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"A BANKABLE PROJECT REPORT ON COMMERCIAL CULTIVATION OF OYSTER MUSHROOM"

A Project Report Prepared By;

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A Project Report Prepared for;

Kiran Agro Park, Bhilai, Chhattisgarh.

29/7, Radhika Nagar, Supela,
Bhilai, Chhattisgarh.
Proprictor: Devesh Mogre.

Sprout Consulting the project report under the scheme of *"National Horticulture Mission"* (NHM) supported by *"Plantation Infrastructure Development"* component.

Date: 24 May 2012

ANNEXURE :-

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TIN NO. 22443304530

Kiran Agro Park

TRADING & GROWING OF MUSHROOMS & SPAWN

0788-2290179
PH. 98269-44944
93298-44944

29/7, Radhika Nagar, Towards Nehru Nagar to Kosa Nala Bridge, Bhilai (C.G.)

Ref. No.

Date .....

To,
The Deputy Director,
National Horticulture Mission
Distt. - Durg (C.G.)

Sub. : To submitting project report for subsidy under NHM.

Dear Sir,

I am going to start the project for Oyester Mushroom Cultivation, Spawn & Training Centre at Shivpuri (JAMUL), Bhilai, Distt. - Durg. We will produce the Oyester Mushroom 100kg-125kg per day. Approx, giving training to women & farmers in our Districts villages & to make available spawn in low cost. The total cost of our project is Rs. 50,59,482.00.

I am applying for subsidy as under NHM guidelines which is 50% of total project cost or maximum Rs. 25,00,000/- for private sector.

So please provide me subsidy under NHM.

Thanks

Enclose -
1. DPR
2. Certificate of Registration
3. Plant & Machinery Quotation
4. Estimate for Building & Civil works
5. Bank appraisal & sanction letter.

Yours faithfully,

Devesh Mogre

KIRAN AGRO PARK
Proprietor

PRIVATE SECTOR
FORMAT FOR SUBMISSION OF POJECT BASED PROPOSALS BY PRIVATE ENTREPRENEURS UNDER NHM

1.	Name of project	-	Oyster mushroom cultivation and Processing unit.
2.	Type of activities	-	Cultivation, Processing, packaging, sale of oyster mushrooms, spawn making and training centre.
3.	Objectives	-	The prime objective of the report is to present a viable bankable model Oyster Mushroom production unit through adoption of appropri ate technology, utilization of resources and suitable market strategy.
4.	Location of the project with address -	-	Village - Shivpuri (Jamul), Bhilai, Chhattisgarh. (The location of the project is at general area)
5.	Date of incorporation and relevant law	-	Proprietorship firm named KIRAN AGRO PARK , Proprietor Devesh Mogre, Registration no. 22443304530 , Valid from 17- May-2012. Page No. 49
6.	Management	-	Page no. 48
7.	Brief background of Promoters		Page no. 7

8.	Cost of project ---	in Rs.
(a)	Land	998179.00
(b)	Building	1525000.00
(c)	Plant and Machinery	1114000.00
(d)	Contingencies	nil
(e)	Miscellaneous fixed assets	183830.00
(f)	Working capital margin	479000.00
(g)	Pre operative exp.	727807.5
	Grand Total	**5027816.5**

10. Means of finance

		in Rs.
(a)	Promoter Share	2552000.00
(b)	Bank term loan	2473000.00
(c)	Subsidy	2500000.00
(d)	Quasi equity	nil
(e)	Unsecured loan	nil
	Total	7525000.00

11. Detail of cost of Plant and Machinery/equipment supported by quotations. **Page 50-54**

12. Detail of the Building construction and the cost duly certified. **Page 55-59**

13. Availability of raw material, name of the cluster and District along with. **Page 60**

14. Backward linkages with farmers with reference to either providing services or purchase of row materia . **Page 61**

15. Forward linkage - Analysis of domestic and export markets, tie up made for sale of Produce and branding aspect. **Page 62**

16. No. of farmers to be benefited - more than 25 farmers.

17. SWOT Analysis. **Page 63**

18. Financial Analysis - IRR ,NPV, Benefit cost ratio, BEP, DSCR, Projected balance sheet etc . **Page 36-42**

19. Name of the sponsoring bank along with the detail of Techno - economical appraisal report ,copy of sanction letter and Detail Project Report (DPR) as submitted to bank. **Page 64-85**

20. Social benefits with reference to employment generation.
    (a) Direct employment :- 7 workers .
    (b) Indirect employment :- more than 20 .
    (c) Women :- 4 .

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22. Implementation schedule. **Page 47**

23. Amount of subsidy sought. Rs. 2500000 .

CHAPTER 1: EXECUTIVE SUMMARY

The global food and nutritional security of growing population is a great challenge, which looks for new crop as source of food and nutrition. In this context, mushrooms find a favor which can be grown even by landless people, that too on waste material and could be a source for proteineous food. Use of mushrooms as food and neutraceutical have been known since time immemorial, as is evident from the description in old epics Vedas and Bible.

Earlier civilizations had also valued mushrooms for delicacy and therapeutic value. In the present time, it is well recognized that mushroom is not only rich in protein, but also contains vitamins and minerals, whereas, it lacks cholesterol and has low calories. Furthermore, it also has high medicinal attributes like immunomodulating, antiviral, antitumor, antioxidants and hepatoprotective properties. With the growing awareness for nutritive and quality food by growing health conscious population, the demand for food including mushrooms is quickly rising and will continue to rise with increase in global population which will be 8.3 million by 2025 and expandable income. The mushroom cultivation has grown up in almost all the parts of the world and during last three decades, the world mushroom production achieved the growth rate of about 10%.

Globally, China is the leading producer of mushrooms with more than 70% of the total global production, which is attributed to community, based farming as well as diversification of mushrooms. In India, owing to varied agro-climate and abundance of farm waste, different types of temperate, tropical and subtropical mushrooms are cultivated throughout the country. It is estimated that India is generating 600 million MT of agricultural waste besides, fruit and vegetable residue, coir dust, husk, dried leaves, prunnings, coffee husk, tea waste which has potential to be recycled as substrate for mushroom production leading to nutritious food as well as organic manure for crops.

Mushroom production being an indoor activity, labour intensive and high profit venture provides ample opportunities for gainful employment of small, farmers, landless laborers, women and unemployed youth. Therefore, promotion of mushroom cultivation shall a step to meet nutritional needs to reduce malnutrition and providing livelihood to landless poor.

Mushroom cultivation in India is of recent origin and it was in the 1961 when ICAR funded a scheme on button mushroom cultivation technology at Solan which led to the establishment of a UNDP project with FAO experts. The pioneering research work of the HPKVV at their Agriculture College campus at Chambaghat, Solan laid a firm foundation for mushroom research in the country. National Centre for Mushroom Research & Training was established in 1983 at the same place under the aegis of ICAR that was later renamed as National Research Centre in 1997 and upgraded to Directorate of Mushroom Research in December 2008. Number of other institutions and State Agricultural Universities have since undertaken R&D activities in button

and various other mushrooms and the mushroom production in the Country has progressed from mere 5000 tons in 1990 to more than 1 lakh ton in 2010.

The present report is an effort to pool the information of cultivation, marketing and utilization of commercially grown mushrooms. The report encompasses all the aspects of various commercial mushrooms from culture maintenance to processing and marketing. The aspect of diversification in mushroom production, so important for India, has been adequately addressed. Engineering aspects of farm-design, machinery, etc in mushroom production, economics, cooking have also found due importance. This also provides insights about button mushroom industry to client and other people to get going in the field and serve nation giving quality.

We really appreciate the efforts and enterprise selection by our client *Kiran Agro Park, Bhilai, Chhattisgarh* in bringing out commercial cultivation of Oyster mushroom, which is one of the fastest growing enterprises in the agriculture industry.

Mushroom production being an indoor activity, labour intensive and high profit venture provides ample opportunities for gainful employment of small, farmers, landless laborers, women and unemployed youth. Therefore, promotion of mushroom cultivation shall a step to meet nutritional needs to reduce malnutrition and providing livelihood to landless poor. By understanding the process and mechanism today Kiran Agro Park quoting a very good example in front of nation which helps many families to earn their livelihood and creating next generations more healthy.

To conclude, as a livelihood diversification option, mushroom cultivation has enormous potential to improve food security and income generation, which in turn can help boost rural and peri-urban economic growth and enhance an individual's and a community's capacity to act upon other economic opportunities.

Kiran Agro Park has proposed to establish Mushroom Cultivation & Processing Unit at Bhilai. This unit would not only facilitate the unemployed youth in earning their livelihood, but the populace of "steel city" would also get mushrooms of good quality.

The activities of *Kiran Agro Park* will contribute greatly to the overall development of the locality in terms of employment generation, improved standard of living, eco-friendly waste disposal, nutritional & medicinal value addition and equitable livelihood opportunities.

OBJECTIVE

The Prime objective of the report is to present a viable bankable model Oyster Mushroom production unit through adoption of appropriate technology, utilization of resources and suitable market strategy.

CHAPTER 2: PROJECT PROFILE OF KIRAN AGRO PARK

Table 1: Project Profile For Kiran Agro Park		
A)	**Promoter Details**	
1	Name & Address	Kiran Agro Park, 29/7, Radhika Nagar, Supela, Bhilai-490023 (Chhattisgarh)
2	Proprietor Name	Mr. Devesh Mogre
3	Education	M.Com, LLB, MBA
4	Experience	7 years experience as life and general insurance agent 1 year experience of oyster mushroom cultivation
B)	**Project Description**	
1	Name of the Project Oyester	Mushroom Cultivation & Processing Unit
2	Location of the Project	Bhilai, Chhattisgarh . Villege Shivpuri (Jamul)
3	Strategic Advantages of Project Location	1. Road Linkage:- The Plant is located about 25 kilometers from the capital of Chhattisgarh - Raipur, on the main Howrah-Mumbai rail line, and National Highway 6 2. Population:- 625,697 in 2011 3. Effective literacy rate:- 87% in 2011 4. Climate:- a. Mild in the winter (minimum temperature 10 °C) b. Medium rains in the monsoon season c. The summers are very hot and dry, with maximum temperature 45 °C and maximum humidity
4	Land Area	7000 Sq. Ft. (Project Area: 4400 Sq. Ft.)
5	Proposed Economic Activities of the Project	Cultivation, Processing, Packaging & Sale of Oyster Mushrooms, Spawn Making & Training .
6	Production Capacity	Dry Oyster Mushroom - 12 Kgs per day (from Fresh Oyster Mushroom - 120 Kgs per day)
7	Operational Period per year	7 Mushroom life cycles (i.e. 315 days)

* Location of the project is at General Area (a) General Area ...

CHAPTER 3: INTRODUCTION

Indian agriculture will continue to be a main strength of Indian economy. With the variety of agricultural crops grown today, we have achieved food security by producing over 200 million tons of food grain. However, our struggle to achieve nutritional security is still on. Though we have significant achievements in milk, vegetables and fruit production still we have to do more. In future, the ever-increasing population, depleting agricultural land, changes in environment, water shortage and need for quality food products at competitive rates are going to be important issues. To meet these challenges and to provide food and nutritional security to our people, it is important to diversify the agricultural activities in areas like horticulture.

Diversification in any farming system imparts sustainability. Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environment related issues. One of the major areas that can contribute towards goal of conservation of natural resources as well as increased productivity is recycling of agro-wastes including agro-industrial waste. Utilizing these wastes for growing mushrooms can enhance income and impart higher level of sustainability.

Commercial production of edible mushrooms bio converts the agricultural, industrial, forestry and household wastes into nutritious food (mushrooms). Indoor cultivation of mushrooms utilizes the vertical space and is regarded as the highest protein producer per unit area and time- almost 100 times more than the conventional agriculture and animal husbandry. This hi-tech horticulture venture has a promising scope to meet the food shortages without undue pressure on land.

Mushroom farming today is being practiced in more than 100 countries and its production is increasing at an annual rate of 6-7%. In some developed countries of Europe and America, mushroom farming has attained the status of a high-tech industry with very high levels of mechanization and automation. Present world production of mushrooms is around 3.5 million tones as per FAO Stat and is over 25 million tonnes (estimated) as per claims of Chinese Association of Edible Fungi. The wide variation in world production data in FAO Stat and CAEF is partly due to the fact that in FAO Stat, mushroom means button mushroom (Agaricus spp.) along with the boletes, morels and tuber, whereas CAEF data covers all types of mushrooms. China alone is reported to grow more than 20 different types of mushroom at commercial scale and mushroom cultivation has become China's sixth largest industry.

Presently, three geographical regions– Europe, America and East Asia contribute to about 96% of world mushroom production. With the rise in the income level, the demand for mushrooms is bound to increase in other parts of the world as well. China has been producing mushrooms at very low costs with the help of seasonal growing, state subsidies and capturing the potential markets in the world with processed mushrooms at costs not remunerative to the growers in other mushroom producing countries.

India produces about 600 million tonnes of agricultural waste per annum and a major part of it is left out to decompose naturally or burnt in situ. This can effectively be utilized to produce highly nutritive food such as mushrooms and spent mushroom substrate can be converted into organic manure/vermi-compost. Mushrooms are grown seasonally as well as in state-of-art environment controlled cropping rooms all the year round in the commercial units. Mushroom growing is a highly labour-oriented venture and labour availability is no constraint in the country and two factors, that is, availabilities of raw materials and labour make mushroom growing economically profitable in India. Moreover, scope for intense diversification by cultivation of other edible mushrooms like oyster, shiitake, milky and medicinal mushrooms are additional opportunities for Indian growers.

In spite of predominantly tropical and subtropical climates in India, it is the temperate button mushroom that has ruled and is still dominant in the mushroom scenario of the country. Taking a clue from China, it is the tropical and sub-tropical mushrooms, which should be promoted in a big way, both with the producers and consumers. A beginning has already been made with the popularization of the oyster and milky mushrooms in South India. People do develop the taste as per the available commodity it is a universal phenomenon. At times, we take the shelter of no demand to justify almost negligible diversification in the mushroom production in India.

However, the challenges and opportunities thrown by this unconventional crop are a bit different particularly with reference to India. Today India is not only self-sufficient in the production of food grains, but is also in a position to export several agricultural commodities. But mushroom scenario in India is not that rosy. The cultivation of white button mushroom - Agaricus bisporus has come a long way of evolution and advancement in technology. Still all stages of evolution of cultivation technology can be seen. There are farmers still growing mushroom on compost prepared by long method and there are commercial units that have shifted to bunkers or almost indoor composting technology.

In younger mushrooms the pileus and stipe are connected by a membranous structure known as veil or veilum. It is broken at maturity. In younger stages, the fruiting body of Agaricus resembles a button. Hence this stage is referred as Button stage. Usually its basidiocarps are harvested at this button stage. The other fleshy fungus of Ascomycotina known as Morchella produces spores inside a sac like structure.

In spite of some articles that say mushrooms can be grown in any dark hole or building, successful commercial mushroom growing requires special houses equipped with ventilation systems. While mushrooms are usually grown in the absence of light, darkness is not a requirement. Mushrooms have been grown in unused coal and limestone mines, old breweries, basements of apartment houses, natural and man-made caves, rhubarb sheds, and many other unusual structures. Mushrooms were reportedly grown in an old dairy barn, which was so damp that cows living in it had died of pneumonia.

In l894, the first structure specifically designed to grow mushrooms was built in Chester County, Pennsylvania, which is usually referred to as the mushroom capital of the world. Growing mushrooms is a waste recycling activity. Mushroom farms benefit the environment by using many tons of mulch hay, straw bedded horse manure, and poultry manure. These products are considered agricultural waste products and would not have a home if it were not for mushroom production. Mushroom production is both an art and a science with many complex and distinct stages.

Mushroom cultivation is a labor intensive job and in the recent past many large farms had to abandon their operations in Europe and America due to very high labour cost. Complete mechanization of a farm where labour requirement will be less is a very high capital investment proposition making this activity uneconomical and uncompetitive. In India where labour is cheap, coupled with plentiful supply of agro wastes and requisite temperature make this activity more attractive and most economical. In view of this many big units have come up in India cultivating white button mushroom, most of their produce is exported to America and European countries earning precious foreign exchange.

In order this effort going commercial mushroom cultivation, Oyster Mushroom is great movement for *Kiran Agro Park* to grow along with existing mushroom facility and contribute towards the growth of the Indian economy.

A model scheme for cultivation of Oyster mushroom (Pleurotus spp.) with commercial viability and bankability has been prepared keeping in view the agro-climatic conditions and other related aspects for successful cultivation of the mushroom and its subsequent marketing. Cultivation of mushroom can be taken up on a large scale by individual entrepreneurs. The agro-climatic conditions as well as local availability of raw material make mushroom cultivation an economically viable proposition.

Mushrooms, also called 'white vegetables' or 'boneless vegetarian meat' contain ample amounts of proteins, vitamins and fiber apart from having certain medicinal properties. Mushroom contains 20-35% protein (dry weight) which is higher than those of vegetables and fruits and is of superior quality. Mushrooms are now getting significant importance due to their nutritional and medicinal value and today their cultivation is being done in about 100 countries. At present world production is estimated to be around 5 million tonnes and is ever increasing. Though 20 mushroom varieties are domesticated about half a dozen varieties viz; button, shitake, oyster, wood ear and paddy straw mushrooms contribute 99% of the total world production.

Mushroom offers prospects for converting lignocelluloses residues from agricultural fields, forests into protein rich biomass. Such processing of agro waste not only reduces environmental pollution but the byproduct of mushroom cultivation is also a good source of manure, animal feed and soil conditioner.

CHAPTER 4: BACKGROUND

1. Origin:

Mushrooms are the plant of immortality - that's what ancient Egyptians believed according to the Hieroglyphics of 4600 BC. The delicious flavor of mushrooms intrigued the pharaohs of Egypt so much that they decreed mushrooms as food for royalty. In various other civilizations throughout the world, including Russia, China, Greece, Mexico and Latin America, mushroom rituals were practiced. Many believed that mushrooms had properties that could produce super-human strength; help in finding lost objects and lead the soul to the realm of the gods. The oldest representation, which suggests the possibility that mushrooms may have been used ritualistically are the Tasili Cave paintings in Northern Algeria where zoomorphic figures whose bodies are adorned with drawings of what macroscopically appear to be mushrooms are found. These drawings have been dated from at least 9000 BP.

The Chinese were the first to artificially cultivate the tropical and subtropical mushrooms about thousands year back (Auricularia polytricha in 600 AD; Flammulina velutips in 800 AD; and Lentinula edodes in 1000 AD) but real commercial ventures started when Europeans started cultivation of button mushroom in caves during 16th and 17th centuries. In the late 19th century, mushroom production made its way across the Atlantic to the United States where curious home gardeners in the East tried their luck at growing this new and unknown crop. The first producer of pure culture virgin spawn was the American Spawn Company of St. Paul Minnesota, headed by Louis F. Lambert, a French mycologist at the beginning of 20th Century. By 1914, mushroom marketing began to play a much greater role in the industry. In the beginning button mushroom dominated the world scenario and even upto 1979 it contributed 70 percent of the world mushroom production. Since then number of other mushrooms have been commercialized and by 1997 the share of button mushroom fell down to 32 percent and mushrooms like shiitake, oyster mushroom, paddy straw mushroom, wood ear mushroom, etc started gaining popularity.

Mushroom cultivation in India is of recent origin and it was in the 1961 when ICAR funded a scheme on button mushroom cultivation technology at Solan which led to the establishment of a UNDP project with FAO experts. The pioneering research work of the HPKVV at their Agriculture College campus at Chambaghat, Solan laid a firm foundation for mushroom research in the country. National Centre for Mushroom Research & Training was established in 1983 at the same place under the aegis of ICAR that was later renamed as National Research Centre in 1997 and upgraded to Directorate of Mushroom Research in December 2008. Number of other institutions and State Agricultural Universities have since undertaken R&D activities in button and various other mushrooms and the mushroom production in the Country has progressed from mere 5000 tons in 1990 to more than 1 lakh ton in 2010. Diversification in any farming system imparts sustainability. Mushrooms are one such component that not only impart diversification but also help in addressing the problems of quality food, health and environmental related issues. Commercial production of edible mushrooms represents unique exploitation of the microbial

technology for the bioconversion of the agricultural, industrial, forestry and household wastes into nutritious food (mushrooms). Indoor cultivation of mushrooms, utilizing the vertical space, is regarded as the highest protein producer per unit area and time. This hi-tech horticulture venture has a promising scope to meet the food shortages, without undue pressure on land. For the people of a developing country like India, the two main issues are the quality food and unemployment besides the environmental issues and these issues can be resolved by popularizing mushroom cultivation amongst the rural masses and the young generation.

2. Botanical Description:

Mushrooms are primitive organisms known as fungi. The organism lack chlorophyll which synthesize food in higher plants in presence of sunlight. They do not possess this green colour substance so they cannot prepare their own food. They grow saprophytically on dead organic matters or other living organisms. Mushrooms are fruit bodies or reproductive structures emanating from the mycelium, which under natural conditions lie buried in the soil or in the substrate where conditions are favorable for their growth. Recently Chang & Miles (1989) has defined mushrooms as, a micro fungus with a distinctive fruiting body which can be either epigeous or hypogenous and large enough to be seen by naked eye and to be picked by hand.

Mushrooms belong to class fungi of the plant kingdom. They are often defined as plants without chlorophyll , that lack differentiation into stem, leaves, flowers and have distinct fruiting , which may be above or below the soil. Mushroom is derived from *mousseron (French)*, a term that includes edible & poisonous mushrooms.

The vegetative mycelium is composed of many inter-woven sepatate hyphae. The reproductive phase is initiated by the formation of small knob like swellings at different points of interwoven mycelial strands. These swellings increase in size and break through the surface of the substratum as small balls constituting the button stage. A matured basidiocarp (fruit body) is whitish in colour and consists of thick short stipe with an annulus. The stipe supports the pileus which appears as a hat like expansion. On the underside of the pileus, a number of radiating gills or lamella are present which are pink when young but purple-brown when mature.

3. Seed (Spawn Production):

Spawn, i.e. seed required for growing mushroom, is the vegetative mycelium from a selected mushroom cultured on a convenient medium like wheat, pearl millet, sorghum grains, etc. In simple words spawn is grains covered with mushroom mycelium. It essentially involves preparation of pure culture of mushroom from tissue/spores, evaluation of selected cultures for yield, quality and other desirable traits, maintenance of selected cultures on suitable agar medium, followed by culturing on sterilized grains and further multiplication on grains. From 1652 to 1894 A.D. spawn was gathered from the wild rather than made and was referred as Natural or Virgin spawn (from pastures & meadows) and Flake spawn (breaking of beds through which mushroom mycelium has run), Mill-track spawn (bricks dried and made from mixture of horse dung, cow dung and loam soil). In the beginning of 20th century pure mycelial culture were made and used for making manure spawn on sterilized horse manure or compost manure.

The process of making grain spawn was first introduced by the Pennsylvania State University in 1932. Grain spawn had an advantage over manure spawn as it could be mixed easily and provided many inoculum points. The grain spawn was further perfected by Stoller in 1962. Today most of the traditional spawn laboratories world over are using wheat, rye and millet grains as substrate for spawn production and are following the standard technique of mother spawn from pure culture mycelium grown on synthetic medium.

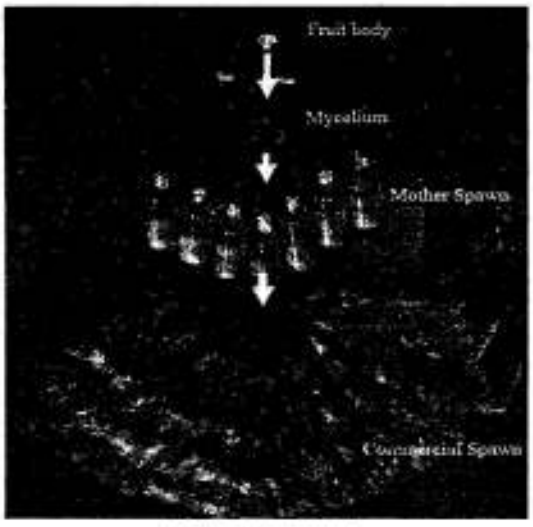


Figure: 1 Spawn Production Process

CHAPTER 5: NUTRITIVE VALUE OF MUSHROOM

Mushrooms are a rich source of nutrients, particularly proteins, minerals and vitamins such as Vitamin B, C and D. The content of the anti-pellagra vitamin, niacin is comparable to its levels found in pork or beef, which are the richest known sources of this vitamin. Mushroom cultivation is the only major fermentation industry, which involves the bio-conversion of cellulose wastes into edible biomass.

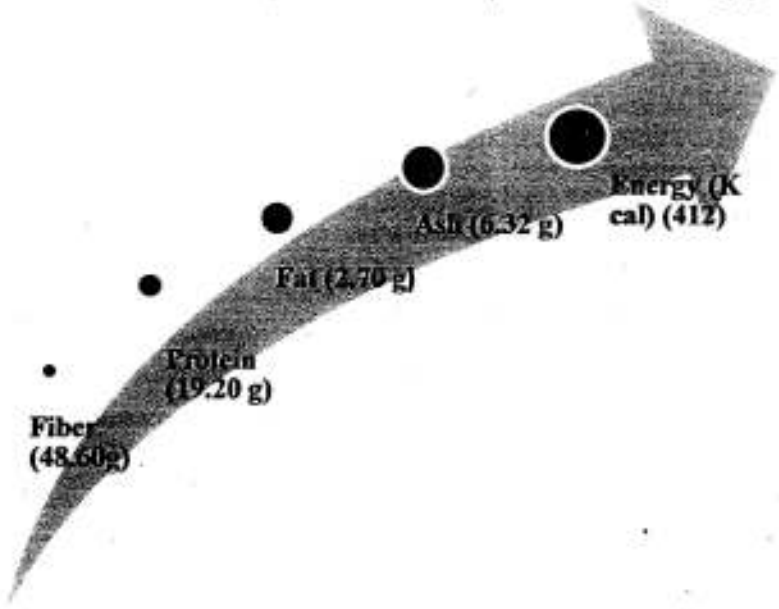
Meeting the food demand for the increasing population from the limited land resource is a big challenge for our Indian democracy in this vulnerable climate change era. In addition to this, wide spread malnutrition and associated diseases are more common among the economically poor population. This compels us to search for cheap alternative quality nutritional sources for our huge population. Non green revolution otherwise referred as mushroom farming is one among the apt ways to meet this challenge because mushrooms grow on wastes without requiring additional land besides its exceptional nutritional and medicinal properties.

According to an estimate, yield of mushroom per unit area, as such or in terms of proteins is 100-1000 times more than conventional agriculture like production of paddy, wheat, pulses and cereals etc., hence, mushrooms are considered to be the best alternative to supply the masses with vegetable protein rich food. Mushrooms are also good source of minerals. They are rich in phosphorus, potassium and iron but are low in sodium. About one third of the total iron in mushrooms is in the available form. Mushrooms are good sources of several vitamins and excel many fruits and vegetables on this account. They are particularly rich in thiamine (B1), riboflavin (B2), niacin, biotin, ascorbic acid, vitamin K and vitamin E. In addition to these, some other interesting features in the nutritional quantities of mushrooms are (i) lack of starch (ii) low fat content (iii) low calorific value (iv) presence of a variety of sugars and their derivatives and (v) high fiber content. Hence, they are said to be the 'delight of diabetics'.

Indian diet is primarily based on cereals (wheat, rice and maize), which is deficient in protein. Supplementation of mushroom recipe in Indian diet will bridge protein gap and improve the general health of socio-economically backward communities. Earlier mushrooms were considered as an expensive vegetable and were preferred by affluent peoples for culinary purposes. Currently common populace also considers mushroom as a quality food due to its health benefits. Mushroom is considered to be a complete, health food and suitable for all age groups, child to aged people. The nutritional value of mushroom is affected by numerous factors such as species, stage of development and environmental conditions. Mushrooms are rich in protein, dietary fiber, vitamins and minerals. The digestible carbohydrate profile of mushroom includes starches, pentoses, hexoses, disaccharides, amino sugars, sugar alcohols and sugar acids. The total carbohydrate content in mushroom varied from 26-82% on dry weight basis in different mushrooms. The crude fiber composition of the mushroom consists of partially digestible polysaccharides and chitin.

A. Nutritive value of Oyster Mushroom:

Figure No: 2: Nutritive value of Oyster Mushroom (Pleurotus sajor-caju)



B. Medicinal Values:

Since thousands of years, edible fungi have been revered for their immense health benefits and extensively used in folk medicine. Specific biochemical compounds in mushrooms are responsible for improving human health in many ways. These bioactive compounds include polysaccharides, tri-terpenoids, low molecular weight proteins, glycoproteins and immunomodulating compounds. Hence mushrooms have been shown to promote immune function; boost health; lower the risk of cancer; inhibit tumor growth; help balancing blood sugar; ward off viruses, bacteria, and fungi; reduce inflammation; and support the body's detoxification mechanisms. Increasing recognition of mushrooms in complementing conventional medicines is also well known for fighting many diseases.

1. Good for heart

The edible mushrooms have little fat with higher proportion of unsaturated fatty acids and absence of cholesterol and consequently it is the relevant choice for heart patients and treating cardiovascular diseases. Minimal sodium with rich potassium in mushroom enhances salt balance and maintaining blood circulation in human being. Hence, mushrooms are suitable for people suffering from high blood pressure. Regular consumption of mushrooms like Lentinula, Pleurotus spp. decreases cholesterol levels. The lovastatin obtained from Pleurotus ostreatus and eritadenine obtained from shiitake has the ability to reduce blood cholesterol levels.

2. Low calorie food

The diabetic patients choose mushroom as an ideal food due to its low calorific value, no starch, little fat and sugars. The lean proteins present in mushrooms help to burn cholesterol in the body. Thus it is most preferable food for people striving to shed their extra weight.

3. Prevents cancer

Compounds restricting tumor activities are found in some mushrooms but only limited number have undergone clinical trials. All forms of edible mushrooms, and white button mushrooms in particular, can prevent prostate and breast cancer. Fresh mushrooms are capable of arresting the action of 5-alpha-reductase and aromatase, chemicals responsible for growth of cancerous tumors. The drug known as Polysaccharide-K (Kresin), is isolated from Trametesversicolor (Coriolusversicolor), which is used as a leading cancer drug. Some mushroom-derived polysaccharides have ability to reduce the side effects of radiotherapy and chemotherapy too. Such effects have been clinically validated in mushrooms like Lentinula edodes, Trametesversicolor, Agaricus bisporus and others. Selenium in the form of seleo proteins found in mushrooms has anticancer properties. According to the International Copper Association, the mushroom's high copper levels help to reduce colon cancer besides osteoporosis.

4. Regulates digestive system

The fermentable fiber as well as oligosaccharide from mushrooms acts as a prebiotics in intestine and therefore they anchor useful bacteria in the colon. This dietary fiber assists the digestion process and healthy functioning of bowel system.

5. Strengthens immunity

Mushrooms are capable of strengthening the immune system. A diverse collection of polysaccharides (beta-glucans) and minerals, isolated from mushroom is responsible for up-regulating the immune system. These compounds potentiate the host's innate (non-specific) and acquired (specific) immune responses and activate all kinds of immune cells.

Mushrooms, akin to plants, have a great potential for the production of quality food. These are the source of bioactive metabolites and are a prolific resource for drugs. Knowledge advancement in biochemistry, biotechnology and molecular biology boosts application of mushrooms in medical sciences. From a holistic consideration, the edible mushrooms and its by-products may offer highly palatable, nutritious and healthy food besides its pharmacological benefits.

Still there are enough challenges ahead. Until now, how these products work is elusive and vast number of potential wild mushrooms is not explored. The utility of mycelia is paid little attention but it has tremendous potential, as it can be produced year around with defined standards. Knowledge on dose requirement, route and timing of administration, mechanism of action and

site of activity is also lacking. Work is under progress in various laboratories across the world to validate these medicinal properties and to isolate new compounds. If these challenges are met out in the coming days, mushroom industries will play a lead role in neutraceutical and pharmaceutical industries. The increasing awareness about high nutritional value accompanied by medicinal properties means that mushrooms are going to be important food item in coming days and at places may emerge as a substitute to non-vegetarian foods. Growing mushroom is economically and ecologically beneficial. Consuming mushroom is beneficial in every respect. Thus mushrooms are truly health food, a promising neutraceutical.

CHAPTER 6: MARKET ANALYSIS AND STRATEGY

1. Production & Market Status:

Large scale white button mushroom production is centered in Europe (mainly western part), North America (USA, Canada) and S.E. Asia (China, Korea, Indonesia, Taiwan and India). The national annual production of mushrooms is estimated to be around 50,000 tones with 85 percent of this production being of button mushrooms.

Marketing is getting the right product, to the right people, at the right price, at the right time and in the right way. Marketing of fresh mushrooms all over the world is not very organized except the auction system in Netherlands. Producers make direct efforts to bring the produce to the super markets and 'wholesale distributor' element is mostly missing. However, trade in the processed (canned and dried) is sizeable and organized.

a. Global Scenario:

About the mushroom marketing, Stan Hughes said "Mushroom growers have mystified me for years. They put so much effort into growing and so little into selling". For effective and efficient marketing, especially export, it is necessary to understand the global trade vis-à-vis the sources of supply, potential regions of demand and consumption patterns. The global mushroom production as per FAO Statistics was estimated at about 2.18 to 3.41 million tons over period of last ten years (1997-2010). Mushrooms in FAO database have been classified as FAOStat code 0449 and have been defined as those inter alia: Boletus edulis; Agaricus campestris, Morchella spp. and Tuber magatum. Since there was an increase of about 56% world mushroom production in last decades and guesstimates can be put on current production to be around 3.5 million tons. China, USA, Netherlands, Poland, Spain, France, Italy, Ireland, Canada and UK are the leading producers.

Table: 2 World Production of Mushroom (Metric Tonnes)

Countries	1997	2010
China	562194	1568523
USA	366810	359630
Netherland	240000	240000
Poland	100000	160000
Japan	74782	67000
United Kingdom	107359	72000
Canada	68020	73257
Ireland	57800	75000
Italy	57646	85900
France	173000	125000
Spain	81304	140000
Germany	60000	55000
Indonesia	19000	48247
India	9000	48000
Belgium	NA	43000
Australia	35485	42739
Iran	10000	28764
Korea	13559	28000
Hungary	13181	21200
Vietnam	10000	18000
Denmark	8766	11000
Thailand	9000	9500
Israel	1260	9395
South Africa	7406	8500
New Zealand	7500	8500
Switzerland	7239	7440
Other countries	85911	59297
Total World Production	**2186222**	**3414392**

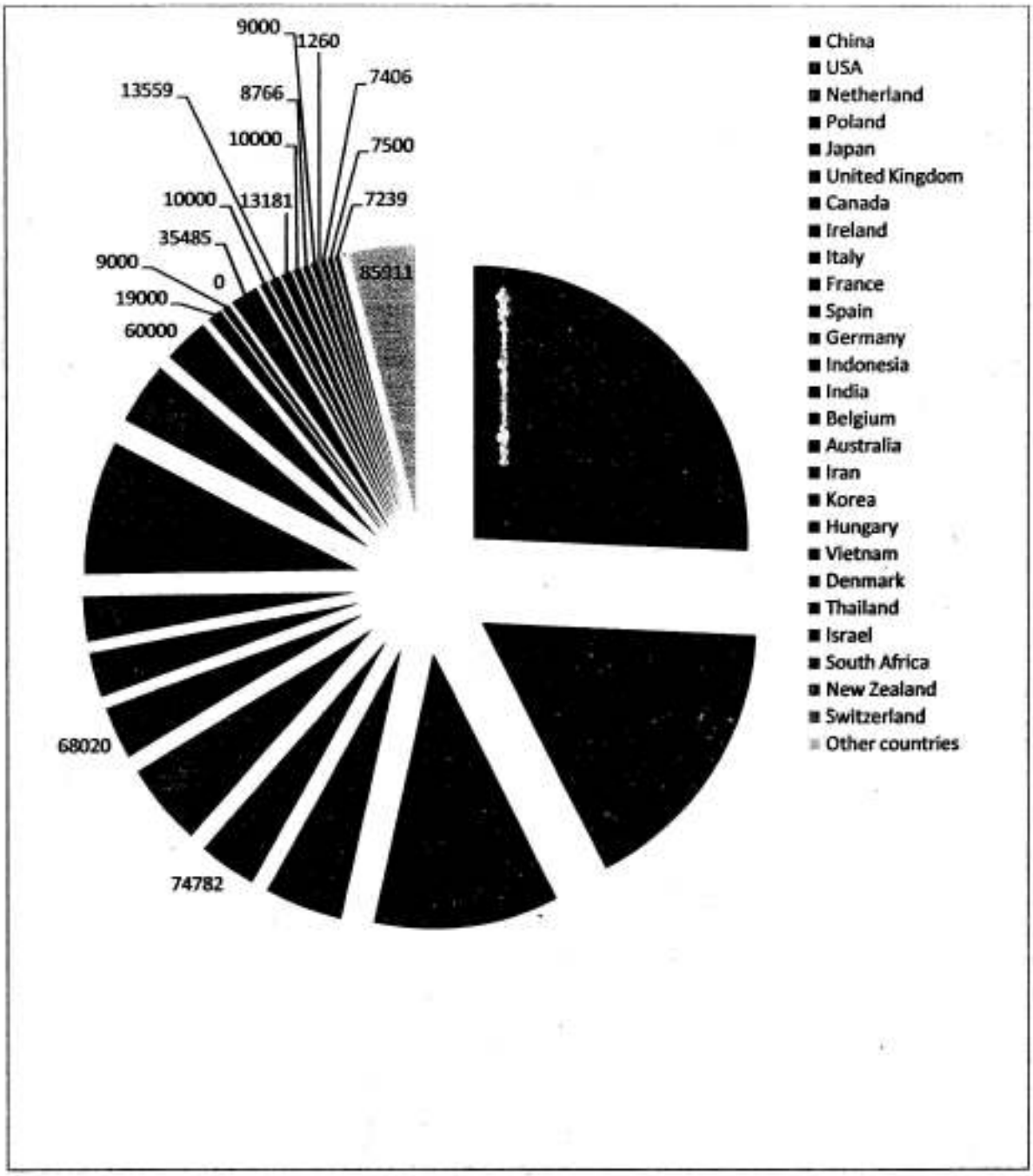


Chart: 1: World Production of Mushroom (Metric Tonnes)

The three major mushroom producing countries as FAO data viz., China, USA, and Netherland account for more than 60% of the world production; however share of China itself is 46% which is about half of the world mushroom production. According to current Indian estimates, mushroom production of India is about 1 lakh metric tons, which is about 3% of the world mushroom production. In USA and Europe major contribution towards mushroom production is by white button mushroom. In Asian countries the scenario is different and other species are also cultivated for commercial production

Considering that 95% of mushroom production in China is consumed locally, the consumption per capita is likely to be over 10 kg/person/year. This is drastically higher than in US and many European countries where it is around 3 kg/person/year. In India the consumption is miserably low. Considering that we produce over 1 lakh tons and export about 60-70% of it, our per capita consumption is around 30-40 g/person/year.

World mushroom production (FAOStat) is continuously increasing from 0.30 to 3.41 million tons over period of about last 50 years from 1961 to 2010. Also the export and import trend lines shows that the mushroom export/import has continuously increased in last 40 years, but marginally up to 1985 and beyond it there is tremendous increase in mushroom export/import upto 2010. Poland, Netherland, Ireland, China, Belgium, Lithuania, Canda and USA are the major mushroom exporting countries while countries like UK, Germany, and France.

World processed (canned and dried) mushroom export is continuously increasing from 0.049 to 0.683 million tons over the period of last four decades (1970-2010) as compared to the fresh mushroom export (0.014 to 0.482 million tons) but fluctuations in export is higher in case of the processed mushroom. In USA, five decades ago, 75% of the mushroom consumption was in the form of canned mushroom. Today, canned mushroom contributes only 15% of total mushroom consumption.

Largest importer of preserved mushrooms (canned) is Germany with about 1, 05,186 tons in 2007 (FAO) followed by Russian Federation (69,726 metric tons), USA (67,058 metric tons) and Japan (32,757 metric tons). Most of these supplies are made by China (4,05,112 metric tons), Netherland (1,15,349 metric tons), Spain (20,623 metric tons), France (18,496 metric tons) and Indonesia (18,392 metric tons).

It is clear from the above that European Union and USA are the biggest markets and Poland and China are the biggest competitors, for mushrooms from India.

b. National Scenario

There is no denying the fact that production of mushrooms, especially of the white button Mushroom & Oyster Mushroom, in India has gone up in the last few years but it has also exacerbated its marketing problems. There have been frequent reports of gluts in north Indian States during the winter months forcing the distress sale of the mushrooms. It should be borne in mind that efforts to increase the production without solving its marketing problems, would be counter-productive. The marketing of fresh mushrooms would determine the future of mushroom industry in India.

Despite the changing currents, there is not yet much market for the processed foods and basically fresh vegetables and fruits are preferred in this country. Fresh mushrooms have very short shelf-life, cannot be transported to long distances without refrigerated transport facility and are sold in localized markets in and around production areas. The cultivation of white button mushrooms throughout the year under controlled condition is restricted to few commercial units and 30-40% of the production is being done under natural conditions during the winters. All the problems of marketing is experienced in 2- 3 winter months (Dec-Feb) when more than 75% of the annual production comes in market for sale in limited duration and market area. Farmers face the consequences of over-saturated market and are forced to sell their produce at highly un remunerative prices. Private processors, rather than coming for rescue, get tempted to avail of the situation for their benefit.

Marketing of mushrooms in India is not yet organised. It is the simple system of producers selling directly to retailer or even to consumer, which has its own limitations. Unlike the other countries where 10% of the total cost is earmarked for marketing, we have not given marketing sufficient thought and investment. Per capita consumption of mushrooms in

India is less than 50 g as against over a kg in various countries. There has not been any serious effort to promote the product, to strengthen and expand the market in order to increase its consumption. Mushroom is a novel food item for this country and what to ask of its flavour, texture, nutritive value, many are not aware of 'what is mushroom and whether vegetarian or non-vegetarian item?'

In the coming years, there is going to be good demand for processed and fast foods. Mushrooms may be canned to meet the demand in the off-season and in the nonproducing areas. Product diversification should also be tried. Regarding the problems of sale/export of canned mushrooms, serious thought has to be given to bring down the cost of production of mushrooms and its processing in order to compete in the international market.

2. Demand and Supply Patterns

White button mushrooms are grown all over the world and account for 35-45 % of the total mushroom production. In India, large units with production capacities between 2000 – 3000 tones / annum have been set up mainly as export oriented units in the southern, western and northern regions. A large number of small units without climatic control equipment exist throughout India and function during the autumn and winter months only.

A big gap exists between the demand and supply position of quality Oyster mushrooms in the United States and European market. India exports the highest quantity of the mushroom produced in the country to USA. Netherlands and China account for 60% of the export of mushrooms. Germany is the largest importer and France and UK are large producers as well as consumers.

The demand for fresh mushroom is increasing in the international market while that of preserved or canned mushrooms is decreasing.

Nigerian having vast demand to market their mushrooms in their domestic market by having commercial and quality production and then they can go for further exports of the same. There is huge demand and supply gap for same market and they have potential to cater various market.

The possibilities of exporting fresh mushrooms to the markets in Middle East, Europe and USA need to be explored. Europe is a very large producer of fresh button mushrooms as such only some exotic varieties of mushrooms which are high priced can be exported to these countries. However, some inhibiting factors are high cost of transportation and absence of proper pre-cooling techniques and storage facilities.

3. Export/Import Trends of Mushroom

World Production

The major varieties of mushrooms produced in the world are European or white-button mushroom (*Agaricus bisporus*), Oyster mushroom or Dhingri (*Pleurotus* spp), Chinese or paddy-straw mushroom (*Volvariella volvacea*), shitake mushroom (*Lentinus edodes*) and *Auricularia* spp. Among these the most widely cultivated species is the *Agaricus bisporus*, which accounts for almost 38% of the total mushroom production. About 2,000 varieties of mushrooms grown in the world are edible. These varieties are grown in diverse regions of the world. The white-button mushroom is grown in the U.S.A, France and China.

The Oyster mushroom is concentrated in China, which accounts for over 80% of the production. It is also grown in South Korea and Italy. India is not a major producer of any of the mushroom varieties, but it does cultivate mushrooms. The variety gaining maximum importance in India has been the white-button mushroom, which registered the highest growth rate in production.

World Trade

Only about 45% of mushrooms produced are consumed in the fresh form. The rest of the 55% is processed with 5% in the dehydrated form and 50% in the canned form. This is because their shelf life in the fresh form is very short. Hence mushrooms are traded in the world market mostly in the processed form.

Netherlands is the largest exporter of canned button mushrooms with a market share of about 38.5%. China is another significant exporter of the processed form of this variety, accounting for almost 30% of world trade. France is another important exporter, contributing to about 13.5% of the world exports.

Table 3: Importer countries of Mushroom

Importers of button mushrooms
Germany
U.S.A.
France
Belgium
Sweden
Norway
U.K.

As far as the import market is concerned, the most significant buyer of canned white button mushroom is Germany. This country alone accounts for almost 40% of the world imports. USA also imports canned mushroom, accounting for about 19% of the world imports.

Netherlands is the leading exporter of button mushrooms (40% share) followed by China, France, Spain, Hong Kong, Taiwan, Indonesia and South Korea. USA is the largest consumer accounting for one third of World production. Other important consumers are Germany, UK, France, Italy and Canada. The quantity of mushrooms exported by India in comparison to the world export is almost negligible. The following tables 1& 2 gives the export status of fresh and dried mushrooms.

Table 4: Country-Wise Quantity and Value of Fresh Mushrooms Exported From India during 2007 - 2010

Country	Fresh Mushrooms	
	Quantity	Value (USD) ($)
Ireland	80.80	149100
Singapore	1.5	2400
U.A.E	0.05	600
U.S.A	2575	161800
Total	**2657.35**	**313900**

Table 5: Country-wise quantity and value of preserved/dried Mushrooms exported from India during 2007 – 2010

Country	Preserved/dried mushrooms	
	Quantity	Value (USD)
France	60.00	103280
Japan	2.00	30720
Nigeria	7.58	12000
Russia	17.00	38660
Switzerland	5.00	12760
U.A.E	13.01	16000
U.S.A	6029.66	61140
Total	**6134.25**	**274560**

The most important importers of white button mushroom are Germany, USA, France, U.K. and Sweden. Canned button mushrooms are imported by UK, Germany, France, USA, Sweden etc. Asian countries like China, Taiwan, and Korea export their produce to the American and European countries in the form of canned mushrooms.

4. Analysis And Future Strategy:

The industry has a comprehensive marketing and promotions program, based on five year plans. Part time co-coordinators are employed in each state to facilitate this program and to involve members in promotional activities. Regular consumer surveys guide the direction of promotion with a wide range of media being included in the program. Advertisements are placed on TV and radio and in all forms of print media.

The industry has a well developed network of food and cookery writers who support promotional efforts. As well direct marketing has been used extensively, with cooking demonstrations and in-store activities featuring strongly in the program. The Association's marketing program has been very successful. This success can be attributed to careful planning and monitoring of activities, as well as a commitment to fund the program at a level which will impact on consumers. Annual per capita consumption has increased from 0.65 kg in 1974 to an estimated 2.82 kg in 1995/96. This compares very favorably with 1.72 kg in the USA. This increase has resulted from greater consumer awareness of the nutritional value of mushrooms, as well as their great value for money. The industry is developing a national grade standards scheme, which will also enable better targeting of consumer needs. Whilst some grading now takes place, this varies from state to state and farm to farm.

This national scheme will enable product to be described consistently across the country. Consumers have expressed a demand for more choice in size of mushrooms and more grade categories will meet this need. To date, there has been little activity in the export market: domestic demand exceeds production, so there has been little incentive to venture further afield. The perishable nature of the product makes it costly to transport and to maintain the quality necessary to achieve good returns on overseas markets. As well, labour costs in Australia are higher than many competitor countries and this makes it difficult to compete. In the near future, this situation is unlikely to change, as there are many other countries better situated than Australia to service overseas markets. There is increasing interest in specialty mushrooms (ones part from the common Agaricus). This is a relatively new segment of the industry in Australia and as yet there are only a few growers producing these different species. In time, this market will expand to provide consumers with a greater range of choice.

4.1 Value Added Commodities

As yet, growers are not particularly active in this market segment. There are some products well established on the market, including canned mushrooms in sauces or in brine. Some growers are packing into 200gm pre-packs, and these are proving popular with consumers. There have been some attempts to market a sliced mushroom pack and this may become more common.

Overseas trends indicate that it is likely this market segment will expand, with pre-packaged products including salad packs and things like mushrooms with microwaveable sauces common in the US. Most value adding for mushrooms in Australia is done outside the mushroom industry, by other food producers. Mushrooms are important ingredients in pizzas, pasta sauces and many pre-packaged meals.

4.2 Market Opportunities

Mushrooms are very popular in most of the developed countries and they are becoming popular in many developing countries like India. Applications and market for mushrooms is growing rapidly in India because of their nice aroma, nutritious values, subtle flavor and special taste. Many exotic food preparations like soup, vegetables, pickles etc. are made from them. They are also used for garnishing, to prepare many varieties of gravy and for stuffing several food preparations. But they are still considered as up-market product and their consumption is limited to urban and semi urban areas. Fresh mushrooms have very limited shelf life but processed and canned mushrooms have fairly long shelf life and can be sold even at far off places. Star hotels, exclusive restaurants, certain caterers are the bulk consumers and a firm tie-up for regular supply with some of them is advisable. The product can be sold even through departmental stores, super markets

CHAPTER 7: PRODUCTION TECHNOLOGY

The cultivation of Oyster mushroom or Dhingri mushroom or Pleurotus spp is relatively simple and can be a homestead project. The agro- climatic conditions in our country especially in the North Indian States are conducive for mushroom cultivation when the temperature is 15-30oC and relative humidity is 70-80%. The production decreases during peak periods of winter.

7.1 Climate & other conditions:

Pleurotus spp. is one of the choice edible mushrooms which can be cultivated in the tropics. It has gained importance only in the last decade and is now being cultivated in many countries in the subtropical and temperate zones. Different species of Pleurotus are suited for growing within a temperature range of 15 to 30oC. P.sajor-caju can tolerate temperatures upto 28-30oC, although it fruits faster and produces larger mushrooms at 25oC during the cooler months of the year or in the highlands of the tropics. This is the species now popularly grown in the tropical Southeast Asian countries, including India. P.abalonus prefers lower temperatures of 22-24oC and is most popular among the Chinese. P.ostreatus is the so-called low-temperature Pleurotus, fruiting mostly at 12-20oC. This species is more suited to the temperate climates of Europe and the United States, although many growers in the USA are also producing P.sajor-caju.

In Europe it is known as the oyster mushroom (P.ostreatus) while in China it is called the balone mushroom (P.abalonus or P. cystidiosus). Several other species are now available for cultivation. These are P.sajor-caju, P.florida (probably a variant of P.ostreatus), P.sapidus, P.eryngii, P. columbinus, P.cornucopiae, and P.abellatus.

7.2 Substrate:

Like other mushrooms, Pleurotus spp. can be grown on various agricultural waste materials using different technologies. They grow well on different types of lignocelluloses materials, converting them into digestible and protein-rich substances suitable for animal feeds. Pleurotus spp. may be produced in the tropics on a mixture of sawdust and rice bran, rice straw and rice bran, saw dust and ipil-ipil leaves and other combinations of tropical wastes. Other wastes such as corncobs, cotton waste, sugarcane bagasse and leaves, corn leaves, grasses, rice hulls and water hyacinth leaves are also good substrates for growing this mushroom (Quimio, 1986). The substrates used in each region depend upon the availability of agricultural wastes.

7.3 Preparation of substrate - Sterilization / Pasteurization:

The use of a pressure cooker to sterilize Pleurotus substrate is not recommended since sterilization kills beneficial micro organisms which are present in the substrate, as well as the harmful ones. In addition, nutrients in the compost are broken down by sterilization into forms more favorable for the growth and development of competing micro organisms (FAO, 1983). Thus, substrates that are sterilized are easily contaminated unless spawned under very aseptic

conditions, as in media and spawn preparation steaming at 100oC (pasteurization) is more acceptable because the cost is lower (the steamer may only be an ordinary large-capacity casserole or a drum) and substrates thus steamed are less susceptible to contamination. The substrate is steamed for 2-3 hours, depending on the volume and the size of the bags. When using a lower temperature (60-70oC) as in the case of room or bulk pasteurization, the substrates, whether in bulk or already packed in bags, are steamed for at least 6 to 8 hours.

7.4 Inoculation / Spawning:

Spawning is carried out aseptically, preferably using the same transfer chamber or the same inoculation room as is used in spawns preparation. Grain or sawdust spawn is commonly used to inoculate the substrate in bags. With grain spawn, the bottle is shaken to separate the seeds colonized with the white mycelium. After lifting the plug and flaming the mouth of the bottle, a few spawn grains (about 1 to 2 tsp.) are poured into the substrate bag. Both the plug of the spawn and the plug of the compost bag are replaced and the next bags are then inoculated. The newly inoculated bags are slightly tilted to distribute the grains evenly in the shoulder area of the bag around the neck.

For sawdust spawn, the spawn is broken up with an aseptic needle. A piece of the spawn may then be transferred, using a long flat-spooned needle especially designed to scoop the spawn. One bottle of grain or sawdust spawn in a 500 ml dextrose bottle is sufficient to inoculate 40 to 50 bags.

The highly industrialized method involves bulk-pasteurization and bulk-spawning before the substrates are distributed in beds similar to those used for Agaricus. The system is labour-saving but requires more complex equipment. Bulk material processing and handling are highly risky for tropical mushroom cultivation due to the risk of contamination.

7.5 Incubation:

The spawned compost bags are kept in a dark room until the mycelium has fully penetrated to the bottom of the substrate. In 20 to 30 days, depending upon the substrate/substrate combination, the substrate appears white, due to the growth of the mycelium. The bags are kept for an additional week before they are opened to check that the mycelium is mature enough to fruit. Most strains of the mushroom form primordia after 3 to 4 weeks of mycelial growth. The bags are opened, to initiate fruiting, inside a mushroom house.

7.6 Fruiting:

The size of the mushroom house will depend on the number of bags prepared at any one time. The house may be built of nipa, sawali, wood or concrete. Air vents on the upper walls will provide the ventilation required for the development of the sporocarps. At the same time a small amount of light should be provided inside the house. The walls may be covered with plastic or

foam sheets to increase the relative humidity (80-95%) in the production house. Shelves, made from bamboo or wood, line both sides of the house. The shelves are on bamboo frames, one shelf above the other, with about 40-50 cm space between them. They should be strong enough to hold the bags or blocks containing the compost.

The bags are opened by removing the plug and then rolling down the mouth of the bag. Alternatively, the mouth portion may be cut off with the help of a sharp instrument or the bag may be slit either criss-cross at four to six places or simply slashed lengthwise. When following the latter technique, the bags may be suspended with a rope or string. When using blocks instead of bags, the blocks are opened either completely or with only the surface or upper portions exposed.

Fruiting requires an appropriate temperature range (20-28oC), ventilation, light moisture and humidity (80-95%). To provide moisture, daily watering of the substrate is required but excessive watering should be avoided. If the temperature inside the house rises to more than 30oC, a light water mist should be used to lower the temperature and hasten fruiting. Doors and windows may also be opened, especially at night to keep the area cool.

Approximately 3 to 4 days after opening the bags, mushroom primordia will begin to form and mature mushrooms would be ready for harvesting in the following 2 to 3 days. If the substrate is not fully colonized, the onset of fruiting is likely to be delayed.

To harvest the mushrooms, they are to be grasped by the stalk and gently twisted and pulled. A knife should not be used. If kept in a refrigerator or in a cool place, the mushrooms can remain fresh for up to 3 to 6 days. After harvesting from the top end of the bag, the other end may be opened to allow fruiting. The two ends are sometimes opened and allowed to fruit at the same time. After harvesting from the end portions, slits may be made on the central portion of the bag so that more mushrooms can develop. When a sawdust substrate is used, the harvested surface may be scraped lightly to expose a new surface for fruiting. As long as the substrate appears white, mushrooms will continue to form under adequate environmental conditions. When it appears colorless and soft, it is time to remove the bags from the house.

7.7 Yield:

Yield ranges from about 100-200% of the dry weight of the substrate and depends on the substrate combination as well as the way in which the substrate has been managed during the fruiting season. The richer the combination and the whiter and denser the mycelium, the greater will be the mushroom yield. To increase yield, the most common supplement used is urea or organic fertilizer dissolved in water (100 gm in 100 liters water). Using a plastic mist sprayer, the solution is sprayed on the surface immediately before fruiting.

CHAPTER 8: POST HARVEST MANAGEMENT

8.1 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 (0-50 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 (40-500 C) within 20-30 minutes giving 80-90% of original weight.

8.2 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.

8.3 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.

CHAPTER 9: SOURCES FOR TECHNOLOGY

Sprout Consultancy services, Pune, India.

Mr. Anil Wanarse Patil

Mr. Anil is a Post Graduate in Agri. business and Plantation Management from Indian Institute of Plantation Management, Bangalore. He has great interest in mushroom cultivation and has specialized in setting up mushroom plants and growing mushroom.

Mr. Anil is presently acting as Mushroom Consultant in the field of mushrooms. Also he is Director for Sprout Naturals, Pune, which company functioning in the Agriculture supply chain domain. He has been the master brain behind the drafting of mushroom project to be established by the company. He has also undergone many training programs on mushroom production technology from recognized institutes like, Agriculture College Pune and DMR Solan, Himachal Pradesh. He is having almost 2 years of experience in setting mushroom farms on commercial scale.

In all aver India he setup various plants for button mushroom, Oyster mushroom and other medicinal mushroom for commercial production of ranging capacity of 1000 kg to 5000kg on per day basis production.

Mr. Raju Jadhav

Mr. Jadhav is Graduate in B.Com and started his journey with Mushroom field as Asst. Manager (Mushroom Research and Growing) from 1985 to 1999 with Himraj Mushrooms in Chakan Pune.

He Worked then for Karjat Fresh Mushrooms in Mumbai, Maharashtra from 2001 to June 2005.

He also worked as mushroom expert in Navin Fresh mushrooms from Pune and still providing consulting to farm as senior mushroom consultant for Sprout Consultancy Services. This total journey is of almost 25 to 30 years only in case of Button mushroom cultivation technology showing efforts and great commitment in the field of Mushrooms. Mr. Jadhav, in this journey had set up of about 10 Button Mushroom plants and all of them are today in very good running conditions giving 100% efficiency in case of production and quality. Now he is associated with Sprout Consultancy Services, Pune as Senior Consultant for Mushroom cultivation.

CHAPTER 10: ECONOMICS OF THE PROJECT

The demand for Oyster Mushroom is increasing rapidly in international markets and a big gap exists between supply and demand. There is need to take advantage of this situation by encouraging its production which is a highly viable venture as brought out below for Kiran Agro Park, Bhilai, Chhattisgarh company putting hands in commercial cultivation of agriculture crops in the country. Company movement in to large scale production of Oyster mushroom would give fast returns to them and will contribute in the wealth of nation.

Detailed information regarding economics of the project is provided as follows;

※ Note. This Estimated Project Cost is not applicable as per bank. Please see the project Cash in Appraisal of Term Loan. Given All projected Amt. is sequence.

ANNEXURE 1: ESTIMATED PROJECT COST

	Estimated Project Cost for Kiran Agro Park.						
I	Fixed Cost estimation						
No	Particulars	Nos.	Unit	Basis	Unit Cost (Rs.)	Quantity	Total Cost (Rs)
A	**Land & Site Development**						
1	Land	Nil	Sqft	Nil	Nil	7000	150000
	Sub Total						**150000**
B	**Building Structure**						
1	Straw Storage Shade	1	Sqft	20x25	150	500	75000
2	Straw soaking room	1	sqft	30x10	300	300	90000
3	Sterilization system room	1	sqft	30x10	300	300	90000
4	Spawning/Bed filling room	1	Sqft	30x10	350	300	105000
5	Incubation room	1	Sqft	20x25	350	500	175000
6	Growing/ Harvesting room	1	Sqft	40x25	350	1000	350000
7	Mushroom Processing Unit (Drying Room)	1	Sqft	20x10	300	200	60000
8	Dry Mushroom storage room	1	Sqm	20x10	300	200	60000
9	Office /Staff room/ Rest room	1	Sqft	20x15	300	300	90000
10	Spawn Lab	1	Sqft	20x25	350	500	175000
11	Training Centre room	1	Sqft	20x15	300	300	90000
12	Architect Plan Fees	1	%	Nil	Nil	2.00%	28800
	Sub Total						**1388800**
C	**Plant & Machinery**						
1	Sterilization system	1	Nil	Nil	Nil	Nil	190000
2	Electric Tray dryer	1	Nil	Nil	Nil	Nil	75000
3	Ms racks	Nil	Nil	Nil	Nil	Nil	175000
4	Humidity maintaining and controlling system	Nil	Nil	Nil	Nil	Nil	75000
5	Ventilation system	Nil	Nil	Nil	Nil	Nil	20000
6	Temperature maintaining and controlling system	Nil	Nil	Nil	Nil	Nil	30000
7	Thermometers & Hygrometers	Nil	Nil	Nil	Nil	Nil	7000
8	Straw chopping machine	Nil	Nil	Nil	Nil	Nil	25000
9	Water Spraying system	Nil	Nil	Nil	Nil	Nil	5000
10	Spawn Lab Equipments	Nil	Nil	Nil	Nil	Nil	500000
11	Sealing Machines	Nil	Nil	Nil	Nil	Nil	7000
12	Other Miscellaneous Equipments	Nil	Nil	Nil	Nil	Nil	5000

	Sub Total						**1114000**
D	**Miscellaneous Fixed Assets**	Nil	Nil	Nil	Nil	Nil	
A	Furniture and other equipments	Nil	Nil	Nil	Nil	Nil	35000
	Sub Total	Nil	Nil	Nil	Nil	Nil	**35000**
E	**Pre-Operative Expenses**						**2687800**
B	Professional consulting charges	Nil	%	Nil	Nil	7%	**188200**
	Sub Total						
	Total fixed cost						**2876000**
F	**Working Capital Requirement for 1 cysle of 45 to 50 days**	Nil	nil	nil	nil	Nil	**142000**
G	**Total Final Cost of the project**						**3018000**

	Estimated Project Cost	
Sr. No.	**Cost of the Items**	**Amt. (Rs. in Lakhs)**
1	**Land Cost**	1.50
2	**Building (Civil & Structural Work)**	13.89
3	**Machinery & Equipments**	11.14
4	**Furniture & Fixtures**	0.35
5	**Preliminary & Preoperative Expenses**	1.88
6	**Margin for Working Capital**	1.42
	Total Cost of the Project	30.18
Sr. No.	**Means of Finance**	**Amt. (Rs. in Lakhs)**
1	**Promoters Contribution (20%)**	6.04
2	**Subsidy**	*
3	**Proposed Bank Loan (80%)**	24.14
	Total Means of Finance	30.18

Note: Subsidy by NHM for the Mushroom project is back-ended. Hence subsidy amount is included in the term loan amount and the same is ignored while calculating interest on term loan.

Following annexure will focus on Ratio Analysis Working for the project.

ANNEXURE 2: INTERNAL RATE OF RETURN

Internal Rate of Return			**34.21%**
Cash Flow	**Discounting Factor**	**Net Cash Flow**	**Discounted Cash Flow**
Cash Outflows at year 0	1.00000	(2,726,000)	(2,726,000)
Net Cash inflows at year 1	0.74512	616,142	459,101
Net Cash inflows at year 2	0.55521	1,262,857	701,147
Net Cash inflows at year 3	0.41370	1,486,547	614,980
Net Cash inflows at year 4	0.30825	1,676,148	516,680
Net Cash inflows at year 5	0.22969	1,889,933	434,093
Net Present Value			**0**

ANNEXURE 3: BENEFIT COST RATIO & NET PRESENT VALUE

Benefit Cost Ratio & Net Present Value			**15.000%**
Cash Flow	**Discounting Factor**	**Net Cash Flow**	**Discounted Cash Flow**
Cash Outflows at year 0	1.00000	(2,726,000)	(2,726,000)
Net Cash inflows at year 1	0.86957	616,142	535,776
Net Cash inflows at year 2	0.75614	1,262,857	954,901
Net Cash inflows at year 3	0.65752	1,486,547	977,429
Net Cash inflows at year 4	0.57175	1,676,148	958,343
Net Cash inflows at year 5	0.49718	1,889,933	939,631
Present Value of discounted Cash Inflow			4,366,079
Present Value of discounted Cash Outflow			2,726,000
Net Present Value (Rs.)			**1,640,079**
Benefit Cost Ratio			**1.60**

ANNEXURE 4: PAY BACK PERIOD

Pay Back Period	Pay Back Period (Without Discounting)	Discounted Pay Back Period
Year	Cumulative Net Cash Flow	Cumulative Discounted Cash Flow
Year 0	(2,726,000)	(2,726,000)
Year 1	(2,109,858)	(2,190,224)
Year 2	(847,001)	(1,235,323)
Year 3	639,546	(257,894)
Year 4	2,315,694	700,449
Year 5	4,205,627	1,640,079
Pay Back Period	2 Years & 7 Months	3 Years & 3 Months

ANNEXURE 5: BREAK EVEN ANALYSIS

Break Even Point (Kgs)	2012-13	2013-14	2014-15	2015-16	2016-17
Fixed Cost:	**418,831**	**394,033**	**363,335**	**337,756**	**316,754**
Repairs & Maintenance	20,378	22,416	24,657	27,123	29,835
Other Operational Expenses	16,333	30,800	33,880	37,268	40,995
Office & General Expenses	10,000	11,000	12,100	13,310	14,641
Insurance charges	25,000	22,000	19,000	16,000	13,000
Depreciation & Amortization	347,120	307,817	273,698	244,055	218,283
Revenue	**1,653,750**	**3,118,500**	**3,430,350**	**3,773,385**	**4,150,724**
Variable Costs:					
Raw Material Cost	385,875	727,650	800,415	880,457	968,502
Labour Charges	115,500	217,800	239,580	263,538	289,892
Fuel & Electricity Expenses	60,610	114,293	125,722	138,295	152,124
Packing Material Cost	36,750	69,300	76,230	83,853	92,238
Transportation Charges	31,646	59,675	65,643	72,207	79,427
Water Charges	10,208	19,250	21,175	23,293	25,622
Contribution (Revenue - Variable Cost)	**1,013,161**	**1,910,532**	**2,101,585**	**2,311,744**	**2,542,918**
Yearly Processed output (Kgs)	3,150	4,725	4,725	4,725	4,725
Contribution per unit	322	404	445	489	538
Capacity (Kgs)	4,725	4,725	4,725	4,725	4,725
Break-even Point Units (Kgs)	**1,302**	**974**	**817**	**690**	**589**
Break-even Point %	*28%*	*21%*	*17%*	*15%*	*12%*
Margin of Safety (Kgs)	**3,423**	**3,751**	**3,908**	**4,035**	**4,136**
Margin of Safety %	*72%*	*79%*	*83%*	*85%*	*88%*

ANNEXURE 6: DEBT SERVICE COVERAGE RATIO (DSCR)

Debt Service Coverage Ratio (DSCR)	2012-13	2013-14	2014-15	2015-16	2016-17
Cover:					
Net Profit After Tax	347,334	1,024,402	1,227,617	1,448,337	1,689,519
Depreciation & Amortization	347,120	307,817	273,698	244,055	218,283
Term Loan Interest	230,625	295,924	227,368	147,792	55,423
Cover Total	**925,079**	**1,628,144**	**1,728,683**	**1,840,184**	**1,963,224**
Service:					
Term Loan Principal Repayment	250,967	426,464	495,020	574,596	666,953
Term Loan Interest	230,625	295,924	227,368	147,792	55,423
Capital Withdrawal	42,000	132,000	145,200	159,720	175,692
Service Total	**523,592**	**854,388**	**867,588**	**882,108**	**898,068**
DSCR	**1.77**	**1.91**	**1.99**	**2.09**	**2.19**

Minimum DSCR	**1.77**
Maximum DSCR	**2.19**
Average DSCR	**1.99**

Here in follows all the financial statements of the project would start.

ANNEXURE 7: PROJECTED PROFIT & LOSS ACCOUNT

Projected Profit & Loss Account							
Ref. No.	**Particulars**	**Schedule**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
A	**Sales Revenue**	A	1,653,750	3,118,500	3,430,350	3,773,385	4,150,724
B	**Total Income / Revenue (Rs)**		**1,653,750**	**3,118,500**	**3,430,350**	**3,773,385**	**4,150,724**
C	Raw Material Cost	B	385,875	727,650	800,415	880,457	968,502
D	Labour Charges	C	115,500	217,800	239,580	263,538	289,892
E	Fuel & Electricity Expenses	D	60,610	114,293	125,722	138,295	152,124
F	Packing Material Cost	E	36,750	69,300	76,230	83,853	92,238
G	Transportation Charges		31,646	59,675	65,643	72,207	79,427
H	Water Charges		10,208	19,250	21,175	23,293	25,622
I	Repairs & Maintenance		20,378	22,416	24,657	27,123	29,835
J	Other Operational Expenses		16,333	30,800	33,880	37,268	40,995
K	Office & General Expenses		10,000	11,000	12,100	13,310	14,641
L	Insurance charges		25,000	22,000	19,000	16,000	13,000
	Total Cost (Rs)		**712,300**	**1,294,184**	**1,418,402**	**1,555,342**	**1,706,277**
M	**Operating Profit (Rs)**		**941,450**	**1,824,316**	**2,011,948**	**2,218,043**	**2,444,447**
N	Interest		230,625	295,924	227,368	147,792	55,423
O	Depreciation & Amortization		347,120	307,817	273,698	244,055	218,283
P	Net Profit before Tax		363,705	1,220,575	1,510,882	1,826,195	2,170,741
Q	Tax		16,370	196,172	283,265	377,859	481,222
R	**Profit After Tax (Rs)**		**347,334**	**1,024,402**	**1,227,617**	**1,448,337**	**1,689,519**

Here in follows all the financial statements of the project would start.

ANNEXURE 7: PROJECTED PROFIT & LOSS ACCOUNT

Projected Profit & Loss Account							
Ref. No.	**Particulars**	**Schedule**	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
A	**Sales Revenue**	A	1,653,750	3,118,500	3,430,350	3,773,385	4,150,724
B	**Total Income / Revenue (Rs)**		**1,653,750**	**3,118,500**	**3,430,350**	**3,773,385**	**4,150,724**
C	Raw Material Cost	B	385,875	727,650	800,415	880,457	968,502
D	Labour Charges	C	115,500	217,800	239,580	263,538	289,892
E	Fuel & Electricity Expenses	D	60,610	114,293	125,722	138,295	152,124
F	Packing Material Cost	E	36,750	69,300	76,230	83,853	92,238
G	Transportation Charges		31,646	59,675	65,643	72,207	79,427
H	Water Charges		10,208	19,250	21,175	23,293	25,622
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J	Other Operational Expenses		16,333	30,800	33,880	37,268	40,995
K	Office & General Expenses		10,000	11,000	12,100	13,310	14,641
L	Insurance charges		25,000	22,000	19,000	16,000	13,000
	Total Cost (Rs)		**712,300**	**1,294,184**	**1,418,402**	**1,555,342**	**1,706,277**
M	**Operating Profit (Rs)**		**941,450**	**1,824,316**	**2,011,948**	**2,218,043**	**2,444,447**
N	Interest		230,625	295,924	227,368	147,792	55,423
O	Depreciation & Amortization		347,120	307,817	273,698	244,055	218,283
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Q	Tax		16,370	196,172	283,265	377,859	481,222
R	**Profit After Tax (Rs)**		**347,334**	**1,024,402**	**1,227,617**	**1,448,337**	**1,689,519**

ANNEXURE 8: SCHEDULES TO PROFIT & LOSS ACCOUNT

Schedules to Profit & Loss Account				
A	**Sales Revenue of Mushroom**	**Output (Kg/day)**	**Selling Price/Kg**	**Sale (Rs.)**
	Daily Sales Revenue (Rs.) - Dry Oyster Mushroom	15	600	9,000
	Sales Revenue per Life Cycle of 45 days	675		405,000
	Annual (7 Life Cycles) Sales Revenue (Rs.)	**4,725**		**2,835,000**

B	**Raw Material Cost**	**Unit Rate per Kg. (Rs.)**	**Quantity per Life Cycle (Kgs)**	**No. of Life Cycles in a year**	**Annual Raw Material Cost (Rs.)**
1	Straw (Wheat/Soya/Paddy/Cotton etc.)	6	9,000	7	378,000
2	Spawn (Seed for cultivation)	50	750	7	262,500
3	Chemicals				21,000
	Annual Raw Material Cost (Rs.)				**661,500**

C	**Labour Cost**	**No. of Staff**	**Labour Cost per month**	**Yearly Labour Cost**
1	Supervisor	1	3,000	36,000
2	Skilled labour	2	2,500	60,000
3	Unskilled labour	3	2,000	72,000
4	Salesman	1	2,500	30,000
	Total Labour Cost (Rs)			**198,000**

D	**Fuel & Electricity Charges**	
	Daily Units consumed	45
	Average Rate per unit (Rs)	7.33
	Daily Electricity Charges (Rs)	330
	Electricity Charges per Life Cycle (Rs)	14,843
	Yearly Fuel & Electricity Charges (Rs)	**103,903**

ANNEXURE 8: SCHEDULES TO PROFIT & LOSS ACCOUNT

Schedules to Profit & Loss Account				
A	**Sales Revenue of Mushroom**	**Output (Kg/day)**	**Selling Price/Kg**	**Sale (Rs.)**
	Daily Sales Revenue (Rs.) - Dry Oyster Mushroom	15	600	9,000
	Sales Revenue per Life Cycle of 45 days	675		405,000
	Annual (7 Life Cycles) Sales Revenue (Rs.)	**4,725**		**2,835,000**

B	**Raw Material Cost**	**Unit Rate per Kg. (Rs.)**	**Quantity per Life Cycle (Kgs)**	**No. of Life Cycles in a year**	**Annual Raw Material Cost (Rs.)**
1	Straw (Wheat/Soya/Paddy/Cotton etc.)	6	9,000	7	378,000
2	Spawn (Seed for cultivation)	50	750	7	262,500
3	Chemicals				21,000
	Annual Raw Material Cost (Rs.)				**661,500**

C	**Labour Cost**	**No. of Staff**	**Labour Cost per month**	**Yearly Labour Cost**
1	Supervisor	1	3,000	36,000
2	Skilled labour	2	2,500	60,000
3	Unskilled labour	3	2,000	72,000
4	Salesman	1	2,500	30,000
	Total Labour Cost (Rs)			**198,000**

D	**Fuel & Electricity Charges**	
	Daily Units consumed	45
	Average Rate per unit (Rs)	7.33
	Daily Electricity Charges (Rs)	330
	Electricity Charges per Life Cycle (Rs)	14,843
	Yearly Fuel & Electricity Charges (Rs)	**103,903**

E	**Packing Material Cost**	
1	PP Bags (18"x36") of 100 gauge	6,000
2	PP bags for fresh and Dry mushroom	3,000
	Total Packing Material cost per Life Cycle	9,000
	Annual Packing Material Cost (Rs)	**63,000**

ANNEXURE 9: PROJECTED BALANCE SHEET

Projected Balance Sheet					
Particulars	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Assets:					
Fixed Assets (Net Block)	**2,378,320**	**2,108,143**	**1,872,085**	**1,665,670**	**1,485,027**
Land	150,000	150,000	150,000	150,000	150,000
Building Structure	1,249,920	1,124,928	1,012,435	911,192	820,073
Machinery	946,900	804,865	684,135	581,515	494,288
Furniture & Fixtures	31,500	28,350	25,515	22,964	20,667
Current Assets	**441,300**	**1,250,318**	**2,118,921**	**3,085,255**	**4,159,495**
Sundry Debtors	118,125	222,750	245,025	269,528	296,480
Cash Balance	323,175	1,027,568	1,873,896	2,815,727	3,863,015
Miscellaneous Assets	**150,560**	**112,920**	**75,280**	**37,640**	-
Pre-operating Expenses	150,560	112,920	75,280	37,640	-
Total Assets	**2,970,180**	**3,471,381**	**4,066,286**	**4,788,565**	**5,644,522**
Liabilities:					
Capital Account	**767,334**	**1,659,737**	**2,742,154**	**4,030,771**	**5,544,598**
Introduced	462,000	-	-	-	-
Net Profit	347,334	1,024,402	1,227,617	1,448,337	1,689,519
Total	809,334	1,024,402	1,227,617	1,448,337	1,689,519
Drawings	42,000	132,000	145,200	159,720	175,692
Term Loan from Bank	**2,163,033**	**1,736,569**	**1,241,550**	**666,953**	-
Current Liabilities & Provisions	**39,813**	**75,075**	**82,583**	**90,841**	**99,925**
Sundry Creditors	30,188	56,925	62,618	68,879	75,767
Provision for expenses	9,625	18,150	19,965	21,962	24,158
Total Liabilities	**2,970,180**	**3,471,381**	**4,066,286**	**4,788,565**	**5,644,522**

ANNEXURE 10: FIXED ASSETS & DEPRECIATION SCHEDULE

Fixed Assets & Depreciation schedule					
Land	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Opening Balance	150,000	150,000	150,000	150,000	150,000
Additions	-	-	-	-	-
Total	150,000	150,000	150,000	150,000	150,000
Depreciation	-	-	-	-	-
Closing Balance	150,000	150,000	150,000	150,000	150,000
Building Structure	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Opening Balance	-	1,249,920	1,124,928	1,012,435	911,192
Additions	1,388,800	-	-	-	-
Total	1,388,800	1,249,920	1,124,928	1,012,435	911,192
Depreciation	138,880	124,992	112,493	101,244	91,119
Closing Balance	1,249,920	1,124,928	1,012,435	911,192	820,073
Machinery	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Opening Balance	-	946,900	804,865	684,135	581,515
Additions	1,114,000	-	-	-	-
Total	1,114,000	946,900	804,865	684,135	581,515
Depreciation	167,100	142,035	120,730	102,620	87,227
Closing Balance	946,900	804,865	684,135	581,515	494,288
Furniture & Fixtures	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Opening Balance	-	31,500	28,350	25,515	22,964
Additions	35,000	-	-	-	-
Total	35,000	31,500	28,350	25,515	22,964
Depreciation	3,500	3,150	2,835	2,552	2,296
Closing Balance	31,500	28,350	25,515	22,964	20,667

ANNEXURE 11: TERM LOAN REPAYMENT SCHEDULE

Term Loan Repayment Schedule												(Rs. in '000)
Particulars	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
2012-13												
Opening Balance	-	-	-	-	2,414	2,384	2,354	2,323	2,292	2,260	2,228	2,196
Interest due	-	-	-	-	30	30	29	29	29	28	28	27
Total	-	-	-	-	2,444	2,414	2,383	2,352	2,320	2,288	2,256	2,223
Repayment	-	-	-	-	60	60	60	60	60	60	60	60
Closing Balance	-	-	-	-	2,384	2,354	2,323	2,292	2,260	2,228	2,196	2,163
2013-14												
Opening Balance	2,163	2,130	2,096	2,062	2,028	1,993	1,958	1,922	1,886	1,849	1,812	1,775
Interest due	27	27	26	26	25	25	24	24	24	23	23	22
Total	2,190	2,156	2,122	2,088	2,053	2,018	1,982	1,946	1,909	1,872	1,835	1,797
Repayment	60	60	60	60	60	60	60	60	60	60	60	60
Closing Balance	2,130	2,096	2,062	2,028	1,993	1,958	1,922	1,886	1,849	1,812	1,775	1,737
2014-15												
Opening Balance	1,737	1,698	1,659	1,620	1,580	1,539	1,498	1,457	1,415	1,372	1,329	1,286
Interest due	22	21	21	20	20	19	19	18	18	17	17	16
Total	1,758	1,719	1,680	1,640	1,599	1,558	1,517	1,475	1,433	1,389	1,346	1,302
Repayment	60	60	60	60	60	60	60	60	60	60	60	60
Closing Balance	1,698	1,659	1,620	1,580	1,539	1,498	1,457	1,415	1,372	1,329	1,286	1,242
2015-16												
Opening Balance	1,242	1,197	1,152	1,106	1,059	1,012	965	917	868	819	769	718
Interest due	16	15	14	14	13	13	12	11	11	10	10	9
Total	1,257	1,212	1,166	1,120	1,073	1,025	977	928	879	829	778	727
Repayment	60	60	60	60	60	60	60	60	60	60	60	60
Closing Balance	1,197	1,152	1,106	1,059	1,012	965	917	868	819	769	718	667
2016-17												
Opening Balance	667	615	563	509	456	401	346	290	233	176	118	59
Interest due	8	8	7	6	6	5	4	4	3	2	1	1
Total	675	623	570	516	461	406	350	294	236	178	120	60
Repayment	60	60	60	60	60	60	60	60	60	60	60	60
Closing Balance	615	563	509	456	401	346	290	233	176	118	59	0

ANNEXURE 12: PROJECTED CASH FLOW STATEMENT

Projected Cash Flow Statement					
Particulars	**2012-13**	**2013-14**	**2014-15**	**2015-16**	**2016-17**
Applications of Funds:					
Fixed Assets purchase	2,726,000	-	-	-	-
Increase in working Capital	78,313	69,363	14,768	16,244	17,869
Loan Principal Repayment	250,967	426,464	495,020	574,596	666,953
Capital Withdrawal	42,000	132,000	145,200	159,720	175,692
Total	**3,097,280**	**627,826**	**654,987**	**750,560**	**860,514**
Sources of Funds:					
Capital introduced	312,000	-	-	-	-
Term Loan from Bank	2,414,000				
Net Profit after Tax	347,334	1,024,402	1,227,617	1,448,337	1,689,519
Depreciation & Amortization	347,120	307,817	273,698	244,055	218,283
Total	**3,420,454**	**1,332,219**	**1,501,315**	**1,692,392**	**1,907,802**
Closing Cash Balance	**323,175**	**1,027,568**	**1,873,896**	**2,815,727**	**3,863,015**

ANNEXURE 13: FINANCIAL BENCHMARKS – RATIO ANALYSIS

	FINANCIAL BENCHMARKS – RATIO ANALYSIS		
	Ratio	**Formula**	
1	Benefit Cost Ratio	Present Value of Discounted Cash Inflow/Present Value of Discounted Cash Outflow	1.60
2	Break Even Point (Kgs)	Fixed Cost/(Revenue - Variable Cost) at project stabilization stage i.e. 3rd year	817
3	Net Present Value (Rs)	Present Value of Discounted Cash Inflow - Present Value of Discounted Cash Outflow	1,640,079
4	Pay Back Period (Without Discounting)	Period at which initial investment is fully recovered	2 Years 7 Months
5	Discounted Pay Back Period	Period at which initial investment is fully recovered calculated w.r.t. discounted cash flows	3 Years 3 Months
6	Internal Rate of Return	Rate at which Outflow equal to present value of sum of future project Inflows	34.21%
7	Debt Service Coverage Ratio	Debt Cover / Debt Service	1.99

ANNEXURE 14: PROJECT IMPLEMENTATION SCHEDULE

A.	Project Implementation Schedule	
Sr. No.	**Stage of Implementation**	**Proposed Month of completion**
1	Completion of Civil Work	Jan-13 ~~Aug-12~~
2	Installation of Machinery	Jan-13 Sep-12
3	Commencement of economic activity	Jan-13 Sep-12
B.	**Personnel Details**	Local unemployed youth will get employment opportunity through this project directly or indirectly. Expected employment generation through this project - 1 supervisor, 2 skilled labour, 3 unskilled labour & 1 salesman.
※ 1 Skilled & 3 Unskilled labour are women.		
C.	**Assumptions**	1. Project is assumed to be operational for 7 months during first year of its operations and for 315 days each during remaining years 2. Depreciation & amortization is provided as per the provisions of the Income Tax Act, 1961 3. Debtors and creditors are assumed to be at 50% of sales and 50% of purchases during one Mushroom life cycle respectively. 4. Subsidy is assumed to be included in the term loan amount and the same is ignored while calculating interest on term loan. 5. Term loan to the extent of 75% of the project cost is assumed to be availed from Bank with repayment period of 56 months at interest rate of 15% p.a. 6. Provision for expenses mainly pertains to provision for outstanding salary & wages for one month. All other operational expenses are assumed to be paid once these are due. 7. For calculating Benefit Cost ratio, Net Present Value and Discounted Payback Period, discounting factor of 15% is considered.

Note: Project details compiled from information & explanations provided by the promoter.