Pre-Feasibility Study

MUSHROOM FARMING

Small and Medium Enterprises Development Authority

Ministry of Industries and Production

Government of Pakistan

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Table of Contents

Table of Tables

Table of Figures

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2. EXECUTIVE SUMMARY

Throughout the history of mankind, mushrooms have been labeled with varying reputations, considered both food and foe. Mushrooms (the term used to identify the edible sporophores) are the fleshy, spore-bearing[1] fruiting body of a fungus. These are typically produced above ground on soil or on its food source. Mushrooms are not plants because they do not make their own food (plants use photosynthesis process to make food). So mushrooms are placed in a kingdom of fungi[2] apart from plants and animals. These grow on naturally available decaying materials. If suitable climatic conditions and growing medium (decaying material) are available to the spore of mushroom fungi, these develop into the (wild or cultivated) mushrooms.

Hundreds of mushroom species are found in nature. Some of those are edible (such as Agaricus Bisporus (Button Mushroom), Pleurotus Ostreatus (Oyster Mushroom), Pleurotus Eryngii (King Oyster Mushroom), Calocybe Indica (Milky Mushroom) etc. Many others are poisonous and non-edible (such as Amanita Phalloides, Conocybe Filaris, Cortinarius, Galerina Marginata, etc.). Most of the mushrooms that are consumed by humans are formally cultivated.

Mushrooms contain essential vitamins and minerals which make them an excellent addition to human diet, contributing positively to human health. Loaded with many health-boosting vitamins, minerals, and antioxidants, they have long been recognized as an important part of the human food chain.

The proposed business project of “Mushrooms Farming” grows two types of edible mushrooms: Agaricus Bisporus, commonly known as button mushroom and Pleurotus Ostreatus, commonly known as oyster mushroom. These edible mushrooms are grown by providing suitable cultivation medium and controlled climatic conditions to the mushroom propagating material, using different materials and equipment to carry out the required processes and techniques, as per the recommended parameters.

The project is suggested to be located in or around a large city; since mushrooms are largely consumed by the urban population. Also, the required agriculture inputs for mushroom farming are easily available in large cities. Therefore, the proposed mushroom farm would ideally be located in or around major cities of Pakistan like Karachi, Lahore, Islamabad, Faisalabad, Islamabad, Peshawar, Quetta, Hyderabad, Rawalpindi and other cities of Pakistan. These cities are suitable also due to the availability of good infrastructure and skilled personnel.

It is assumed that the production capacity for the mushroom farm is 70% during the first year of its operations. The capacity will increase at the rate of 5% per annum attaining 90% of its total in 5 years. The farm will annually produce 9,450 kg of button mushroom in 7 production cycles in a year and 20,250 kg of oyster mushroom in 12

[1] without flower or bloom and not producing seeds.

[2] A fungus (plural: fungi) is a type of eukaryotic organism belonging to the kingdom Fungi, alongside plants, animals, protozoa, and monera. Fungi are incredibly diverse, with commonly encountered forms including yeast, molds, truffles, and mushrooms.

production cycles in a year. The proposed farm will sell its production in both wholesale and retail markets in the proportion of 60:40 respectively in the packing sizes of 150-gram, 250 gram and 1000 gram.

At maximum capacity, in the wholesale market, button mushroom production will be distributed into 20,412 packets which include 11,340 150-gram packets, 6,804 250-gram packets and 2,268 1000-gram packets. Oyster mushroom production will be distributed into 43,740 packets which include 24,300 150-gram packets, 14,580 250-gram packets and 4,860 1000-gram packets. In the retail market, button mushroom production will be distributed into 13,608 packets which include 7,560 150-gram packets, 4,536 250-gram packets and 1,512 1000-gram packets. Oyster mushroom production will be distributed into 29,160 packets which include 16,200 150-gram packets, 9,720 250-gram packets and 3,240 1000-gram packets.

At initial year production capacity utilization of 70%, in the wholesale market, button mushroom production will be distributed into 14,289 packets which include 7,938 150-gram packets, 4,763 250-gram packets and 1,588 1000-gram packets. Oyster mushroom production will be distributed into 30,618 packets which include 17,010 150-gram packets, 10,206 250-gram packets and 3,402 1000-gram packets. In the retail market, button mushroom production will be distributed into 9,525 packets which include 5,292 150-gram packets, 3,175 250-gram packets and 1,058 1000-gram packets. Oyster mushroom production will be distributed into 20,412 packets which include 11,340 150-gram packets, 6,804 250-gram packets and 2,268 1000-gram packets.

This farm will be set up in a rented building with an area of 3,600 square feet (16 Marla). The proposed business requires a total investment of PKR 22.16 million. This includes capital investment of PKR 20.80 million and working capital of PKR 1.35 million. The project will be established using 100% equity financing. The Net Present Value (NPV) of project is PKR 15.56 million with an Internal Rate of Return (IRR) of 39% and a Payback period of 3.11 years. Further, this project is expected to generate Gross Annual Revenues of PKR 35.60 million during 1st year, Gross Profit (GP) ratio ranging from 47% to 55% and Net Profit (NP) ratio ranging from 6% to 23% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at capacity of 58% (61,764 packets) with annual breakeven revenue of PKR 29.37 million.

The proposed project may also be established using leveraged financing. At 50% financing at a cost of KIBOR+3%, the proposed business provides Net Present Value (NPV) of PKR 19.72 million, Internal Rate of Return (IRR) of 38% and Payback period of 3.17 years. Further, this project is expected to generate Net Profit (NP) ratio ranging from 6% to 23% during the projection period of ten years. The proposed project will achieve its estimated breakeven point at 58% of its total service capacity (62,401 packets), with breakeven revenue of PKR 29.67 million.

The proposed project will provide employment opportunities to 29 people, working in a single shift of 8 hours each during 360 days in a year. High return on investment and

steady growth of business is expected to the entrepreneur having some prior experience or education in the related field of business. The legal business status of this project is proposed as “Sole Proprietorship” or “Partnership “concern.

3. INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with the objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out ‘sectorial research’ to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives.

Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need-based capacity building programs of different types in addition to business guidance through help desk services.

National Business Development Program for SMEs (NBDP) is a project of SMEDA, funded through Public Sector Development Program of Government of Pakistan.

The NBDP envisages provision of handholding support / business development services to SMEs to promote business startup, improvement of efficiencies in existing SME value chains to make them globally competitive and provide conducive business environment through evidence-based policy-assistance to the Government of Pakistan. The Project is objectively designed to support SMEDA's capacity of providing an effective handholding to SMEs. The proposed program aimed at facilitating around 314,000 SME beneficiaries over a period of five years.

4. PURPOSE OF THE DOCUMENT

The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management.

The purpose of this document is to facilitate potential investors in setting up a “Mushrooms Farming” by providing a general understanding of the business with the intention of supporting them in investment decisions.

The need to come up with pre-feasibility reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by trial and error, and certain industrial norms that become a guiding source regarding various aspects of business setup and its successful management.

Apart from carefully studying the whole document one must consider critical aspects provided later on, which form the basis of any investment decision.

5. BRIEF DESCRIPTION OF PROJECT & PRODUCTS

Mushrooms are the edible fleshy fruiting bodies which have a long association with humankind and provide profound biological and economic benefits. Since ancient times, man has been consuming wild mushrooms as a delicacy[3] to enjoy its pleasing taste. Edible mushrooms provide high quantity and quality of protein that can be produced with greater biological efficiency than animal protein. Mushrooms are rich in fiber, minerals and different types of vitamins.

As mushrooms have no leaves, roots or seeds, they are not considered vegetables and fall under the category of fungi. Plants having chlorophyll, manufacture their food by the process of photosynthesis in the presence of sunlight. Fungi are devoid of chlorophyll and thus cannot produce their own food. However, mushrooms are still consumed as vegetables.

There are thousands of types of mushrooms in the world. Majority of the types are grown wild and all are not edible. Out of over 2000 identified varieties of edible mushrooms, around twenty varieties are under commercial cultivation. There are four types of mushrooms which are more popular with respect to their commercial potential. The common and botanical names of those mushrooms are shown in Table 1.

Table 1: Four Popular Mushroom Types

Sr. No.	Common Name	Botanical Name
1.	Button Mushroom	Agaricus Bisporus
2.	Oyster Mushroom	Pleurotus Ostreatus
3.	King Oyster Mushroom	Pleurotus Eryngii
4.	Milky Mushroom	Calocybe Indica

[3] something pleasing to eat that is considered rare or luxurious

The four popular types of mushrooms are shown in Figure 1, Figure 2, Figure 3 and Figure 4.

Figure 1: Button Mushrooms

Figure 2: Oyster Mushrooms

Figure 3: King Oyster Mushrooms

Figure 4: Milky Mushrooms

Mushroom farming today, is being practiced in more than 100 countries, and its production is continuously increasing. 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. Cultivation of mushrooms is commercially carried out by providing suitable growing media and maintaining the required climatic conditions for getting maximum production.

Mushroom cultivation is also important from the perspective of bringing in diversification in the local farming system. Mushroom cultivation, not only helps increase diversification, but also helps in addressing the problems of quality food, health and environment related issues. Utilizing agro-industrial wastes for growing mushrooms can enhance incomes and help better achieve sustainability in the local agriculture. Commercial production of edible mushrooms converts the agricultural, industrial, forestry and household wastes into nutritious food (mushrooms).

Uses of Mushrooms

Mushrooms, being edible, delicious, and healthy products, are used to prepare different cuisines all around the world. Some mushrooms are also used for medicinal and many other purposes. Different uses of mushrooms are discussed below:

Uses of Mushrooms as Food

Mushrooms have a unique texture, good aroma, taste and flavor that makes them unique when compared to many other types of food. Mushrooms are highly nutritive food, offering rich supply of quality proteins, vitamins and minerals. They are an important natural source of food having high fiber, low fat and low starch. Edible mushrooms have been considered to be ideal food for obese[4] persons and for diabetics to prevent hyperglycemia. These may be fried, stir-fried, roasted, used as toppings on pizza, and may be added to soups, creamy sauces and pastas. Figure 5 and Figure 6 shows dishes prepared with mushrooms.

Figure 5: Mushrooms Uses as Food

[4] Body weight that is greater than what is considered normal or healthy for a certain height.

Figure 6: Mushrooms Uses as Food

Uses of Mushrooms as Medicine

Mushrooms represent not only a source of nutrients but also have high medicinal value, useful in preventing diseases such as hypertension, diabetes, hypercholesterolemia and cancer. Some mushrooms species have antitumor, antiviral, and antithrombotic and immunomodulation properties. Some mushrooms also have potential to lower elevated blood sugar levels.

Uses of Mushroom in Environment Conservation

Mushrooms, being fungi, are classified as primary decomposers in the ecosystem. Decomposers are crucial in the recycling of organic matter within the ecosystem because these break down the decaying organic matter into absorbable nutrients. Unlike plants, fungi lack chlorophyll and can only make their own food by decomposing dead plant and animal matter. Multiple species of fungi mushrooms excrete enzymes that break down dead and decaying organic material into usable compounds. Figure 7 shows mushroom application as decomposer.

Figure 7: Mushroom Application as Decomposer

There are thousands of species of mushrooms in the world, many of which are grown wild. All types of mushrooms are not edible, majority are non-edible and poisonous. Out of the approximately 13,000 identified varieties of edible mushrooms, there are limited varieties which are used for commercial cultivation. In the proposed project, it has been assumed that the business grows two types of mushrooms which are more popular with respect to their commercial potential. These are commonly known as Button Mushroom and Oyster Mushroom. Descriptions of these two types of mushrooms are as follows:

Button Mushroom (Agaricus Bisporus)

The white mushrooms, resembling the shape of buttons, are commonly known as Button mushroom. These are naturally grown in meadows, and thus are also called meadow mushrooms. Another name of these mushrooms is European mushroom. These are grown and consumed in large quantities throughout the world. These are also the least expensive, have the mildest flavor, though these readily absorb the flavors of other ingredients with which these are cooked. These may be eaten raw, or cooked via sautéing, stir-frying, grilling, braising or roasting. Figure 8 shows Button mushrooms.

Figure 8: Button Mushroom

Oyster Mushroom (Pleurotus Ostreatus)

Oyster Mushrooms are one of the most common types of cultivated mushrooms in the world. These are also known as Pearl Oyster mushrooms or Tree Oyster mushrooms. Oyster mushrooms are loved for their delicate texture and mild, savory flavor. They are eaten in a variety of cuisines and are especially popular in Chinese, Japanese and Korean cooking. Oyster mushrooms are loaded with fiber, vitamins, minerals, and other important nutrients. They are also low in carbohydrates, which makes them a good choice for people following low carb dietary patterns. Figure 9 shows Oyster mushrooms.

Figure 9: Oyster Mushroom

5.1 Opportunity Rationale

Mushroom business has a wide impact on livelihoods and poverty reduction. Mushroom cultivation does not require a lot of land and offers better per acre profits. Mushroom growing does not require large capital investment and the scale of cultivation can be chosen according to the availability of investment. Mushrooms can also be cultivated on a part-time basis with little maintenance. Establishing mushrooms cultivation and processing facility is a good investment opportunity from multiple perspectives. Key factors are discussed below:

5.1.1. Abundant Availability of Raw Material

Pakistan is an agriculture country and there is abundant availability of agriculture raw materials like wheat straw, rice straw, cotton waste, etc. to be used for preparing compost for mushrooms cultivation.

5.1.2. Large Export Market

Mushrooms have a large export market triggered by their increasing global consumption. Pakistan can target to increase mushrooms production to get a respectable share of this large market. Country's existing presence (though small) in mushrooms export market indicate towards this potential and provide a base to further increase this market penetration by realizing new investments in the sector.

5.1.3. Large Local Market

By being a populous country with sizeable middle-to-upper income class, Pakistan can be developed into a large market for mushrooms.

5.1.4. Existing Market Presence

Pakistan already has a presence in mushrooms production and exports. There are number of small producers in Pakistan and the country has small export volumes as

well. This presence can be capitalized upon to further develop the sector to achieve its fullest potential in the years to come.

5.1.5. CPEC

Investments under CPEC can open new opportunities to trade products like mushrooms between Pakistan, China and other countries of the region.

Mushroom Cultivation

The basic concept and procedure for cultivation of Button and Oyster mushrooms is dependent on the compost and spawn. Spawn is mixed with compost and put in a special room or under shade as required for a certain period under required temperature and humidity.

Spawn

The mushroom spores, termed as spawn, constitute the main propagating material for mushroom production. Spawn is the living fungal culture, called Mycelium,[5] grown onto a substrate. It provides the basis of any mushroom growing operation. It is the equivalent of seed for a mushroom farm. Spawn preparation is a highly specialized and technical job, and only large-scale mushroom growers can afford to produce their own spawn. In the proposed project, business will purchase spawn from local commercial spawn producers or suppliers. Figure 10 shows mushroom spawn.

Figure 10: Mushroom Spawn

[5] A mycelium is a network of fungal threads or hyphae. Mycelia often grow underground but can also thrive in other places such as rotting tree trunks. A single spore can develop into a mycelium. The fruiting bodies of fungi, such as mushrooms, can sprout from a mycelium.

Compost

Compost can be made from various things including wheat straw, cotton meal, cotton seed hulls, horse dung and poultry waste. These things are used along with water and gypsum. Composting converts these materials into a suitable nutritional substrate/ medium for the growth of mushrooms. As mushrooms cannot synthesize their food themselves, therefore all the required nutrients are supplied in the compost. Bags are filled with fresh compost and placed in a controlled environment for several days for quality mushroom production. Figure 11 shows different types of materials which may be used as mushroom compost.

Figure 11: Mushroom Compost

Peat Moss

Peat moss remains the primary component for casing layers in the cultivation of mushrooms. Peat moss is combined with limestone and other materials to induce mushroom pinning and development. Layer of peat moss is spread over the compost to maintain humidity and facilitate formation of mushrooms. In the proposed project, it will be used for casing of button mushroom. Figure 12 shows Peat Moss.

Figure 12: Peat Moss

Pasteurization Tunnel

Mushroom pasteurization tunnel, with dimension 15 feet by 15 feet by 9 feet (Length*Width*Height), is a constructed structure, which consists of underground duct system, used to provide moisture to mushroom compost. It is insulated from all sides and is provided with an insulated opening gate. Fresh air is allowed into the tunnel through a small passage. Blower is used to extract air from the insulated tunnel and steam (produced by steam boiler) is injected into the tunnel through underground duct system. Figure 13 shows Mushroom pasteurization tunnel.

Figure 13: Pasteurization Tunnel

Bunker

Bunker is a self-constructed structure, with dimensions 15 feet by 15 feet by 9 feet (Length*Width*Height), which consists of an underground duct system. This duct system is used to provide moisture to mushroom compost. Moisture and humidity of compost is maintained by providing accurate quantity of moist air, supplied under pressure to the compost, using a blower. Blower uses the air extracted from tunnel to increase the moisture level of compost which reduces the ammonia production in compost. Figure 14 mushroom compost bunker.

Figure 14:Mushroom Compost Bunker

5.2 Machinery and Equipment

Details of machinery and equipment used in purposed project are as follows:

Air Handling Unit (AHU)

An air handling unit (commonly called an AHU) is the composition of elements, mounted in large, accessible box-shaped unit. It houses the appropriate ventilation requirements for purifying, air-conditioning or intake the air through ducts, in the building or facility. After attaining the required temperature, the chamber automatically closes to save the electricity cost, and also to save the mushrooms from getting very cool. In the proposed mushroom farming project, the AHU system performs multiple functions, including filtration and control of the quality of the air, control of the indoor air temperature, humidity monitoring for greater indoor comfort and Carbon Dioxide levels through in-built sensors and controls. Figure 15 shows Air Handling Unit.

Figure 15: Air Handling Unit

Compost Turner

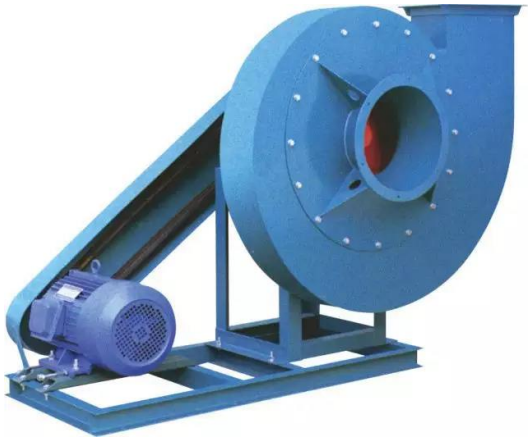
Compost turner is used for mixing or composting of agricultural waste, organic waste, poultry manure, straw, mushroom residue, sugar residue, etc. In the proposed project, a tractor towable compost turner is used to prepare the compost. The whole machine has a hydraulic control system which features pivot steering, large torque, easy moving, and convenient operation. Water can be supplied to the compost, during the turning by a pull behind or mounted water tank. It can be towed with the tractor of 60 HP or more. Figure 16 shows compost turner.

Figure 16: Compost Turner

Blower

Blower, commonly known as centrifugal fan, is an equipment which increases the velocity of air or gas when passed through its impellers. It is mainly used for generating a flow of air/gas required for exhausting, aspirating, cooling, ventilating or conveying. In the proposed project, 4 blowers are used. 2 blowers of 3 HP are used to provide exhaust air into the bunker through duct system and 2 blowers of 5 HP are used to extract air from the tunnel to build pressure inside. They have speed of 1500-3000 RPM and air volume of 2100-50000 cubic meter per hour. Figure 17 shows blower.

Figure 17: Blower



Steam Boiler

In the proposed project, pressurized steam is generated inside the boiler by heating water. The steam is transferred through pipes to the point of use. It is a gas-fired operated device. In the proposed project, natural gas is used for steam generation. However, for some basic functioning, the boiler also consumes electricity of 500 watts. It has an evaporation rate of 50-500 kg per hour and steam temperature of 170C and water capacity of 25-50 liter. Figure 18 shows steam boiler.

Figure 18: Steam Boiler

Cold Storage Chamber

Cold storage chamber is a container, maintained at lower temperature, used to store vegetables and fruits. It has an in-built system of maintaining the cooling temperature required for storage. After attaining the required temperature, the chamber automatically closes to save the electricity cost as well as to save the mushroom getting over cooled. In the proposed business model, cold storage chamber will be used to store mushrooms. It has an electricity consumption of 850 watts and temperature range of -40℃ to +10℃. Figure 19 shows cold storage chamber.

Figure 19: Cold Storage Chamber

Mushroom Packing Machine

Mushroom Packing Machine is an automatic packing machine which is used for packing of different types of trays. It has a moving belt conveyor on which the product is placed for keeping it inside the packing machine. A PVC film is wrapped around the tray by this machine. It has an electricity consumption of 1440 watts and packaging capacity of 30 packets/min Figure 20 shows mushroom packing machine

Figure 20: Mushroom Packing Machine

Water Pump

A water pump is a machine used to increase the pressure of water to move it from one point to another. In the proposed project, it will be used for supply of water at different points through rubber pipes. It has an electricity consumption of 0.37 KW. Figure 21 shows water pump.

Figure 21: Water Pump

500 kg Weighing Scale

In the proposed project, weighing scale of 500 kg load capacity is used to weigh raw materials. It has an electricity consumption of 20 Watts. Figure 22 shows weighing scale.

Figure 22: Weight Scale 500kg

Weighing scale of 10 kg

A smaller weight scale of 10 kg load capacity is used to weigh finished goods. It has an electricity consumption of 8 watts. Figure 23 shows weighing scale of 10 kg.

Figure 23: Weight Scale 10Kg

Generator 50 KVA

In the proposed project, a 50 KVA generator is used to provide consistent backup power supply. The fuel tanks of this generator can provide continuous electricity for 8 hours. Figure 24 shows generator 50KVA.

Figure 24: Generator 50KVA

5.3 Consumables Inventory

Consumables inventory required in “Mushroom Farming” is described as follows:

Gardener Forks

A garden fork, spading fork, or digging fork is an agri-implement, with a handle and a square-shouldered head featuring several (usually four) short, sturdy tines. In the proposed project, it will be used for twisting, rotating compost material. Figure 25 shows gardener fork.

Figure 25: Gardener Fork

Harvesting Baskets

In the proposed project, rectangular plastic baskets are used to collect and carry mushrooms after plucking. Figure 26 shows harvesting basket.

Figure 26: Harvesting Basket

Harvesting Knife

In the proposed project, curved stainless steel blade mushroom harvesting knife is used to pluck the mushrooms. Curved blade allows easy slicing through the stem without disrupting or pulling up the mushroom mycelium. Figure 27 shows harvesting knife.

Figure 27: Harvesting Knife

Formalin Solution

In the proposed project, a 37% aqueous (water) solution of formaldehyde, a pungent gas, with the chemical formula HCHO, is used as an antiseptic (disinfectant).

Mushroom Humidifier

In the proposed project, mushroom humidifier is used to spray the formalin solution to make the mushroom chamber safe and disinfectant. Figure 28 shows mushroom humidifier.

Figure 28: Mushroom Humidifier

PP (Polypropylene) Woven Sack Bag

PP sacks are used for packaging various types of products. In the proposed project, these sacks are used to transfer pasteurized compost to spawn filling point. Figure 29 shows pp (polypropylene) woven sack bag.

Figure 29: PP (Polypropylene) Woven Sack Bag

PP (Polypropylene) Plastic Bag

PP plastic bags are flexible thin and are made up of polypropylene material. In the proposed project, breathable polypropylene bags of 8 kg capacity (for button mushroom) and 4 kg capacity (for oyster mushroom), with filters, are used for mushroom growing. These are strong heat resistant bags which are used to sterilize, supplement substrates for mushroom growing and spawn production. Figure 30 shows PP plastic bag.

Figure 30: PP (Polypropylene) Plastic Bag

PVC Watering Pipe

Made of soft plastic, PVC pipe is ideal for watering the plants and trees in gardens and for other water supplies. In the proposed project, it is used for various purposes of water supplying. Figure 31 shows PVC watering pipe.

Figure 31: PVC Watering Pipe

Shrink Wrap Roll

These plastic wrap sheets are used for wrapping of mushroom filled packets/trays, using a packaging machine. Figure 32 shows shrink wrap roll.

Figure 32: Shrink Wrap roll

Mushroom Punnet Tray

In the proposed project, business uses Punnet trays of different capacities (150 g, 200 g and 1,000 g) for packaging of button and oyster mushroom. Figure 33 shows mushroom Punnet trays.

Figure 33: Mushroom Punnet Trays

Steel Racks

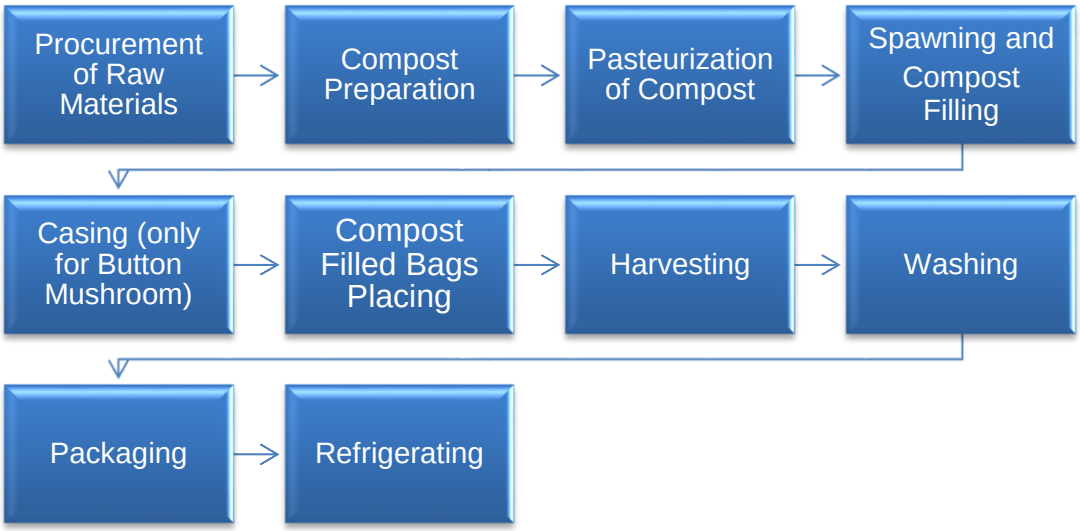
In the proposed project, steel racks are used to place the filled compost bags for mushroom cultivation. It has a dimension (L*W*H) of 8*1.5*8. Each steel rack has 4 number on shelfs. In proposed project, for button mushroom, 5 bags of compost is placed on each shelf of steel rack and for oyster mushroom, 8 bags of compost is placed on each shelf of steel rack.Figure 34 shows steel rack.

Figure 34: Steel Racks

5.4 Process Flow for Mushroom Farming

A general process flow of a mushroom farm is shown in Figure 35.

Figure 35: Process Flow for Mushroom Farming



Brief description of the process flow is as follows:

Procurement of Raw Materials

In mushroom cultivation, different raw materials are mixed at different stages. Some of these raw materials are locally purchased and some are imported. The quality of product is mainly dependent on the quality of raw materials introduced at different stages. There are some common raw materials like wheat straw, poultry manure, gypsum and khal choker etc.

Figure 36: Cotton Waste for Mushroom Farming

In addition, there are some specific raw materials (spawn) for button and oyster mushrooms. Common materials can be purchased locally while the spawn is a high-quality material and requires high investment for producing. Therefore, spawn will be imported for button and oyster mushroom cultivation from other countries like China, United States, UK, Germany etc. The business maintains raw material inventory of one month and half month respectively.

Compost Preparation

Composting converts raw materials into a suitable nutritional substrate/medium for the growth of mushrooms. Compost preparation is done by mixing the raw materials with water. Different materials are mixed to form a compost ready for mushroom growing. This process takes place in many days. Compost preparation for button and oyster mushroom is different in term of the required materials and number of days required for compost preparation. Compost preparation for both types of mushrooms are discussed as under:

Compost Preparation for Button Mushroom

Compost preparation for button mushroom cultivation is started by mixing wheat straw, poultry manure, gypsum and khal chokar in the required proportion. The quantity of raw materials required for a batch of 1 ton of button mushroom is shown in Table 2.

Table 2: Raw Materials for a Batch of 1 Ton of Button Mushroom Compost

Sr. No.	Raw Materials	Quantity (Kg)
1.	Wheat Straw	1,000
2.	Poultry Manure	400
3.	Gypsum	70
4.	Khal Chokar	50

These ingredients are mixed in compost area (compost yard) with the turner, towed by the tractor and spraying water through the water container mounted on the turner. Water is supplied from the water reservoir where it is stored using water pump. The mixed ingredients of the compost are left in open area for 12 days for completion of chemical and biological processes. The material requires several turnings. First turning is done on the fourth and second on the seventh day. Khal choker and gypsum are added and mixed thoroughly. Third turning is done the tenth day and fourth on the twelfth day. After completion of all chemical and biological processes, the material obtained at the end has a weight of around one ton.

Compost Preparation for Oyster Mushroom

Compost preparation for oyster mushroom cultivation is started by mixing wheat straw, gypsum and khal choker in the required proportion. The quantity of these raw material requires for a batch of 1 ton of oyster mushroom is shown in Table 3.

Table 3: Raw Materials for a Batch of 1 Ton of Oyster Mushroom Compost

Sr. No.	Raw Materials	Quantity (Kg)
1.	Wheat Straw	1,000
2.	Gypsum	7
3.	Khal Chokar	50

These ingredients are mixed in compost area (compost yard) with the turner, towed by the tractor and spraying water through the water container mounted on the turner. Water is supplied from the water reservoir where it is stored using water pump. The mixed ingredients of the compost are left in open area for 7 days for the completion of further chemical and biological processes with several turnings. First turning start on the fourth day and the second (last) turning is done on seventh day. After completion

of all chemical and biological processes, the material obtained at the end has a weight of around one ton.

After this stage, compost is transferred by labor for pasteurization.

Pasteurization of Compost

Pasteurization of the compost is an important step. Pasteurization kills insects, bacteria and harmful organisms that may affect mushroom growth and productivity. In the proposed project, two bunkers and two tunnels are constructed for this purpose. One bunker and one tunnel is used for button compost pasteurization and the others for oyster compost pasteurization. Compost is moved from compost yard to bunkers.

Pasteurization of Compost of Button Mushroom

Button mushroom compost is transferred from compost yard to the bunker, where there is a constructed system of underground ducts to maintain humidity of compost. It is then transferred to pasteurization tunnel specified for button mushrooms. In the pasteurization tunnel, temperature is raised to 60 C and maintained for 4-6 hours. Temperature of compost is later maintained in the range 48-52 C for 2-3 days while controlling the relative humidity at 80-100%. The blower circulates air inside the tunnel through underground ducts at the rate of 150-250 cubic meter per hour for a batch of one ton compost.

Pasteurization of Compost of Oyster Mushroom

Oyster mushroom compost is be transferred from compost yard to the bunker and then to pasteurization tunnel specified for oyster mushroom. In the pasteurization tunnel, temperature is raised to 60 C and maintained for 3-4 hours. Temperature of compost is later maintained in the range 48-52 C for 2-3 days while controlling the relative humidity at 80-100%. The blower circulates air inside the tunnel through underground ducts at the rate of 150-250 cubic meter per hour for a batch of one ton compost.

After pasteurization, compost is filled in 50 kg capacity PP (polypropylene) woven sacks to transfer this pasteurized compost into compost filling station.

Spawning and Compost Filling

After pasteurization, compost filled PP bags are transferred to production hall by the labor to the area specified for spawning and compost filling. This process takes about 1-2 days. In the production hall, temperature is maintained in the range 23-25 C and humidity level is maintained at 95-100% through AHU.

Button mushroom spawn and compost are filled in PP bags of 8 kg in required proportion, whereas, oyster mushroom spawn and compost are filled in PP bags of 4 kg. Difference of compost filling capacity of bag for oyster and button mushroom is due to difference in growing process cycles, output ratio and fruiting cycles.

After this, spawn and compost filled plastic bags are transferred to steel racks in mushroom growing hall where temperature, humidity and Carbon Dioxide levels are

maintained through air handling unit which have in-built sensors and controlling systems.

Casing (Only for Button Mushrooms)

Casing is an important step in button mushroom cultivation. Casing involves the covering of compost with a thin layer of sterile soil or materials to maintain moisture and gaseous exchange. The main function of the casing layer is to keep the moisture retention in the substrate which is necessary for mushroom fruit body formation.

In the casing process for button mushrooms, compost filled plastic bag beds are cased when white covering appears on the compost surface, which indicates decrease of moisture level. Layer of peat moss (a specially prepared soil) is spread over the compost to maintain humidity and facilitate formation of mushrooms. Chemicals required for pest and disease control are mixed in the casing material. The pH[6] of this casing soil should be in the range 7.5-7.8.

Compost Filled Bags Placing

In this step, the compost and spawn filled bags of button and oyster mushroom are transferred to production hall for placement on racks. Each rack consists of 4 shelves and on each shelf of rack 7 bags of button mushrooms compost and 8 bags of oyster mushroom composts are placed for growing under controlled condition. Figure 37 shows the compost bags placed in the racks.

Figure 37: Bags Placed in Racks

[6] Scale used to specify the acidity or basicity of an aqueous solution

Harvesting

On appearance of pinheads of the mushrooms, harvesting is started.

Button Mushroom

First harvesting of button mushrooms is started after 33 days. Second and third harvesting is done after every 7-8 days using mushroom harvesting knife. Mushrooms are collected in plastic baskets.

Oyster Mushroom

First harvest of oyster mushrooms is started after 16 days, second and third harvesting is done after every 7-8 days with the help of mushroom harvesting knife. Mushrooms are collected in plastic baskets. Figure 38 shows oyster mushrooms ready for harvesting.

Figure 38 – Oyster Mushrooms Ready for Harvesting

In the proposed project, button and oyster mushroom will be harvested 3 times. On 1st harvesting 100% mushroom will be harvested. Subsequently, it will be reduced by 10% and 20% respectively on 2nd and 3rd harvesting.

After completing harvesting process of mushroom (1st, 2nd and 3rd harvesting) the compost filled bags are sold in local market as fertilizer or animal feed.

Washing

After harvesting, the plucked mushrooms are washed with water for some minutes to remove any dirt. Washing is also necessary to prevent mushroom brownish discoloration and stalk elongation. It is important to cool mushrooms after harvesting.

Packaging

After washing the mushrooms, these are packed into packets of different sizes, for wholesale and retail markets. Both types of mushrooms are packed into the packaging

of 150 g, 250 g and 1000 g separately with the help of automatic mushroom packaging machine.

Refrigerating

After packaging, mushrooms packets are transferred to finished goods store in the cold storage chamber where these are stored at a temperature of 2C to -4C until sold. Business will maintain finished goods inventory of half month. Business will also use cold container vehicle for mushroom delivery at customer premises.

5.5 Installed and Operational Capacities

It is assumed that the operational capacity for the mushroom farm is 70% during the first year of its operations. The capacity will increase at the rate of 5% per annum attaining 90% of its total in 5 years. The farm will annually produce 9,450 kg of button mushroom in 7 production cycles in a year and 20,250 kg of oyster mushroom in 12 production cycles in a year. The proposed farm will sell its production in both wholesale and retail markets in the proportion of 60:40 respectively in the three packing sizes of 150-gram, 250-gram and 1000-gram.

At maximum capacity, in the wholesale market, button mushroom production will be distributed into 20,412 packets which include 11,340 150-gram packets, 6,804 250-gram packets and 2,268 1000-gram packets. Oyster mushroom production will be distributed into 43,740 packets which include 24,300 150-gram packets, 14,580 250-gram packets and 4,860 1000-gram packets. In the retail market, button mushroom production will be distributed into 13,608 packets which include 7,560 150-gram packets, 4,536 250-gram packets and 1,512 1000-gram packets. Oyster mushroom production will be distributed into 29,160 packets which include 16,200 150-gram packets, 9,720 250-gram packets and 3,240 1000-gram packets.

At initial year production capacity utilization of 70%, in the wholesale market, button mushroom production will be distributed into 14,289 packets which include 7,938 150-gram packets, 4,763 250-gram packets and 1,588 1000-gram packets. Oyster mushroom production will be distributed into 30,618 packets which include 17,010 150-gram packets, 10,206 250-gram packets and 3,402 1000-gram packets. In the retail market, button mushroom production will be distributed into 9,525 packets which include 5,292 150-gram packets, 3,175 250-gram packets and 1,058 1000-gram packets. Oyster mushroom production will be distributed into 20,412 packets which include 11,340 150-gram packets, 6,804 250-gram packets and 2,268 1000-gram packets.

The installed and operational capacity of the business is shown in Table 7 and Table 8.

Table 4: Production Cycle of Business

Mushroom Type	Time Required for Compost Preparation & Pasteurization Process (Days)	Time Required for Spawning Process (Days)	Time Required for Casing Process (Days)	Time Required for 1st Harvesting (Days)	Time Required for 2nd Harvesting (Days)	Time Required for 3rd Harvesting (Days)	Total Time per Batch (Days)	Total Working Days in a Year	No of Production Cycles per year
Button Mushrooms	15	3	8	7	7	7	47	360	7
Oyster Mushrooms	7	2	-	7	7	7	30		12
Total									**19**

Table 5: Annual Mushroom Production

Mushroom Type	No of Bags of Compost Per Production Cycle	Average Mushroom Produced by one Bag (Kg)	Total Mushroom Production in 1st Harvesting (Kg)	Total Mushroom Production in 2nd Harvesting (Kg)	Total Mushroom Production in 3rd Harvesting (Kg)	Total Mushroom Production per Batch (Kg)	Total No of Production Cycles per year	Annual Mushroom Production (Kg)
Button	125	4	500	450	400	1,350	7	9,450
Oyster	250	2.5	625	563	500	1,688	12	20,250
Total	**375**						**19**	**29,700**

Table 6: Distribution Ratio

Distribution Channel	Ratio
Wholesale	60%
Retail	40%
Total	**100%**

Table 7: Installed and Operational Capacity of Mushroom-Wholesale Market

Packaging	Annual Mushroom Production @ 100% (Kg)	Wholesale Sale Ratio (%)	Wholesale Quantity (Kg)	Product Ratio	Distributed Quantity (Kg)	Distributed Quantity (Gram)	Gram in One Packet	No of Packets @100%	No of Packets @70%
Button Mushroom									
Packets 150 g	9,450	60%	5,670	30%	1,701	1,701,000	150	11,340	7,938
Packets 250 g				30%	1,701	1,701,000	250	6,804	4,763
Packets 1000 g				40%	2,268	2,268,000	1,000	2,268	1,588
Sub-Total								**20,412**	**14,289**
Oyster Mushroom									
Packets 150 g	20,250	60%	12,150	30%	3,645	3,645,000	150	24,300	17,010

Packets 250 g				30%	3,645	3,645,000	250	14,580	10,206
Packets 1000 g				40%	4,860	4,860,000	1,000	4,860	3,402
Sub-Total								**43,740**	**30,618**
Total								**64,152**	**44,907**

Table 8: Installed and Operational Capacity of Mushroom-Retail Market

Packaging	Annual Mushroom Production @ 100% (Kg)	Retail Sale Ratio	Retail Quantity (Kg)	Product Ratio	Distributed Quantity (Kg)	Distributed Quantity (Gram)	Gram in One Packet	No of Packets @100%	No of Packets @70%
Button Mushroom									
Packets 150 g	9,450	40%	3,780	30%	1,134	1,134,000	150	7,560	5,292
Packets 250 g				30%	1,134	1,134,000	250	4,536	3,175
Packets 1000 g				40%	1,512	1,512,000	1,000	1,512	1,058
Sub-Total								**13,608**	**9,525**
Oyster Mushroom									
Packets 150 g	20,250	40%	8,100	30%	2,430	2,430,000	150	16,200	11,340
Packets 250 g				30%	2,430	2,430,000	250	9,720	6,804
Packets 1000 g				40%	3,240	3,240,000	1,000	3,240	2,268

Sub-Total								**29,160**	**20,412**
Total								**42,768**	**29,937**

6. CRITICAL FACTORS

Before making the decision to invest in mushroom farming, one should carefully analyze the associated risk factors. The important considerations in this regard include:

- Suitable location of mushroom farm, since humidity, temperature and light have major effect on growth of mushrooms.
- Procurement of high-quality spawn
- Sound technical knowhow and basic knowledge of the business
- Availability of specialized workforce
- Selection of appropriate machinery and technology
- Rigorous supervision of the production process at every level
- Quality products and customer satisfaction
- Accurate control of different quality parameters such as temperature, humidity etc.
- Selection of appropriate distribution channel

7. GEOGRAPHICAL POTENTIAL FOR INVESTMENT

The project is suggested to be located in or around a large city; since mushrooms are largely consumed by the urban population. The required agriculture inputs for mushroom farming are easily available in larger cities. Therefore, the proposed mushroom farm would ideally be located in or around major cities of Pakistan like Karachi, Lahore, Faisalabad, Islamabad, Peshawar, Quetta, Hyderabad, Rawalpindi, and other cities of Pakistan. These cities are also suitable due to the availability of good infrastructure and skilled personnel.

8. POTENTIAL TARGET MARKETS/CUSTOMERS

Pakistan is the fifth most populous country in the world, with 220 million people. Population is growing at around 2% per annum which keeps generating additional demand for food supply sources. Agriculture sector is very important to ensure food security and rural development in Pakistan. It contributes 22.7 percent to the GDP and provides employment to around 37.4 percent[7] of the labor force. Pakistan is a large producer of multitude of agricultural commodities and thus there is an abundant availability of agriculture waste materials like wheat straw, rice straw, cotton waste, etc. required for mushroom cultivation.

[7] https://www.finance.gov.pk/survey/chapter_22/PES02-AGRICULTURE.pdf

Market for mushrooms is growing in Pakistan because of their nice aroma, nutritious values, subtle flavor and special taste. Many exotic food preparations like soups, 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. The product can be sold even through departmental stores, super markets, etc. The people of Sindh, mostly of the desert and mountain (Thar and Kohistan) areas are familiar with the local desert mushroom, commonly known as Khumbhi. The people of the hilly areas of Gilgit Baltistan, Kashmir and Punjab are familiar with Black Morels. White umbrella type mushroom locally known as Khamiri is also eaten by people of Balochistan, Sindh and Punjab.

The international trade of mushrooms is reported under the vegetables category. Mushrooms are traded in four different forms fresh, provisionally preserved, dried and preserved other than acetic acid. The first three categories are classified under the main HS code 07 whereas the prepared/ preserved mushrooms are reported under HS 2003. Mushrooms of genus Agaricus (Button) are classified separately while all other types of mushrooms are classified under the other subcategory. Mushroom spawn is reported under the main HS code 0602. HS codes of mushrooms and mushroom spawn are shown in Table 9.

Table 9: HS Codes of Mushrooms and Mushroom Spawn

Fresh Mushrooms	
0709.51	Fresh Mushrooms of the genus Agaricus
0709.59	Fresh Mushrooms of other than genus Agaricus
Provisionally Preserved Mushrooms	
0711.51	Provisionally preserved Mushrooms of genus Agaricus
0711.59	Provisionally preserved Mushrooms of other than genus Agaricus
Dried Mushrooms	
0712.31	Dried Mushrooms of genus Agaricus
Prepared or Preserved Mushrooms other than Acetic Acid	
2003.10	Prepared Mushrooms of genus Agaricus
2003.90	Prepared Mushrooms of other genus Agaricus
Mushroom Spawn	
0602.9010	Mushroom spawn

During the year 2021, Pakistan exported fresh Genus Agaricus mushroom of trade value of USD 1.06 million and dried Genus Agaricus mushroom of trade value of USD 5.67 million under the HS code of 0709.5. The export value of fresh mushrooms other than Genus Agaricus was USD 0.54 million and of fresh mushroom other than Genus Agaricus was USD 0.54 million. Exports of dried mushroom other than Genus Agaricus

was USD 0.28 million under the HS code of 0712.3[8]. Pakistan exported most of its mushrooms to France, Hong Kong and South Korea.

Sale of mushrooms in the local market follows the traditional distribution channel, through middlemen or wholesalers at farms who identifies potential buyers and negotiate price, or sells directly to retailers in urban markets. The key factors in marketing are availability of current market information, quality of mushroom and supply and demand which determines the selling price.

Globally, mushrooms are traded mostly in processed form. However, fresh mushrooms are preferred over preserved ones in EU and American countries. Major exporting countries of fresh mushrooms are Netherlands, Poland, Ireland and Belgium. China is the largest exporter of preserved mushrooms with a market share of 42%. Netherlands (25%) and Spain (8%) are the other major countries. The major importing countries of prepared and preserved mushrooms are Germany, USA and France while those of fresh mushrooms are U.K, Germany, USA and France The world's total mushrooms production in the year 2020 was 14.79 million tons at the growth rate of 6.3%. The global mushroom market is projected to grow from 15.25 million tons in 2021 to 24.05 million tons in 2028 at a CAGR of 6.74% in forecast period.[9]

This is a very healthy growth rate that is indicative of the increasing demand of mushrooms in the global markets. Expansion of the hotel/restaurant/catering sector is increasing the demand for mushrooms swiftly in Pakistan and over the world. The rising adoption of mushrooms as a meat substitute, coupled with increasing vegan[10] populations is anticipated to further drive the market growth in forecasted period.

Incorporation of non-conventional crops in the existing agriculture system can help in improving the social as well as economic status of small farmers in Pakistan. Mushroom, which may be the first domesticated food crop, can be the best choice because it is one of the most economical crops. The increasing population demands constant and high food production. Mushroom technology can help in the production of increasing food demand for Pakistan where the annual population growth rate is about three percent.

[8] https://comtrade.un.org/data
[9] https://www.fortunebusinessinsights.com/industry-reports/mushroom-market-100197
[10] A vegan diet is based on plants (such as vegetables, grains, nuts and fruits) and foods made from plants.

9. PROJECT COST SUMMARY

A detailed financial model has been developed to analyze the commercial viability of mushroom farming. Various assumptions relevant to revenue and costs along with the results of the analysis are outlined in this section.

The projected Income Statement, Cash Flow Statement and Balance Sheet are attached as annexures of this document.

All the figures in this financial model have been calculated after carefully considering the relevant assumptions and target market.

9.1 Initial Project Cost

Table 10 provides fixed and working capital requirements for establishment of mushroom farming.

Table 10: Initial Project Cost estimates

Particulars	Cost (PKR)	Reference
Land	-	9.1.1
Building / Infrastructure	405,397	9.1.2
Machinery & equipment	11,994,360	9.1.1
Office equipment	1,668,500	9.1.1
Tools and Equipment	478,000	9.1.5
Furniture & fixtures	841,000	9.1.6
Office vehicles	4,015,060	9.1.7
Pre-operating costs	751,683	9.1.8
Security against building	600,000	9.1.9
License costs[11]	50,000	
Total Capital Cost - (A)	**20,804,000**	
Equipment spare part inventory	99,953	
Raw material inventory	53,624	
Upfront building rent	200,000	
Cash	1,000,000	
Total	**1,353,577**	
Total Project Cost - (A+B)	**22,157,577**	

[11] The license is given by the Pakistan Halal Authority which are responsible for ascertaining the halal status of product process and services. It is not a statutory requirement; it is just taken to maintain the customer satisfaction in market

9.1.1. Land

The proposed unit will be established on a rented land having an area of 3,600 square feet (16 Marla). Total rental cost has been estimated as PKR 200,000. The breakup of the space requirement is provided in Table 11.

Table 11: Breakup of Space Requirement

Production Area	Number	Length (Ft)	Width (Ft)	Area (Sq. Ft.)
Admin Area	1	20	20	400
Raw Material Store	1	14	14	196
Compost Area	2	18	20	700
Water Reservoir	1	10	10	100
Compost Bunker	2	15	15	450
Pasturization Tunnel	2	15	15	450
Mushroom Production Hall	2	20	20	800
Washing & Packaging Area	1	10	20	200
Finished Goods Store	1	10	13	130
Kitchen	1	8	6	48
Washrooms	3	7	6	126
Total				**3,600**

9.1.2. Building/ Infrastructure

There will be no cost of building construction since the mushroom farming will be started in a rented building. However, there will be a renovation cost required to make the building usable for the business. Building rent of PKR 200,000 per month has been included in the operating cost. The proposed project requires electricity load of around 40.07 KW for which an industrial electricity connection will be required. Table 12 provide details of building renovation cost.

Table 12: Building Renovation Cost

Cost Item	Unit of Measurement	Total Units	Cost/Unit (PKR)	Total Cost (PKR)
Paint Cost	Liter	95	800	75,672
Labour Cost	Sq.Feet	9,459	15	141,885
Tile Cost	Sq.Feet	574	120	68,880
Labour Cost-Tile	Sq.Feet	574	40	22,960

PVC AC Control Curtains	Units	8	12,000	96,000
Total				**405,397**

9.1.3. Machinery and Equipment

Table 13 provides details of machinery and equipment for the proposed project.

Table 13: Machinery Cost Details

Cost Item	No.	Unit Cost (PKR)	Applicable Duties(%)	Applicable Duties(PKR)	Taxes(%)	Taxes(PKR)	Total Cost (PKR)
Air Handling Units (5 Ton) (Button Mushroom)	1	1,550,000	0%	0	18%	279,000	1,829,000
Air Handling Units (5 Ton) (Oyster Mushroom)	1	1,550,000	0%	0	18%	279,000	1,829,000
Compost Turner	1	900,000	0%	0	18%	162,000	1,062,000
Weighing Scale (500kg)	1	17,000	0%	0	18%	3,060	20,060
Samll Weighing Scale (10 kg)	1	7,000	0%	0	18%	1,260	8,260
Blowers (3 & 5 Hp) (Button Mushroom)	2	280,000	0%	0	18%	100,800	660,800
Blowers (3 & 5 Hp) (Oyster Mushroom)	2	280,000	0%	0	18%	100,800	660,800
Steam Boiler (500L/H) (Button Mushroom)	1	500,000	0%	0	18%	90,000	590,000
Steam Boiler (500L/H) (Oyster Mushroom)	1	500,000	0%	0	18%	90,000	590,000
Water Pump	1	13,000					13,000
Cold Storage Chamber	1	623,000	0%	0	18%	112,140	735,140
Generator 50 KVA	1	1,015,000	0%	0	18%	182,700	1,197,700
Cling Film Packing Machine (30Pcs/Min)	1	1,270,000	0%	0	18%	228,600	1,498,600
Pasteurization Tunnel - Ducting and Piping System	2	70,000					140,000

Bunker - Ducting and Piping System	2	80,000					160,000
Mushroom Growing Room Ventilation & Installation System	2	500,000					1,000,000
Total							**11,994,360**

9.1.4. Office Equipment

Table 14 shows details of equipment cost required for the mushroom farm.

Table 14: Office Equipment Cost Details

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Air Conditioners	3	105,000	315,000
Laptops	5	150,000	750,000
Desktop Computer	4	75,000	300,000
Printer	1	51,500	51,500
Water Dispenser	2	20,000	40,000
Security System (6 Cams 2 MP)	16	2,500	40,000
DVR	2	14,000	28,000
LED/LCD TV	1	36,000	36,000
WI-FI/ Internet Connection	1	3,500	3,500
Ceiling Fan	8	8,000	64,000
Exhaust Fan	9	4,500	40,500
Total			**1,668,500**

9.1.5. Tools and Equipment

Table 15 shows details of tools and equipment required for the mushroom farm

Table 15: Tools and Equipment

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Electrician Kits	2	5,000	10,000
Steel Racks	20	20,000	400,000
Mushroom Humdifier	4	17,000	68,000
Total	**26**		**478,000**

9.1.6. Furniture and Fixtures

Table 16 shows details of furniture and fixture required for the mushroom farm.

Table 16: Furniture and Fixtures

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Executive Table	1	60,000	60,000
Executive Chair	1	30,000	30,000

Staff Chairs	29	14,000	406,000
Staff Table	6	30,000	180,000
Visitor Chairs	6	20,000	120,000
Sofa Set	1	45,000	45,000
Total			**841,000**

9.1.7. Office Vehicles

Table 17 provides details of the vehicles required along with their cost for the proposed project.

Table 17: Office Vehicle Cost Details

Cost Item	No.	Unit Cost (PKR)	Registration Fee Plus Number Plate Charges	Total (PKR)
Motorcycle	1	111,500	6,500	118,000
Tractor with Front Loader	1	1,800,000	74,530	1,874,530
Hyundai Pickup + Reefer Container	1	2,000,000	22,530	2,022,530
Total	**3**			**4,015,060**

9.1.8. Pre-Operating Costs

Table 18 provides details of estimated pre-operating costs.

Table 18: Pre-Operating Cost Details

Costs Item	Hiring Months Beforein Year 0	Unit Cost (per month) (PKR)	Cost (PKR)
Production Manager	1	100,000	100,000
Horticulture Expert	1	100,000	100,000
Mechanical Technician	1	40,000	40,000
Quality Assurance Officer		60,000	60,000
Composting Labor (Semi-Skilled)	1	30,000	30,000
Steaming Process(Semi-Skilled)	1	30,000	30,000
Spawning & Casing(Semi-Skilled)	1	30,000	30,000
Harvesting(Semi-Skilled)	1	30,000	30,000

Washing & Packaging (Semi-Skilled)	1	30,000	30,000
Driver	1	30,000	30,000
Office Boy	1	25,000	25,000
Security Guard	1	25,000	25,000
Sweeper	1	25,000	25,000
Utility expenses			196,683
Total Cost (PKR)			**751,683**

9.1.9. Security against Building

Table 19: Security against Building

Particular	Months	Rent per month (PKR)	Total (PKR)
Security against building	3	200,000	600,000
Total (PKR)			**600,000**

9.2 Breakeven Analysis

Table 20 shows calculation of break-even analysis.

Table 20: Breakeven Analysis

Particulars	Amount First Year (PKR)	Profitability Ratio
Sales (PKR) – A	35,594,080	100%
Variable Cost (PKR) – B	20,489,695	58%
Contribution (PKR) (A-B) = C	15,104,385	42%
Fixed Cost (PKR) – D	12,464,681	35%
Contribution Margin	42%	
Breakeven Analysis		
Breakeven Revenue (PKR)		29,373,513
Break-Even (Patients)		61,764
Breakeven Capacity		58%

9.3 Revenue Generation

Table 21, Table 22 and Table 23 provides details regarding revenue generation from the mushroom farming wholesale and retail and from fertilizer or animal feed respectively during the first year of its operations.

Table 21: Revenue Details-Wholesale

Products	Number of Sales Mushroom Packets@ 70%	Price Per Packet (PKR)	Total Revenue (PKR)
Button Mushroom			
Packets 150 g	7,607	300	2,282,100
Packets 250 g	4,565	450	2,054,250
Packets 1000 g	1,522	1,700	2,587,400
Subtotal (A)	**13,694**		**6,923,750**
Oyster Mushroom			
Packets 150 g	16,301	230	3,749,230
Packets 250 g	9,781	350	3,423,350
Packets 1000 g	3,260	1,300	4,238,000
Subtotal (B)	**29,342**		**11,410,580**
Total (A+B)	**43,036**		**18,334,330**

Table 22: Revenue Details-Retail

Products	Number of Sales Mushroom Packets@ 70%	Price Per Packet (PKR)	Total Revenue (PKR)
Button Mushroom			
Packets-150 g	5,071	450	2,281,950
Packets-250 g	3,043	650	1,977,950
Packets-1000 g	1,058	2,400	2,539,200
Subtotal (A)	**9,172**		**6,799,100**
Oyster Mushroom			
Packets-150 g	10,868	300	3,260,400
Packets-250 g	6,521	450	2,934,450
Packets-1000 g	2,174	1,700	3,695,800
Subtotal (B)	**19,563**		**9,890,650**
Total (A+B)	**28,735**		**16,689,750**

Table 23: Revenue-Fertilizer or Animal Feed

Mushroom Type	Total Bags of Both Mushrooms	Compost filled in a Bag (Kg)	Net Compost Filled Per Batch (Kg)	Annual Production Cycles	Annual Compost Filled (Kg)	Sale Price per Kg (PKR)	Revenue (PKR)
Button Mushroom	125	8	1,000	7	7,000	30	210,000
Oyster Mushroom	250	4	1,000	12	12,000		360,000
Total	**375**						**570,000**

9.4 Variable Cost Estimate

Variable costs of the project have been provided in Table 24.

Table 24: Variable Cost Estimate

Description of Costs	Amount (PKR)
Compost Cost	577,297
Spawn Cost	121,363
Other Material	5,513
PP Woven Sack Bag	15,200
PP Plastic Bag	66,875
Mushroom Punnet Tray	1,277,370
Consumables	55,500
Direct Electricity Cost	1,977,917
Direct Labor	9,600,000
Gas Expense-Steam Boiler	889,852
Tractor Running & Miantaince Cost	1,067,822
Generator Diesel Cost	1,987,200
Machinery Maintenance Cost	1,199,436
Communications expense (phone, mail, internet, etc.)	568,800
Office vehicles running expense	510,750
Office expenses (stationery, entertainment etc.)	568,800
Total Variable Cost (PKR)	**20,489,695**

Table 25: Compost Cost

Cost Item	Batch Size of Compost (Kg)	Material Introduce in One Batch of One Ton (Kg)	Price Per Kg (PKR)	Total Cost Per Batch (PKR)	Production Cycles	Total Annual Cost (PKR)
Button Mushroom						
Wheat Straw	1,000	1,000	35	35,000	7	245,000
Poultry Manure		400	20	8,000		56,000
Gypsum		70	40	2,800		19,600
Khal Choker		50	85	4,250		29,750
Subtotal (A)				**50,050**		**350,350**
Oyster Mushroom						
Wheat Straw	1,000	1,000	35	35,000	12	420,000
Khal Choker		50	85	4,250		51,000
Gypsum		7	40	280		3,360
Subtotal (B)				**39,530**		**474,360**
Total (A+B)						**824,710**
Total @ 70%						**577,297**

Table 26: Spawn Cost

Cost Item	No of Bags in One Batch	Quantity Filled in One Bag (Kg)	Quantity Filled in One Batch	Price Per Kg (PKR)	Total Cost Per Batch (PKR)	Production Cycle	Total Annual Cost (PKR)
Button Mushroom							
Spawn	125	0.05	6.3	1,700	10,625	7	74,375
Subtotal (A)					**10,625**		**74,375**
Oyster Mushroom							
Spawn	250	0.03	7.5	1,100	8,250	12	99,000
Subtotal (B)					**8,250**		**99,000**
Total (A+B)							**173,375**
Total @70%							**121,363**

Table 27: Other Material

Cost Item	No of Bags in One Batch	Quantity Filled in One Bag (Kg)	Quantity Filled in One Batch	Price Per Kg (PKR)	Total Cost Per Batch (PKR)	Production Cycle	Total Annual Cost (PKR)
Button Mushroom							
Peat Moss	125	0.02	2.5	450	1,125	7	7,875
Total					**1,125**		**7,875**
Total @70%							**5,513**

Table 28: PP Woven Sack Bag

Particular	Total Pasteurized Compost of Both Mushroom (Kg)	Total Pasteurized Compost Transferred to Production Hall (Kg)	Number of Bag Required to Transfer	Price Per Bag (PKR)	Total Number of Production Cycles	Total Cost(PKR)
Button & Oyster Mushroom (50Kg)	2,000	1,000	40	20	19	15,200
Total						**15,200**

Table 29: PP Plastic Bag

Particular	Number of Bags Required	Price Per Bag (PKR)	Total Number of Production Cycles	Total Cost (PKR)
Button Mushroom (8Kg)	125	25	7	21,875
Oyster Mushroom (4Kg)	250	15	12	45,000
Total	**375**			**66,875**

Table 30: Mushroom Punnet Tray

Packets	Sales Packet	Cost Per Packet (PKR)	Total Cost (PKR)
150 Gram	39,847	10	398,470
250 Gram	23,910	20	478,200
1000 Gram	8,014	50	400,700
Total	**71,771**		**1,277,370**

Table 31: Consumables

Cost Item	No.	Unit Cost (PKR)	Total Cost (PKR)
Gardener Forks	5	1,000	5,000
Harvesting Baskets	15	400	6,000
Harvesting Knife	5	500	2,500
Formalin Solution (1L)	10	300	3,000
Watering Pipe 200 ft	2	9,500	19,000
Shrink Wrap Roll	200	100	20,000
Total			**55,500**

Table 32: Direct Labor

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Production Manager	1	100,000	1,200,000
Horticulture Expert	2	100,000	2,400,000
Mechanical Technician	2	40,000	960,000
Quality Assurance Officer	1	60,000	720,000

Composting Labor (Semi-Skilled)	2	30,000	720,000
Steaming Process(Semi-Skilled)	2	30,000	720,000
Spawning & Casing(Semi-Skilled)	4	30,000	1,440,000
Harvesting(Semi-Skilled)	2	30,000	720,000
Washing & Packaging (Semi-Skilled)	2	30,000	720,000
Total			**9,600,000**

Table 33: Generator Cost

Machine	Diesel Consumption per Liter/Hour	Generator Usage Hours per Day	Total Diesel Consumption Liter/Day	Diesel Price per Liter	Total Diesel Consumption Liter/Day (PKR)	Total Diesel Consumption Liter/Year (PKR)
50kva Generator	12	2	24	230	5,520	1,987,200

Table 34: Vehicle Running Expenses

Particulars	No, Rate, Amount	
	Hyundai Pickup + Reefer Container	Motorcycle
No of vehicles	1	1
Fuel per month	23,000	8,063
Oil Change per month	3,000	1,500
General maintenance	5,000	2,000
Charges per Month	31,000	11,563
Vehicle Runnung & Maintenance Cost	**372,000**	**138,750**
Total (PKR)		**510,750**

Table 35: Variable Cost Assumption

Description of Costs	Rational
Machinery Maintenance Cost	10% of Cost of Machinery
Gas Expense-Steam Boiler	2.5% of revenue
Tractor Running & Miantaince Cost	3% of revenue
Commuication expense	12% of Management staff expense
Office expenses (stationery, entertainment, etc.)	12% of Management staff expense

9.5 Fixed Cost Estimate

Table 36 shows the estimated fixed cost of the project.

Table 36: Fixed Cost Estimate

Description of Costs	Amount (PKR)
Management Staff	4,740,000
Administration benefits expense	717,000
Building rental expense	2,400,000
Indirect Electricity Cost	382,281
Promotional expense	1,423,763
Depreciation expense	2,290,360

Amortization of pre-operating costs	150,337
Bad debt expense	355,941
Amortization of Legal, Licensing, and Training costs	5,000
Total Fixed Cost	**12,464,681**

Table 37: Management Staff

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Admin and Accounts Officer	1	50,000	600,000
Sales & Marketing Officer	1	80,000	960,000
Procurment Officer	1	40,000	480,000
Store Incharge	1	45,000	540,000
Driver	1	30,000	360,000
Office Boy	1	25,000	300,000
Security Guard	3	25,000	900,000
Sweeper	2	25,000	600,000
Total			**4,740,000**

Table 38: Fixed Cost Assumptions

Description of Costs	Rational
Promotional expense	4% of revenue
Administration benefits expense	5% of administration expense
Bad debt expense	1% of revenue
Depreciation	
Building & infrastructure	10% of cost
Machinery & equipment	15% of cost
Office equipment, Furniture & Fixture, Office vehicles	15% of cost

9.6 Financial Feasibility Analysis

The financial feasibility analysis provides the information regarding projected Internal Rate of Return (IRR), Net Present Value (NPV) and Payback period of the study, which is shown in Table 39.

Table 39: Financial Feasibility Analysis

Description	Project
IRR	39%
NPV (PKR)	15,561,245
Payback Period (years)	3.11
Projection Years	10
Discount rate used for NPV	25%

9.7 Financial Feasibility Analysis with 50% Debt

The financial feasibility analysis provides the information regarding projected IRR, NPV and payback period of the study on the basis of Debt: Equity Model (50:50), which is shown in Table 40.

Table 40: Financial Feasibility Analysis with 50% Debt

Description	Project
IRR	38%
NPV (PKR)	19,727,078
Payback Period (years)	3.17
Projection Years	10
Discount rate used for NPV	22%

9.8 Human Resource Requirement

The proposed services shall require the workforce as provided in Table 41.

Table 41: Human Resource

Personnel	Number of Personnel	Salary per Head (PKR)	Annual Salaries (PKR)
Production Manager	1	100,000	1,200,000
Horticulture Expert	2	100,000	2,400,000
Mechanical Technician	2	40,000	960,000
Quality Assurance Officer	1	60,000	720,000

Composting Labor (Semi-Skilled)	2	30,000	720,000
Steaming Process(Semi-Skilled)	2	30,000	720,000
Spawning & Casing(Semi-Skilled)	4	30,000	1,440,000
Harvesting(Semi-Skilled)	2	30,000	720,000
Washing & Packaging (Semi-Skilled)	2	30,000	720,000
Admin and Accounts Officer	1	50,000	600,000
Sales & Marketing Officer	1	80,000	960,000
Procurment Officer	1	40,000	480,000
Store Incharge	1	45,000	540,000
Driver	1	30,000	360,000
Office Boy	1	25,000	300,000
Security Guard	3	25,000	900,000
Sweeper	2	25,000	600,000
Total	**29**		**14,340,000**

10. CONTACT DETAILS

The contact details of all the major suppliers of machinery & equipment and raw material are given in Table 42.

Table 42: Contact Details

Name of Supplier	Product	Contact	Website/Email
Guangzhou Air woods Environment Technology Co., Ltd.	Air Handling Unit (AHU)	+86-13302499811	http://www.airwoods.cn
Shandong Sunco Aet Co., Ltd	Compost Turner		http://www.sdnyzb.com
Dongguan Linyue Electric Technology Co., Ltd.	Blowers	+85-22815 0191	http://www.tslindustry.com
Zhangjiagang Wilford Thermal Co., Ltd.	Steam Boiler	+86 17701567985	http://www.wilfordboiler.com
Shanghai Kendall Electromechanical Equipment Co., Ltd.	Cold Storage Chamber	+86-18516660562	http://kendallcool.com
Henan Chanda Machinery Co.,Ltd	Cling Film Packing Machin	+86-18939535088	http://hnchanda.com
Fungi Ally	Spawn and Peat Moss		https://www.fungially.com/
Field & Forest Products	Spawn and Peat Moss	+800-792-6220	https://www.fieldforest.net/

11. USEFUL LINKS

Table 43: Useful Links

Name of Organization	E-mail Address
Small and Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
National Business Development Program (NBDP)	www.nbdp.org.pk
Government of Pakistan	www.pakistan.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	sindh.gov.pk/
Government of Balochistan	balochistan.gov.pk/
Government of Khyber Pakhtunkhwa	kp.gov.pk/
Government of Gilgit Baltistan	gilgitbaltistan.gov.pk/
Government of Azad Jammu & Kashmir	ajk.gov.pk/
Trade Development Authority of Pakistan	www.tdap.gov.pk
Securities and Exchange Commission of Pakistan	www.secp.gov.pk
State Bank of Pakistan	www.sbp.gov.pk
Federal Board of Revenue	www.fbr.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
Pakistan Stock Exchange (PSX)	www.psx.com.pk
Pakistan Standards and Quality Control Authority (PSQCA)	http://www.psqca.com.pk
Punjab Small Industries Corporation	https://www.psic.gop.pk/
Sindh Small Industries Corporation	https://ssic.gos.pk/
Government of KPK	https://small_industries_de.kp.gov.pk/
Government of Balochistan Industries and Commerce	https://balochistan.gov.pk/departments-download/industries-and-commerce/
Ministry National Food Security & Research	https://mnfsr.trancemedia.pk/
Punjab Food Department	https://food.punjab.gov.pk/food_security
Sindh Food Authority	http://sfa.gos.pk/
KP Food Safety & Halal Food Authority	https://kpfsa.gov.pk/

Balochistan Food Authority	https://bfa.gob.pk/
Pakistan Food Association	https://www.confectioneryproduction.com/organisation/the-pakistan-food-association/
Horticultural Research Institute (HRI)	http://www.parc.gov.pk/index
Agri. Education Pakistan	https://agrieducation.pk/
University of Agriculture Faisalabad (UAF)	http://web.uaf.edu.pk/

12. ANNEXURES

12.1 Income Statement

Income Statement										SMEDA
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Button Mushroom - Whole Sale	6,923,750	8,494,285	9,973,706	11,669,238	13,598,682	15,002,670	16,512,938	18,175,241	20,004,882	22,018,706
Oyster Mushroom-Whole Sale	11,410,580	14,002,846	16,442,964	19,232,298	22,416,412	24,730,101	27,219,598	29,959,704	32,975,648	36,295,196
Button Mushroom - Retail	6,799,100	8,339,476	9,793,742	11,451,957	13,352,776	14,729,668	16,212,454	17,844,508	19,640,855	21,618,034
Oyster Mushroom-Retail	9,890,650	12,137,492	14,249,882	16,667,235	19,429,812	21,436,712	23,594,674	25,969,872	28,584,172	31,461,645
Fertilizer or Animal Feed	570,000	627,380	690,536	760,050	836,562	920,776	1,013,467	1,115,490	1,227,782	1,351,379
Revenue	**35,594,080**	**43,601,479**	**51,150,831**	**59,780,778**	**69,634,243**	**76,819,926**	**84,553,132**	**93,064,814**	**102,433,339**	**112,744,962**
Cost of sales										
Compost Cost	577,297	680,798	799,287	934,733	1,089,349	1,199,010	1,319,710	1,452,561	1,598,786	1,759,730
Spawn Cost	121,363	143,121	168,030	196,505	229,009	252,062	277,437	305,365	336,105	369,940
Other Material	5,513	6,501	7,632	8,926	10,402	11,449	12,602	13,870	15,267	16,803
PP Woven Sack Bag	15,200	16,730	18,414	20,268	22,308	24,554	27,026	29,746	32,741	36,037
PP Plastic Bag	66,875	73,607	81,017	89,173	98,149	108,030	118,905	130,874	144,049	158,550
Mushroom Punnet Tray	1,277,370	1,567,371	1,840,437	2,152,676	2,509,202	2,768,224	3,046,892	3,353,612	3,691,209	4,062,791
Consumables	55,500	61,087	67,236	74,005	81,455	89,654	98,680	108,613	119,547	131,582
Direct Electricity Cost	1,977,917	2,156,655	2,351,545	2,564,046	2,795,751	3,048,393	3,323,866	3,624,233	3,951,743	4,308,849
Direct Labor	9,600,000	10,531,200	11,552,726	12,673,341	13,902,655	15,251,212	16,730,580	18,353,446	20,133,731	22,086,702
Gas Expense-Steam Boiler	889,852	1,199,767	1,549,189	1,992,824	2,554,972	3,102,366	3,758,414	4,553,195	5,516,046	6,682,508
Tractor Running & Miantaince Cost	1,067,822	1,439,721	1,859,026	2,391,389	3,065,966	3,722,839	4,510,097	5,463,834	6,619,255	8,019,009
Generator Diesel Cost	1,987,200	2,187,245	2,407,427	2,649,775	2,916,519	3,210,115	3,533,267	3,888,949	4,280,437	4,711,334
Machinery Maintenance Cost	1,199,436	1,320,179	1,453,077	1,599,354	1,760,355	1,937,564	2,132,613	2,347,296	2,583,590	2,843,671
Total cost of sales	18,841,345	21,383,983	24,155,046	27,347,014	31,036,092	34,725,473	38,890,087	43,625,596	49,022,505	55,187,507
Gross Profit	16,752,735	22,217,496	26,995,785	32,433,764	38,598,152	42,094,453	45,663,045	49,439,219	53,410,834	57,557,455
General administration & selling expenses										
Management Staff	4,740,000	5,199,780	5,704,159	6,257,462	6,864,436	7,530,286	8,260,724	9,062,014	9,941,029	10,905,309
Administration benefits expense	717,000	786,549	862,844	946,540	1,038,355	1,139,075	1,249,565	1,370,773	1,503,738	1,649,601
Building rental expense	2,400,000	2,640,000	2,904,000	3,194,400	3,513,840	3,865,224	4,251,746	4,676,921	5,144,613	5,659,074
Indirect Electricity Cost	382,281	416,826	454,493	495,565	540,347	589,176	642,418	700,472	763,771	832,790
Communications expense (phone, mail, internet, etc.)	568,800	623,974	684,499	750,895	823,732	903,634	991,287	1,087,442	1,192,924	1,308,637
Office vehicles running expense	510,750	562,166	618,757	681,045	749,604	825,064	908,120	999,537	1,100,158	1,210,907
Office expenses (stationery, entertainment etc.)	568,800	623,974	684,499	750,895	823,732	903,634	991,287	1,087,442	1,192,924	1,308,637
Promotional expense	1,423,763	1,744,059	2,046,033	2,391,231	2,785,370	3,072,797	3,382,125	3,722,593	4,097,334	4,509,798
Amortization of Legal, Licensing, and Training costs	5,000	5,000	5,000	5,000	5,000	2,500	2,500	2,500	2,500	2,500
Depreciation expense	2,290,360	2,290,360	2,290,360	2,290,360	2,290,360	2,290,360	1,940,232	3,007,049	3,007,049	3,007,049
Amortization of pre-operating costs	150,337	150,337	150,337	150,337	150,337	-	-	-	-	-
Bad debt expense	355,941	436,015	511,508	597,808	696,342	768,199	845,531	930,648	1,024,333	1,127,450
Subtotal	14,113,031	15,479,038	16,916,489	18,511,538	20,281,454	21,889,950	23,465,536	26,647,391	28,970,372	31,521,753
Operating Income	2,639,704	6,738,458	10,079,296	13,922,226	18,316,697	20,204,503	22,197,509	22,791,828	24,440,462	26,035,702
Gain / (loss) on sale of office equipment	-	-	-	-	-	-	417,125	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	-	-	1,003,765	-	-	
Earnings Before Interest & Taxes	2,639,704	6,738,458	10,079,296	13,922,226	18,316,697	20,204,503	23,618,399	22,791,828	24,440,462	26,035,702
Subtotal	-	-	-	-	-	-	-	-	-	-
Earnings Before Tax	2,639,704	6,738,458	10,079,296	13,922,226	18,316,697	20,204,503	23,618,399	22,791,828	24,440,462	26,035,702
Tax	444,926	953,847	1,825,176	6,766,388	5,557,908	5,038,762	4,099,940	4,327,247	3,873,873	3,435,182
NET PROFIT/(LOSS) AFTER TAX	**2,194,778**	**5,784,611**	**8,254,120**	**7,155,838**	**12,758,789**	**15,165,742**	**19,518,459**	**18,464,581**	**20,566,589**	**22,600,520**

12.2 Balance Sheet

Balance Sheet	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Assets											
Current assets											
Cash & Bank	1,000,000	2,848,995	7,258,649	11,723,759	14,375,535	19,440,837	24,050,687	33,226,899	54,128,667	77,054,113	103,343,473
Accounts receivable	-	972,891	1,193,725	1,401,675	1,639,465	1,911,047	2,108,310	2,320,546	2,554,148	2,811,265	3,094,266
Equipment spare part inventory	99,953	120,540	145,367	175,307	211,414	254,957	307,469	370,797	447,167	539,267	-
Raw material inventory	53,624	69,604	89,945	115,776	148,509	179,913	217,959	264,050	319,888	387,534	-
Finished goods inventory		785,056	890,999	1,006,460	1,139,760	1,293,170	1,446,895	1,620,420	1,817,733	2,042,604	2,299,479
Pre-paid building rent	200,000	220,000	242,000	266,200	292,820	322,102	354,312	389,743	428,718	471,590	-
Total Current Assets	1,353,577	5,017,086	9,820,685	14,689,176	17,807,502	23,402,027	28,485,632	38,192,456	59,696,321	83,306,374	108,737,218
Fixed assets											
Land	-	-	-	-	-	-	-	-	-	-	-
Building Infrastructure Renovation	405,397	364,857	324,318	283,778	243,238	202,699	162,159	121,619	81,079	40,540	-
Machinery & equipment	11,994,360	10,794,924	9,595,488	8,396,052	7,196,616	5,997,180	4,797,744	3,598,308	2,398,872	1,199,436	-
Furniture & fixtures	841,000	714,850	588,700	462,550	336,400	210,250	84,100	1,594,209	1,355,077	1,115,946	876,815
Office vehicles	4,015,060	3,412,801	2,810,542	2,208,283	1,606,024	1,003,765	401,506	6,117,355	5,199,751	4,282,148	3,364,545
Office equipment	1,668,500	1,418,225	1,167,950	917,675	667,400	417,125	166,850	3,162,826	2,688,402	2,213,978	1,739,555
Security against building	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000	600,000
Total Fixed Assets	20,002,317	17,711,957	15,421,598	13,131,238	10,840,878	8,550,519	6,260,159	16,100,419	13,093,369	10,086,320	7,079,270
Intangible assets											
Pre-operation costs	751,683	601,347	451,010	300,673	150,337	-	-	-	-	-	-
Total Intangible Assets	801,683	646,347	491,010	335,673	180,337	25,000	22,500	20,000	17,500	15,000	137,168
TOTAL ASSETS	**22,157,577**	**23,375,390**	**25,733,292**	**28,156,087**	**28,828,717**	**31,977,545**	**34,768,291**	**54,312,875**	**72,807,191**	**93,407,694**	**115,953,656**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		120,423	134,715	150,950	169,440	189,723	212,721	238,845	268,580	302,495	247,938
Total Current Liabilities	-	120,423	134,715	150,950	169,440	189,723	212,721	238,845	268,580	302,495	247,938
Other liabilities											
Total Long Term Liabilities	-	-	-	-	-	-	-	-	-	-	-
Shareholders' equity											
Paid-up capital	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577	22,157,577
Retained earnings		1,097,389	3,441,000	5,847,560	6,501,699	9,630,244	12,397,993	31,916,452	50,381,033	70,947,622	93,548,141
Total Equity	22,157,577	23,254,966	25,598,577	28,005,137	28,659,277	31,787,822	34,555,570	54,074,030	72,538,610	93,105,199	115,705,719
TOTAL CAPITAL AND LIABILITIES	**22,157,577**	**23,375,390**	**25,733,292**	**28,156,087**	**28,828,717**	**31,977,545**	**34,768,291**	**54,312,875**	**72,807,191**	**93,407,694**	**115,953,656**

12.3 Cash Flow Statement

Cash Flow Statement											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Operating activities											
Net profit		2,194,778	5,784,611	8,254,120	7,155,838	12,758,789	15,165,742	19,518,459	18,464,581	20,566,589	22,600,520
Add: depreciation expense		2,290,360	2,290,360	2,290,360	2,290,360	2,290,360	2,290,360	1,940,232	3,007,049	3,007,049	3,007,049
amortization of pre-operating costs		150,337	150,337	150,337	150,337	150,337	-	-	-	-	-
Accounts receivable		(972,891)	(220,834)	(207,950)	(237,790)	(271,582)	(197,263)	(212,237)	(233,602)	(257,118)	(283,001)
Finished goods inventory		(785,056)	(105,943)	(115,461)	(133,300)	(153,411)	(153,724)	(173,526)	(197,313)	(224,871)	(256,875)
Equipment inventory	(99,953)	(20,587)	(24,827)	(29,940)	(36,107)	(43,544)	(52,512)	(63,327)	(76,371)	(92,100)	539,267
Raw Material Iventory -	(53,624)	(15,980)	(20,341)	(25,831)	(32,733)	(31,405)	(38,046)	(46,091)	(55,838)	(67,646)	387,534
Pre-paid building rent -	(200,000)	(20,000)	(22,000)	(24,200)	(26,620)	(29,282)	(32,210)	(35,431)	(38,974)	(42,872)	471,590
Accounts payable		120,423	14,291	16,235	18,490	20,283	22,997	26,124	29,735	33,915	(54,557)
Cash provided by operations	(353,577)	2,946,384	7,850,654	10,312,670	9,153,476	14,695,546	17,007,843	20,956,703	20,901,768	22,925,446	26,414,027
Financing activities											
Issuance of shares	22,157,577	-	-	-	-	-	-	-	-	-	-
Cash provided by / (used for) financing activities	22,157,577	-	-	-	-	-	-	-	-	-	-
Investing activities											
Capital expenditure	(20,804,000)	-	-	-	-	-	-	(11,780,492)	-	-	(124,668)
Cash (used for) / provided by investing activities	(20,804,000)	-	-	-	-	-	-	(11,780,492)	-	-	(124,668)
NET CASH	1,000,000	2,946,384	7,850,654	10,312,670	9,153,476	14,695,546	17,007,843	9,176,212	20,901,768	22,925,446	26,289,360

13. KEY ASSUMPTIONS

13.1 Operating Cost Assumptions

Table 44: Operating Cost Assumptions

Description	Details
Operating costs growth rate	10.1%
Electricity growth rate	9.0%
Water price growth rate	9.0%
Gas price growth rate	9.0%
Wage growth rate	9.7%
Office equipment price growth rate	9.6%
Office vehicles price growth rate	6.2%

13.2 Revenue Assumptions

Table 45: Revenue Assumptions

Description	Details
Sale price growth rate	10.1%
Capacity utilization	70%
Capacity utilization growth rate	5%
Maximum capacity	90%

13.3 Financial Assumptions

Table 46: Financial Assumptions

Description	Details
Project life (Years)	10
Debt: Equity	0:100
Discount Rate	25%

13.4 Debt Related Assumptions

Table 47: Debt Related Assumption

Description of Cost	Details
Project Life (Years)	10
Debt: Equity	50:50
Discount Rate	22%
Debt Grace Period	1 Years
Interest Rate (KIBOR+3%)	19%

13.5 Cash Flow Assumptions

Table 48: Cash Flow Assumptions

Description	Details
Accounts receivable cycle (in days)	10
Accounts payable cycle (in days)	30