildings along with the electrification of these buildings and the vermi-sheds may be included under this item.

10. Seed Stock

This is an important item requiring considerable expenditure. Though the worms multiply fast to give the required numbers over a period of 6 months to a year, it may not be wise to wait till such a time having invested on the infrastructure heavily. Thus, worms @ 1 kg per m^3 of bed volume should be adequate to startwith and to build up the required population in about two or three cycles without unduly affecting the estimated production.

11. Fencing and Roads/Paths

The site area needs development for construction of structures and development of roads and pathways for easy movement of hand-drawn trolleys/wheel barrows for conveying the raw material and the finished products to and from the vermi- sheds. The entire area has to be fenced to prevent trespass by animals and other unwanted elements. These could be

estimated based on the length of the periphery of the farm and the length and type of roads/paths required. The costs on fencing and formation of roads should be kept low as these investments are essential for a production unit, yet would not lead to increase in production.

12. Water Supply System

As the beds have to be kept moist always with about 50% moisture content, there is a need to plan for a water source, lifting mechanism and a system of conveying and applying the water to the vermi-beds. Drippers with round the clock flow arrangement would be quite handy for continuous supply and saving on water.Such a water supply system requires considerable initial investment. However, it reduces the operational cost on hand watering and proves economical in the long run. The cost of these items would depend on the capacity of the unit and thetype of water supply chosen.

13. Machinery

Farm machinery and implements are required for cutting (shredding) the raw material into small pieces, conveying shredded raw material to the vermi-sheds, loading, unloading, collection of compost, loosening of beds for aeration, shifting of the compost before packing and for air drying of the compost, automatic packing and stitching for efficient running of the unit.

14. Transportation

For any vermi-composting unit transport arrangement is a must. When the source of raw material is away from the production unit, an off-site transport becomes major item of investment. A large sized unit with about 1000 tonnes per annum capacity may require a three tonne capacity mini-truck. With small units particularly with the availability of raw material near the site, expending on transport facility may become infructuous. On-site transport facilities like manually drawn trolleys to convey raw material and finished products between thestorage point and the vermi-compost sheds could also be included in the project cost.

15. Furniture

A reasonable amount could also be considered for furnishing the office-cum-stores including the storage racks and other office equipment. This will enhance the efficiency of operations.16. Financial aspects

16. Benefits

It is assumed that there will be around 2-3 cycles of production in the first year and 5 – 6 cycles in the subsequent years with a duration of each cycle at around 65-70 days. Further, taking into account various limitations and operational problems, the capacity utilization is further assumed at 50% in the 1st year and90% from 2nd year onwards. Benefits include the income from sale of vermi- compost @ `4500 per MT and worm @ `200/- per kg. The net income from the2nd year onwards would be about Rs.6,48,000 annually.

17. Project Cost

Vermi-composting could be taken up on any scale starting from 10 MT per annum (TPA) to 1000 TPA and above. As the production is proportional to the vermi-bed space, it is advantageous to start with less capacities and later expand the unit after gaining production experience and developing assured market for the product. A bed volume of 324 m^3 spread over 24 beds - 15 m long, 1.5 m wide and 0.6 m high is estimated to produce vermi-compost of 200 TPA over 6 cycles/crops of 65- 70 days each annually. Total of 24 such beds may be housed under 2 to 4 different open sheds. The particulars of capitalised costs including mother stock of earthworms, cost of machinery and tools and operational cost/production cost of compost are set outin Annexure I and II. The costs and benefits of the unit are set out in Annexure III. As can be seen, the investment cost is Rs.13,50,000/-, operational cost Rs.3,42,000. Operational cost of two cycles amounting to Rs.1,24,800/- has been capitalised.

18. Margin

The margin money/down payment has been considered at 25% in the present model, which works out to Rs.3.375 lakh.

19. Bank loan

Bank loan considered in the model is 75% which works out to Rs.10.125 lakh.

20. Rate of interest

Banks are free to decide the rate of interest within the overall RBI guidelines issued from time to time. While the interest rate may vary from 13 to 15%, for the purpose of financial analysis and bankability of the project, the ultimate lending rate has been assumed at 13%.

21. Security

Banks are guided by RBI guidelines issued from time to time in this regard.

22. Financial analysis

The financial analysis is shown in Annexure IV. It indicates that the model is viable. The major financial indicators are given below:

NPV:7.627 lakh

BCR: 1.23 : 1

IRR: 34 %

23. Repayment

Based on the cash flow the detailed repayment schedule has been worked out andfurnished in Annexure V. The loan outstanding can be repaid in 6 years.

Annexure I

Capital Cost

Sr	Particulars of item	Amt (Rs)	
		Year 1	**Year 2 Onwards**
A.	**Land and Building**		
1.	Land (On lease)	----	----
2.	Levelling and earth filling for vermicompost sheds	7500	----
3.	Fencing and gate	25000	----
4.	Open Shed with brick lined bed bottom & platform with RCC / MS pipe post & truss and thatch /HDPE / locally available roof (@ 1000/m^2) for :		
a.	Vermicompost beds (15 m*1.5 m*24 nos = 540 m^2 + 20 m^2 pathways/utility = 560 m^2)	560000	
b.	For finished products 30 m^2	30000	----
5.	Godown / Store cum office 50 m^2 @ 5000/-per m^2	250000	----
	Sub total	**872500**	----
B.	**Implements and machinery**		----
1	Shovels, spades, crowbars, iron baskets, dung fork, buckets, bamboo baskets, trowel,	5000	----
2	Plumbing and fitting tools	1500	----
3	Power operated shredder	25000	----
4	Sieving machine with 3 wire mesh sieves- 0.6 m x 0.9 m size - power operated with motor	45000	----
5	Weighing scale (100 kg capacity)	2500	----
6	Weighing machine (platform type)	6000	----
7	Bag sealing machine	5000	----
8	Culture trays (plastic) (35 cm x 45 cm) - 4 Nos	1600	----
9	Wheel barrows - 2 Nos.	12000	----
	Sub total	**103600**	----
C.	**Water provision – Bore well with hand pump, pipe, dripper**	**75000**	----
D.	**Electrical installation**	**10000**	----
E.	**Furniture & fixtures**	**25000**	----
F.	**Earthworms (@1 Kg per m^3 and @`300/Kg, total utilized bed volume = 324 m^3)**	**97200**	----
	TOTAL CAPITAL COST	**1183300**	

Annexure II

Total operational cost for one year with 7 cycles of 65-75 days

Bed volume 324 m^3

Recovery: 30 %

Operational Cost

Sr	Particulars of item	Amt (Rs.)	
		Year 1	**Year 2 Onwards**
1.	Agricultural wastes (cost, collection and transportation) @ 320 kg per m^3 and Rs.200/MT (15*1.5*0.6*24*5*320*200/1000) [at 50% in 1st year]	51840	103680
2.	Cow dung (cost, collection and transportation) @80 kg/m3 and Rs.250/MT (15*1.5*0.6*24*5*80*250/1000) [at 50% in 1st year]	16200	32400
3.	Salary wages for 2 permanent skilled labourers @ Rs.6000/month	12000	12000
4.	Labour wages on day to day basis in formation of vermibed with agro-waste, cow dung and worms, watering, stirring, harvesting, sieving, packing, etc., including cost of bags (250 mds[@ Rs.200/md) [at 50% in 1st year]	25000	50000
5.	Electrical charges for pump, machinery, lighting etc. [at 50% in 1st year]	12000	24000
6.	Repair and maintenance [at 50% in 1st year]	30000	60000
7.	Cost of bags and marketing cost [at 50% in 1st year]	15000	30000
	Sub Total	**156040**	**312080**
8.	Lease rent, Miscellaneous etc.	30000	30000
	Total Operational Cost	**186040**	**342080**

Annexure III

Cost and Benefits

Sr	Cost	Amt (Rs.)	
		Year 1	**Year 2 Onwards**
1.	Total Capital cost	1183300	---
2.	Total Operational cost	186040	342080
3.	Total cost	1369340	342080
4.	Benefit		
4a.	Sale of vermicompost (200 MT @ 30% conversion) [@ Rs.4500/MT at 60% in 1st year and 90% in 2nd year onwards]	405000	810000
4b.	Sale of worms [@ 5 Kg/MT of compost and @ Rs.200/Kg.]	90000	180000
4c.	Total benefit	495000	990000
5.	Net benefit	(874340)	647920

Annexure IV

Financial analysis

Sr	Cost	Amt (Rs.)	
		Year 1	**Year 2 onwards**
1.	Total Capital cost	1183300	---
2.	Total Operational cost	186040	342080
3.	Total cost	1369340	342080
4.	Benefit		
4a.	Vermicompost	405000	810000
4b.	Sale of worms	90000	180000
4c.	Total benefit	495000	990000
5.	Net benefit	(874340)	647920
6.	Discounting rate – 15%		
7.	PVC – RS.2893538		
8.	PVB – Rs.3655654		
9.	NPV – Rs.762116		
10.	BCR - 1.226: 1		
11.	IRR – 34%		

Annexure V

Repayment Schedule

TFO (Rs.) **1338132** **(Say R s . 13.50 lakh)**

Bank Loan (Rs.) **1012500**

Margin (Rs.) **337500**

Rate of Interest 13%

Year	Loan O/s	Net Income*	Principal	Interest	Total outgo	Net surplus
1	1012500	456584	75000	131625	206625	249959
2	937500	647920	160000	121875	281875	366045
3	777500	647920	180000	101075	281075	366845
4	597500	647920	200000	77675	277675	370245
5	397500	647920	220000	51675	271675	376245
6	177500	647920	177500	23075	200575	447345

** 1st year net income = 1st year total income -operational cost of 1 cycle + insurance andlease [As 2 operational cycle and lease rent are capitalized].*

Appendix III D

Model Profile for 1.0 ha Mango Cultivation

1. Introduction

Mango (*Mangifera indica*) is the leading fruit crop of India and considered to be the king of fruits. Besides delicious taste, excellent flavour and attractive fragrance, it is rich in vitamin A&C. The treeis hardy in nature, can be grown in a variety of soil and requires comparatively low maintenancecosts. Mango fruit is utilised at all stages of its development both in its immature and mature state. Raw fruits are used for making chutney, pickles and juices. The ripe fruits besides being used for desert are also utilised for preparing several products like squashes, syrups, nectars, jams and jellies. The mango kernel also contains 8-10 percent good quality fat which can be used for soap and also as asubstitute for cocoa butter in confectionery.

2. Scope for Mango Cultivation and its National Importance

Mango occupies about 34% of the total area under fruits (2019-20) comprising of 22.91 lakh hectares,with a total production of 204.44 lakh tonnes. Uttar Pradesh and Andhra Pradesh are having the largest area under mango each with around 23% of the total area followed by Karnataka, Bihar, Gujarat and Tamil Nadu. Fresh mangoes and mango pulp are the important items of agri-exports from India. India's main export destinations for mango are UAE, Bangladesh, UK, Saudi Arabia, Nepal, Kuwait, USA and other Middle East countries with a limited quantity being shipped to European market. Although, India is the largest mango producing country, accounting about 45% of world production, the export of fresh fruit is limited to Alphonso and Dashehari varieties. India'sshare in the world mango market is about 15 percent. Mango accounts for 40 percent of the total fruit exports from the country. There is good scope for increasing the area and productivity of mango in thecountry.

3. Technical Requirements of Mango Cultivation

3.1 Climate

Mango can be grown under both tropical and sub-tropical climate from sea level to 1400 m altitude, provided there is no high humidity, rain or frost during the flowering period. Places with good rainfalland dry summer are ideal for mango cultivation. It is better to avoid areas with winds and cyclones which may cause flower and fruit shedding and breaking of branches.

3.2 Soil

Mango can be grown on a wide range of soils from alluvial to laterite provided they are deep (minimum 6') and well drained. It prefers slightly acidic soils (pH 5.5 to 7.5)

3.3 Varieties

Though there are nearly 1000 varieties of mango in India, only following varieties are grown in different states : Alphonso, Bangalora, Banganpalli, Bombai, Bombay Green, Dashehari, Fazli, Fernandin, Himsagar, Kesar, KishenBhog, Langra, Mankhurd, Mulgoa, Neelam, Samarbehist, Chausa, Suvarnarekha, Vanaraj and Zardalu.

Recently some mango hybrids have been released for cultivation by different institutes / universities. A brief introduction to such varieties is presented below:

Mallika - It is a cross between Neelam and Dashehari. Fruits are medium sized cadmium coloured with good quality, reported to be a regular bearer.

Amrapali - It is a cross between Dashehari and Neelam. It is a dwarf vigorous type with regular and late bearing variety. It yields on an average 16 t/ha and about 1600 plants can be accommodated in one hectare.

Mangeera : It is a cross between Rumani and Neelam. It is a semi vigorous type with a regular bearing habit. Fruits are medium sized with light yellow coloured skin, firm and fibreless flesh and sweet to taste.

Ratna : It is a cross between Neelam and Alphonso. It is a regular bearer and free from spongy tissue.Fruits are medium sized with excellent quality. Flesh is firm and fibreless, deep orange in colour with high TSS (19-21^{o} Brix).

Arka Aruna : It is a hybrid between Banganapalli and Alphonso with regular bearing habit and dwarfin stature. About 400 plants can be accommodated per hectare. Fruits are large sized (500-700 gm) with attractive skin colour. Pulp is fibreless, sweet to taste (20-22^{o} Brix). Pulp percentage is 73 andthe fruits are free from spongy tissue.

Arka Puneet : It is a regular and prolific bearing hybrid of the cross between Alphonso and the Banganapalli. Fruits are medium sized (220-250 gm) with attractive skin colour, having red blush. Pulp is free from fibre, pulp percentage being 70 percent. Fruits are sweet to taste (20-22^{o} Brix) with good keeping quality and free from spongy tissue. It is a good variety for processing also.

Arka Anmol : It is a semi-vigorous plant type from the cross between Alphonso and Janardhan Pasand. It is also a regular bearing and free from spongy tissues. Fruits ripen to uniform yellow colour. Keeping quality of the fruit is very good and it is suitable for export. It has got excellent sugar and acid blend and fruits weigh on an average about 300 g, Pulp is orange in colour.

3.4 Propagation

Farmers should always get vegetatively propagated, true to type plants from recognised nurseries. Inarching, veneer grafting, side grafting and epicotyl grafting are the popular methods of propagation in mango.

3.5 Planting

Land should be prepared by deep ploughing followed by harrowing and levelling with a gentle slope for good drainage. Spacing varies from 10 m x 10 m, in the dry zones where growth is less, to 12 m x 12 m, in heavy rainfall areas and rich soils where abundant vegetative growth occurs. New dwarf hybrids like Amrapali can be planted at closer spacing of 5m X 5m. Pits are filled with original soil mixed with 20-25 kg well rotten FYM, 2.5 kg single super phosphate and 1 kg muriate of potash.

One year old healthy, straight growing grafts from reliable sources can be planted at the centre of pits along with the ball of the earth intact during rainy season in such a way that the roots are not expanded and the graft union is above the ground level. Plants should be irrigated immediately after planting. In the initial one or two years, it is advisable to provide some shade to the young plants and also stake to make them grow straight.

3.6 Training and pruning

About one meter from the base on the main trunk should be kept free from branching and the main stem can be allowed thereafter spaced at 20-25 cm apart in such a way that they grow in different directions. Branches which cross over/rub each other may be removed at pencil thickness.

3.7 Fertiliser Application

In general, 170 gm urea, 110 gm single super phosphate and 115 gm muriate of potash per plant per year of the age from first to tenth year and thereafter 1.7 kg, 1.1 kg, and 1.15 kg respectively of these fertilisers per plant per year can be applied in two equal split doses (June-July and October). Foliar spray of 3% urea is recommended before flowering in sandy areas.

3.8 Irrigation

Young plants are watered frequently for proper establishment. In case of grown up trees, irrigation at 10 to 15 days interval from fruit set to maturity is beneficial for improving yield. However, irrigation is not recommended for 2-3 months prior to flowering as it is likely to promote vegetative growth at the expense of flowering.

3.9 Inter cropping

Inter crops such as vegetables, legumes, short duration and dwarf fruit crops like papaya, guava, peach, plum, etc. depending on the agro-climatic factors of the region can be grown. The water and nutrient requirements of the inter crops must be met separately.

3.10 Plant Protection

Mango is prone to damages by a large number of pests, diseases and disorders. The recommended control measures for most important and common among them are briefed below:

Mango hopper: Two sprays (at panicles emergency and at pea size of fruits) of carbaryl (0.15%), monocrotophos (0.04%) or phosphamidan (0.05).

Mealy bug : Ploughing inter spaces in November and dusting 2% methyl parathion @200 g per tree near the trunk and fixing 20 cm wide 400 gauge polythene strips around the trunk with grease applied on the lower edge in January as prophylactic measures and two sprays of monocrotophos (0.04%) at 15 days interval as control are needed.

Powdery mildew: Two to three sprays of wettable sulphur (0.2%) or Karathane (0.1%) at 10-15 days interval.

Anthracnose: Two sprays of Bavistin (0.1%) at fortnight interval.

Malformation: One spray of 200 ppm NAA in October followed by de-blossoming at bud burst stagein December - January.

Fruit drop: Regular irrigation during fruit development, timely and effective control of pests and diseases and spraying 20 ppm NAA at pea size of fruits.

3.11 Harvesting and yield

Graft plants start bearing at the age of 3 - 4 years (10-20 fruits) to give optimum crop from 10-15th year which continues to increase upto the age of 40 years under good management.

3.12 Post-Harvest Management

Storage: Shelf life of mangoes being short (2 to 3 weeks) they are cooled as soon as possible to storage temperature of 13^{o}C. A few varieties can withstand storage temperature of 10^{o}C. Steps involved in post-harvest handling include preparation, grading, washing, drying, waxing, packing, pre-cooling, palletisation and transportation.

Packaging: Mangoes are generally packed in corrugated fibre board boxes 40 cm x 30 cm x 20cm in size. Fruits are packed in single layer 8 to 20 fruits per carton. The boxes should have sufficient number of air holes (about 8% of the surface area) to allow good ventilation.

Financial institutions have also formulated mango financing schemes in potential areas for expansion of area under mango. Individual mango development schemes with farm infrastructure facilities like well, pump set, fencing and drip irrigation system etc. have also been considered.

The techno-economic parameters for the model project are detailed in **Annexure I.**

4. Financial Viability & Bankability

4.1 Project Cost

The unit cost varies from state to state. The cost presented here is indicative only. The entrepreneurs and the bankers are requested to consult our Regional Offices for the latest information in this regard. The unit cost estimated for this model scheme is Rs.97000 per ha capitalised upto the fifth year. The break-up details are given in **Annexure I**.

4.2 Margin Money

The margin money / down payment prescribed is 5 %, 10 % and 15% for small, medium and other farmers respectively. The rest of the cost of development will be provided as bank loan. However, in the present model, 10 % of the unit cost i.e. Rs.9700/ha has been considered as margin money.

4.3 Bank Loan

Bank loan of 85 - 90 % of the total cost of development shall be available from the financing institution. Bank loan considered in the model is 90%. It works out to Rs.87300/ha in the model.

4.4 Rate of Interest

Banks are free to decide the rate of interest within the overall RBI guidelines issued from time to time.However, the ultimate lending rate has been considered as 10 % for working out the bankability of themodel project.

4.5 Security

Banks are guided by RBI guidelines issued from time to time in this regard.

4.6 Financial Analysis

The detailed calculation of project's income and expenditure has been indicated in **Annexure III.** IRR, NPW and BCR for the model works out to 29 %, Rs. 132692/- and 1.28:1 respectively and the details are given in **Annexure III**.

4.7 4.7 Repayment period of loan

Based on the cash flow the detailed repayment schedule has been worked out and furnished in the **Annexure IV**. The repayment period works out to nine years including six years' grace period for repayment of principal.

Annexure- I

Techno-economic parameter

Spacing	10 m x 10 m
Plant Population (plants/ha)	100
Land preparation (Rs./ha)	2000
Labour (Rs./manday)	300
Planting material (Rs./plant)	75
Farm Yard Manure (Rs./MT)	2000
Urea (Rs./kg)	5.5
Single Super Phosphate (Rs./kg)	7.5
Muriate of Potash(Rs./kg)	17.5
Plant protection material (Rs./litre)	300
Sale price (Rs./kg)	25

(Amt in Rs.)

Cost of cultivation

Items	Year					Total
	1	2	3	4	5	
Cultivation expenses						
Land preparation	2000	0	0	0	0	2000
Digging and filling up of pits	3000	0	0	0	0	3000
Plant material	8250	0	0	0	0	8250
Planting and staking	2000	0	0	0	0	2000
Cost of FYM	6000	3000	3000	3500	3500	19000
Cost of fertilizers	2000	2500	3000	3500	4000	15000
Manures & fertilizers application	1500	2000	2000	2000	2000	9500
Irrigation	2000	2000	2000	1400	1000	8400
Plant protection measures	1500	1500	3000	3000	3600	12600
Appl. of plant protection	600	600	800	800	1200	4000
Interculture	1000	1000	1600	1600	2000	7200
Intercropping	3000	0	0	0	0	3000
Live fencing	2000	0	0	0	0	2000
Harvesting	0	0	0	0	1000	1000
TOTAL	34850	12600	15400	15800	18300	96950
Rounded off	35000	13000	15000	16000	18000	97000

Annexure - II

Income – Expenditure Statement

(Amount in Rs.)

Items	Year						
	6	7	8	9	10	11	12 onwards
Income							
Yield (Kg per plant)	20	30	35	50	75	100	125
Yield (Kg per ha)	2000	3000	3500	5000	7500	10000	12500
Income	50000	75000	87500	125000	187500	250000	312500
Expenditure							
Cost of FYM	3500	3500	3500	3500	3500	3500	3500
Cost of fertilizers	4000	4000	4000	4000	4000	4000	4000
Manures & fertilizers application	2000	2000	2000	2000	2000	2000	2000
Irrigation	1500	1500	1500	1500	1500	1500	1500
Plant protection measures	3600	3600	3600	3600	3600	3600	3600
Appl. of plant protection	1200	1500	1500	1500	1500	1500	1500
Interculture	2000	2000	2000	2000	2000	2000	2000
Harvesting	1000	3000	3000	3000	3000	3000	3000
TOTAL	18800	21100	21100	21100	21100	21100	21100
Rounded off	19000	21000	21000	21000	21000	21000	21000
Surplus	31000	54000	66500	104000	166500	229000	291500

Annexure - III

Economics of 1.0 ha mango cultivation

(Amt. in Rs.)

Items	Year											
	1	2	3	4	5	6	7	8	9	10	11	12 onwards
Cost of investment	35000	13000	15000	16000	18000	0	0	0	0	0	0	0
Maintenance cost	0	0	0	0	0	19000	21000	21000	21000	21000	21000	21000
Total cost	35000	13000	15000	16000	18000	19000	21000	21000	21000	21000	21000	21000
Benefits	0	0	0	0	30000	50000	75000	87500	125000	187500	250000	312500
Net Benefit	-35000	-13000	-15000	-16000	12000	31000	54000	66500	104000	166500	229000	291500
D F at 15%	0.87	0.756	0.658	0.572	0.497	0.432	0.375	0.327	0.284	0.247	0.215	1.23
Disc. Cost	-30450	-9828	-9870	-9152	5964	13392	20250	21745.5	29536	41125.5	49235	358545
Disc. Benefits	0	0	0	0	14910	21600	28125	28612.5	35500	46312.5	53750	384375
Net discounted benefits	-30450	-9828	-9870	-9152	5964	13392	20250	21745.5	29536	41125.5	49235	358545
NPW	Rs.132692											
BCR	1.28	: 1										
IRR	29%											

Annexure - IV
(Amt.in Rs.)

Repayment schedule 1.0 ha mango

TFO	97000
Margin @10%	9700
Bank Loan	87300

Year	Loan O/s at the beginning of the year	Interest @10.0%	Net surplus	Repayment of principal	Deferred Interest	Total outgo	Net Amt. in hand	Loan O/s at the end of the year
1	31500	3150	10000	0	0	3150	6850	31500
2	43200	4320	10000	0	0	4320	5680	43200
3	56700	5670	10000	0	0	5670	4330	56700
4	71100	7110	10000	0	0	7110	2890	71100
5	87300	8730	30000	0	0	8730	21270	87300
6	87300	8730	31000	0	0	8730	22270	87300
7	87300	8730	54000	20000	0	28730	25270	67300
8	67300	6730	66500	25000	0	31730	34770	42300
9	42300	4230	104000	42300	0	46530	57470	0

*First 4 years intercrop income has been taken into account

Appendix III E

PROJECT ON SPICE GRINDING (PULVERIZING)

Submitted to
United Bank of India, Haringhata, Nadia.

Prepared and Submitted By
XXXXX YYYYYY
ACABC ID:-W.B. 1XX1 T.P: 1XX4

CHAPTER -1

PROJECT BACKGROUND

1.1 Introduction

Spices are essential ingredients adding taste and flavouring in food preparations. India is the largest producer and consumer of spices with a production of around 36.68 lakh tones. Indian spices are of the finest quality. Today the demand for it has considerably increased from all the countries. The project aims at production of ground (powder) spices in consumer packs. The project mainly would involve production of chilli powder, turmeric powder, cumin powder, coriander powder, black pepper powder, mustard powder, fenugreek powder, curry powder, cloves powder and mix spice powder.

1.2 Industrial Overview

In India, there is a shortage of processed spices but a huge demand of processed spices India. The demand is increasing in local market as well as abroad. There is a big scope of agri processing industries.

1.3 Background of the Promoter(s):

Name of Promoting organization	**: Agri Farm**
Name of the proprietor	:
Name of Father	:
Address	**:** Vill.: Shrikrishnanagar, P.O.: Digha, P.S.: Duttapukur, Dist.: 24 PGS(N), West Bengal, India -743248
Contact	:+91-9836023834/9038955962
Qualification	:B. Tech. (Agricultural Engineering) :M. Tech. (Food Process Engineering)
Date of Birth	:11th November 1989(Age: 27+)
PAN Number	:BKGS89XXX
Aadhar Number	:7934412XXXXX
Bank	:United Bank of India
Account No	:
Branch	:Haringhata, Nadia
Email	:

D. Land and Location

Land: Area: 1330.00 m^2

Owner of the Land:

Contact Duration: 10 Years

Rent per Month: Rs. 2000.00

Location: Vill.: Basantapur, P.O.: Mollabelia, P.S.: Haringhata, Dist.: Nadia, West Bengal, India- 741249

Mouza: Basantapur,

J.L. No: 21,

Dag No: 523,

CHAPTER -2

MARKET STUDY

2.1. Present Scenario and Marketing Strategy

Spices are integral part of Indian food (India has come to be known as “land of spices”) both as a component of daily food items as well as part of pickles, sauces & chutneys etc. With changing of life style and especially with changes of food habits and increase of income level, the use of powdered spices has increased. The market for ready mix of spices has grown significantly. Export market for Indian spices is also growing simultaneously. Thus, the market is huge with potential for quality producer.

2.2 SWOT analysis

The following SWOT analysis captures the key strengths and weaknesses within the company, and de scribe s the opportunities and threats facing Interior Views.

Strengths

1. Have a reach technical knowledge regarding it's product and service.
2. Localizing certified product.
3. Product cost is less relative to other brands.
4. Certification of products from concerned authority.

Weaknesses

- ∞ Creating outlets in traditional market is a hurdle.
- ∞ Perishability of products.
- ∞ Processing losses.

Opportunities

1. Products are available at regular price like traditional market.

2. Health and environmental benefits (as there is no synthetic colour and chemicals).

Threats

- ∞ Less idea about the customer mindset, if they will accept the new brand easily or not.
- ∞ Competition from big players like Sona, MDH, Ashok Masala, Sunrise etc.

CHAPTER -3

PROJECT ENGINEERING

3.1 Scope of Project

Powdered spices are convenient to use and also saves time and energy for preparing different delicious dishes. Besides their everyday use in households, spices are used in significant quantities in processed foods such as pickles and sauces. It is also very much useful particularly for the working couples, bachelors, hostels, hotels, restaurants, hospital and different camps of defence personnel spreading throughout the country.

3.2 Building and Civil Work

Project layout is the key plan of a project, which is prepared as per the technical process involved, taking into consideration the available site condition, installed capacity technology and the available resources. It is therefore nothing but an engineering means of locating various structures and equipment systematically so that wastage of space due to handling is minimised and the expansion of the unit is possible with minimum expenditure and without affecting the existing system. It also helps in minimising unwanted built up area and therefore restricts unwanted constructional expenditure. This is very effectively contributing towards minimising the cost of production and increasing the efficiency of the unit.

3.2.1 Technical aspects

Sl. No	Subjects	Details
1	Processing	A 3m x2m with a height of 3m room for processing room.
2	Packaging	A 6m x2m with a height of 3m room for processing room.

3.2.2 Non-Technical Section

Sl. No	Subjects	Details
1	Office & others	A room with a size of 6m x2m for office use.
2	Godown	A 3m x4m with a height of 2.25m room for storing raw materials.
3	Receiving shed	A 6m x3m shed for receiving and dispatching.

3.2.3 Plant and Machineries

Sl. No	Description
1	Processing machine (pulverizer)
2	Packaging machine

3	Office and Others (Computer and furniture)

3.2.4 Miscellaneous and Fixed Assets

Sl. No	Description
1	Weighing Machines (1.Capacity 1000gm and 1.Capacity 200 kg)
2	Moving vehicles
3	Hand Trolley 5nos

CHAPTER -4

THE ORGANIZATION AND PERSON POWER PLANING

4.1 Men Power Planning

The man power planning of the project has been made under two distinct heads, the Administrative Cum Commercial Wing (ACW) and the Person Cum Technical Section Wing (PCT) and there are well-defined clear cut distinctions between these two heads.

4.1.1. Administrative-Cum-Commercial Wing (ACW):

This wing comprises of one sales cum purchase officers(Self), one account cum typist (self).

4.1.2 Person-Cum-Technical Section Wing (PCT)

Under this wing there will be one operator 1 helpers and 1 driver.

CHAPTER -5

PROJECT IMPLEMENTATION

5.1. Project Schedule

For successful implementation of any project planning, organization & control are essential tools regardless of the type, purpose, magnitude & complexity of its operations. The management will no doubt be concerned about developing an operational plan of the activities that make up the project. Further scheduling of these Activities over an acceptable time span will also be necessary to ensure proper co-ordinating & control. With respect to planning, it will be necessary to quantify the manpower and facilities required for implementation of the programme & synchronise the same with passage of time. The aim is to optimise the cost & time required for completing the project implementation in a smooth and expeditious manner.

5.2 Program of Implementation

A chart depicting the various phase of project implementation & commission has been drawn up to balance the timing of the various functions. The programme show that a total time span will be of four months which is needed for completion of the project from the date of initiation onwards

Sl. No	Details	Date of Commencement	Expected date of Complementation
1	Acquisition of land	Already done	
2	Development of land	15th December	20th December
3	Civil work	20th December	20th January
4	Procurement of plant machineries	15th December	30th January
6	Arrangement of power	15th December	30th January
7	Supply of raw material	29th January	30th January
8	Commercial run	30th January	

CHAPTER -6

ECONOMICS AND FINANIAL EVALUATION

Schedule A: Cost of Land and Site Development

1. Rent
2. Cost of Site Development

Schedule B: Building and Other Civil Work

1. Processing and packaging house
2. Office and godown

Schedule A: Cost of Land and Site Development

Sl. No	Description	Rate /Month (Rs)	Amount (Rs. in lakh)
1	Land	2000.00	0.02
2	Land development		0.075
		Total	**0.095**

Schedule B: Building and Other Civil Work

Sl. No	Description	Area (m^2)	Rate (Rs/m^2)	Amount (Rs. in lakh
1	Processing	6	4260	0.207
2	Packaging	12	4260	0.412
3	Office	12	4260	0.412
4	Godown	12	4260	0.412
5	Receiving shed	12	500	0.06
			Total	**1.5**
			Total A+B	**1.595**

Schedule C: Machineries

Sl. No	Description	**Amount** (Rs. in lakh)
1	Processing machine (pulverizer)	1.6
2	Packaging	0.3
	Total	**1.9**

Schedule D: Miscellaneous and Fixed Assets

Sl. No	Description	**Amount** (Rs. in lakh)
1	Weighing Machine Capacity 1000gm Capacity 200 kg	 0.005 0.085
2	Moving vehicles (already acquired)	2.5
3	Hand Trolley 10nos	0.02
4	Office and Others Furniture, Computer (already acquired) Misc.	 0.10 0.46 0.10
	Total	3.27

Schedule E: Electrification

Sl. No	Description	**Amount** (Rs. in lakh)
1	Electric connection (with three pillar)	0.4
2	Wearing	0.05
	Total	**0.45**

Schedule F: Fixed Cost

Sl. No	Description	**Amount** (Rs. in lakh)
1	Land and Site Development	0.095
2	Building and Other Civil Work	1.5

3	Machineries	1.9
4	Miscellaneous and Fixed Assets	3.27
5	Electrification	0.45
	Total	**7.215**

Schedule G: Operational Variable Cost

Sl. No	Description	Amount (Rs. In lakh)
1	Raw materials	1.275
2	Packaging materials	0.125
	Total	**1.4**

Schedule H: Programme for Revenue Income

Financial year	Amount (Rs. In lakh)
2018	60
2019	78
2020	102
2021	132
2022	172

Schedule I: Salary and Wages

Sl. No	Description	Unit	Rate per Unit Rs./day	Rs. per Month
1	Helper and driver	2	250	15000
2	Operator	1	300	9000
3	Office & sells	1	700	21000
			Total	**45000**

The unit envisages an averages annual increment @7% whereby the total salary and Wages payable from 2nd year onwards will be as fallows

Year	Total Cost (Rs. In lakh)
1st	5.4
2nd	5.78
3rd	6.18
4th	6.61
5th	7.08

Schedule J: Over Head

Sl. No	Description	Amount (Rs. lakh)
1	Power (Approx 25kw/day*365days*Rs6.5/Kw)	0.59
3	Repair	0.2
4	Office (Approx 3kw/day*365days*Rs6.5/Kw)	0.071
	Total	**0.861**

Schedule K: Cost of the Project

Sl. No	Description	Amount (Rs. in lakh)
1	Fixed Cost	7.215
2	Operational Cost (per cycle)	1.4

3	Salary (One months)	0.45
	Total	**9.065**

Schedule L: Means of Finance

Sl. No	Description	Contribution (%)	Amount (Rs. in lakh)
1	Margin money	44	4.079
2	Term Loan (Mudra	56	4.986
	Total	**100**	**9.065**

Schedule M: Debt Equity Ratio

Sl. No	Description	Amount (Rs. Lakh)
A	**Equity**	
1	Margin Money	4.079
	Total A	**4.079**
B	**Debt**	
1	Term Loan	4.986
	Total	**4.986**

Debt Equity ratio=1.22

Schedule N: Projected Profit & Lose Account

(Rs. in lakh)

Sl. No.	Description	1st year	2nd year	3rd year	4th year	5th year
A	**Net revenue Receipt**	**60**	**78**	**102**	**132**	**172**
B	**Expenses**					
1	Raw materials	42.85	55.7	72.4	94.14	122.38
2	Power	0.59	0.76	0.99	1.29	1.68
3	Fuel	3.6	4.68	6.08	7.9	10.28
4	Salary and Wages(yearly)	5.4	7.61	8.06	8.86	9.75
5	Maintenance & Repair	0.2	0.2	0.2	0.2	0.2
6	Depreciation (12%)	0.94	0.81	0.71	0.62	0.54
	Total B	**53.34**	**69.76**	**88.44**	**113.01**	**144.83**
C	**Gross profit(B-C)**	**6.66**	**8.24**	**13.56**	**18.99**	**27.17**
D	Administrative Over Head	0.071	0.071	0.071	0.071	0.071
E	Interest (Term Loan)	0.52	0.41	0.29	0.18	0.07
F	**Profit Before taxes [C-(D+E)]**	6.07	7.76	13.20	18.74	27.03
G	Provision for Taxes	0.73	0.93	1.58	2.25	3.24
H	Profit After Taxes	5.34	6.83	11.62	16.49	23.76
J	Depreciation	0.94	0.81	0.71	0.62	0.54
K	**Net Cash Accruals**	**6.28**	**7.64**	**12.33**	**17.11**	**24.33**

Schedule R: Interest and Repayment Schedule for Term Loan (Rs.)

Sl. No	Opening Balance	Interest	Repayment
1	498600	4570.5	4570.5
2	49800	4570.5	4570.5
3	498600	4570.5	13167.5

4	490003	4491.7	13088.7
5	481406	4412.9	13009.9
6	472809	4334.1	12931.1
7	464212	4255.3	12852.3
8	455615	4176.5	12773.5
9	447018	4097.7	12694.7
10	438421	4018.9	12615.9
11	429824	3940.1	12537.1
12	421227	3861.2	12458.2
13	412630	3782.4	12379.4
14	404033	3703.6	12300.6
15	395436	3624.8	12221.8
16	386839	3546.0	12143.0
17	378242	3467.2	12064.2
18	369645	3388.4	11985.4
19	361048	3309.6	11906.6
20	352451	3230.8	11827.8
21	343854	3152.0	11749.0
22	335257	3073.2	11670.2
23	326660	2994.4	11591.4
24	318063	2915.6	11512.6
25	309466	2836.8	11433.8
26	300869	2758.0	11355.0
27	292272	2679.2	11276.2
28	283675	2600.4	11197.4
29	275078	2521.5	11118.5
30	266481	2442.7	11039.7
31	257884	2363.9	10960.9
32	249287	2285.1	10882.1
33	240690	2206.3	10803.3
34	232093	2127.5	10724.5
35	223496	2048.7	10645.7
36	214899	1969.9	10566.9
37	206302	1891.1	10488.1
38	197705	1812.3	10409.3
39	189108	1733.5	10330.5
40	180511	1654.7	10251.7
41	171914	1575.9	10172.9
42	163317	1497.1	10094.1
43	154720	1418.3	10015.3
44	146123	1339.5	9936.5
45	137526	1260.7	9857.7
46	128929	1181.8	9778.8
47	120332	1103.0	9700.0
48	111735	1024.2	9621.2
49	103138	945.4	9542.4
50	94541	866.6	9463.6
51	85944	787.8	9384.8

52	77347	709.0	9306.0
53	68750	630.2	9227.2
54	60153	551.4	9148.4
55	51556	472.6	9069.6
56	42959	393.8	8990.8
57	34362	315.0	8912.0
58	25765	236.2	8833.2
59	17168	157.4	8754.4
60	8571	78.6	8675.6

Schedule S: Debt Service Coverage Ratio (Rs. in lakh.)

Sl. No		**Description**	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**Total**
A	**Service**	Net Cash Accruals	**6.28**	**7.64**	**12.33**	**17.11**	**24.33**	67.68
B	**Debt**	Repayment of Term Loan	0.86	1.03	1.03	1.03	1.03	4.98

D.S.C.R.=A:B=13.59:1

Schedule T: Pay Back Period (Rs. in Lac.)

Year	**Profit After Taxes**	**Depreciation added Back**	**Interest Added Back**	**Cumulative Cash Accrual**
1st	5.34	0.94	0.52	6.80
2nd	6.82	0.81	0.41	14.84
3rd	11.62	0.71	0.29	27.46
4th	16.49	0.62	0.18	44.75
5th	23.78	0.54	0.07	69.14

Cost of the Project: Rs. 9.065 lakh.

Pay Back Period: Middle of 2nd year

Schedule U: Break Even Point (Rs. in lakh)

Sl. No	**Description**	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**
A	**Fixed Cost**					
1	Salary and Wages(yearly)	5.4	7.61	8.06	8.86	9.75
2	Maintenance & Repair	0.2	0.2	0.2	0.2	0.2
3	Depreciation	0.94	0.81	0.71	0.62	0.54
4	Administrative Over Head	0.071	0.071	0.071	0.071	0.071
5	Interest (Term Loan)	0.52	0.41	0.29	0.18	0.07
	Total	**7.13**	**9.10**	**9.33**	**9.93**	**10.63**
B	**Variable Cost**					
1	Power	0.59	0.76	0.99	1.29	1.68
2	Fuel	3.6	4.68	6.08	7.9	10.28
	Total	**4.19**	**5.44**	**7.07**	**9.19**	**11.96**

C	**B.E.P. (FC/(SP-VC))**	12.8	12.54	9.8	8.1	6.6
D	**Average B.E.P. (%)**			9.97		

Schedule V: Cash flow (Rs. in lakh)

Sl. No	**Description**	**Const. Period**	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**Total**
A	**Cash Inflows**							
1	Profit After Taxes		5.34	6.83	11.62	16.49	23.76	64.04
2	Depreciation		0.94	0.81	0.71	0.62	0.54	3.62
3	Interest (Term Loan)		0.52	0.41	0.29	0.18	0.07	1.47
	Total		6.8	8.05	12.62	17.29	24.37	69.13
	Discount (12%)		0.89	0.79	0.71	0.64	0.57	
	Total (12%)		6.05	6.36	8.96	11.06	13.89	46.33
	Discount (15%)		0.87	0.76	0.66	0.57	0.50	
	Total (15%)		5.91	6.12	8.33	9.86	12.12	42.4
B	**Revenue return**		**60**	**78**	**102**	**132**	**172**	**544**
C	**Cash Outflow**							
	Capital Expenditure	9.065						9.065
	Total	9.065						9.065
A-C	Net Cash outflows	-9.065	6.8	8.05	12.62	17.29	24.37	60.07
D	**Cost**							
1	Raw materials		42.85	55.7	72.4	94.14	122.38	387.47
2	Power		0.59	0.76	0.99	1.29	1.68	5.31
3	Fuel		3.6	4.68	6.08	7.9	10.28	32.54
4	Salary and Wages(yearly)		5.4	7.61	8.06	8.86	9.75	39.68
5	Maintenance & Repair		0.2	0.2	0.2	0.2	0.2	1
	Total cost	9.065	52.64	68.95	87.73	112.39	144.29	475.065

Internal Rate of Return (IRR): 40.41%
BCR & NPW of the project are 1.14 & Rs. 60.07 lakh

Schedule W: Projected Balance Sheet as at End off (Rs. in lakh)

Sl. No.	**Description**	**Const. Period**	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**
A	**Liabilities**						
1	Share capital	4.079	4.079	4.079	4.079	4.079	4.079
2	Surplus	-	5.34	6.83	11.62	16.49	23.76
3	Term Loan	4.98	3.95	2.92	1.89	1.03	-
	Total (A)	**9.06**	**13.37**	**13.83**	**17.56**	**21.60**	**27.84**

B	**Assets**						
1	Capital expenditure	7.215	7.215	6.275	5.465	4.755	4.135
2	Less: Depreciation Under (WDV)	-	0.94	0.81	0.71	0.62	0.54
	Total	7.215	6.275	5.465	4.755	4.14	3.56
4	Cash & others Assets	1.85	7.095	8.365	12.81	17.47	24.28
	Total(B)	**9.065**	**13.37**	**13.83**	**17.56**	**21.61**	**27.84**