PM Formalization of

Micro Food Processing Enterprises Scheme

DETAILED PROJECT REPORT

FOR

OLIVE OIL PROCESSING

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	2nd year	73.22
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	Benefit Cost Ratio	1.85
	Term Loan Payment	7 Years with 1 year grace period
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Note: All the data/contents of this DPR are taken from the available information on IIFPT site.

1 GENERAL OVERVIEW OF OLIVE PRODUCTION, CLUSTERS, POST-HARVEST MANAGEMENT AND VALUE ADDITION IN INDIA

1.1 INTRODUCTION

The **olive**, known by the botanical name ***Olea europaea***, meaning "European olive", is a species of small tree in the family Oleaceae, found traditionally in the Mediterranean Basin. The species is cultivated in all the countries of the Mediterranean, as well as South America, South Africa, India, China, Australia, New Zealand, Mexico, and the United States Olea *europaea* is the type species for the genus *Olea*.

The olive's fruit, also called an "olive", is of major agricultural importance in the Mediterranean region as the source of olive oil; it is one of the core ingredients in Mediterranean cuisine. The tree and its fruit give their name to the plant family, which also includes species such as lilacs, jasmine, *Forsythia*, and the true ash trees (*Fraxinus*).

The olive tree is heavily associated with human existence in Greece, and especially in the Messinian region. Messinian olive oil is associated with the tradition of the region and can trigger the olive oil–culture–tourism–economy relationship. The purpose of this study is to examine whether a traditional agricultural product, such as olive oil, can contribute significantly to sustainable regional development twofold. On one hand, the cultivation of olive and olive oil is an integral part of the Messinian land. Olive oil is a mix of symbolism, values, faith, and traditions, constitutes an invaluable intangible cultural heritage of this region, and on the other hand, this Messinian Olive oil is a high-quality agricultural product, famous for its benefits (health, nutrition, well-being). The key point is to link the tradition of olive cultivation with new, innovative ideas that, without neglecting the past, modernize it and link it to other forms of economic activity, adding added value to olive oil and yielding multiplier benefits to the economic and social sector. Also, the existence of innovative strategies such as product certification is able to create “identity”-a brand name and promote tourism development specializing in olive cultivation, and it

should be it cultural heritage. A brand name is created that harmoniously combines history with tradition, nature, and the excellent quality of the Messinian Olive oil.

1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF OLIVE

The olive, known by the botanical name Olea europaea, meaning "European olive", is a species of small tree in the family Oleaceae, found in the Mediterranean Basin from Portugal to the Levant, the Arabian Peninsula, and southern Asia as far east as China, as well as the Canary Islands and Reunion. The species is cultivated in many places and considered naturalized in all the countries of the Mediterranean coast, as well as in Argentina, Saudi Arabia, Java, Norfolk Island, California, and Bermuda. The Origins of the Olive Tree Revealed. Olives, like the Salonika variety pictured here, were likely first domesticated in the Levant around 6,000 years ago, new research suggests. The olive was first domesticated in the Eastern Mediterranean between 8,000 and 6,000 years ago, according to new research. Modern olive cultivars descend from multiple wild ancestors; however, the detailed history of domestication is not known yet. Olive production mainly occurs in countries like Italy, Spain, Greece, Turkey, Tunisia, Syrian Arab Republic, Morocco, Egypt, Portugal, Lebanon, Libyan, Arab Jamahiriya, Algeria, Palestine, United States of America, Argentina, Jordan, Israel, Peru, Islamic Republic of Iran and Croatia.

Olive crop although grown wild or scattered in some parts of India long back but its commercial cultivation to India is new. It is being grown in some parts of Jammu and Kashmir like Ramban, Uri, and Srinagar etc. Recently Rajasthan state had started cultivation of olive plants. In Rajasthan, Olive farms are basically situated in 7 districts - Bikaner, Sriganganagar, Nagaur, Jhunjhunu, Alwar, Jaipur & Jalore. It is also grown in some parts of UP and Himachal Pradesh

1.3 VARIETIES

Its varieties can be divided into 2 categories.

They are:

Oil type

1. Carolea,
2. Coratina,
3. Pendolino,
4. Frontoio,
5. Canino,
6. Sdcolanaterena
7. Aglandeau

Pickle Type

- Ascolano
- Mission
- Grosseune
- Picholine
- Cornicobra,
- Coratina

1.4 HEALTH BENEFITS AND NUTRITIONAL INFORMATION

Nutritional value:

The nutrition facts for 100 grams of ripe, canned olives are:

- Calories: 115
- Water: 80%

- Protein: 0.8 grams
- Carbs: 6.3 grams
- Sugar: 0 grams
- Fiber: 3.2 grams
- Fat: 10.7 grams
- Saturated: 1.42 grams
- Monounsaturated: 7.89 grams
- Polyunsaturated: 0.91 grams

Olives are a good source of several vitamins and minerals, some of which are added during processing. This fruit's beneficial compounds include:

- **Vitamin E:** High-fat plant foods usually contain high amounts of this powerful antioxidant.
- **Iron:** Black olives are a good source of iron, which is important for your red blood cells to transport oxygen.
- **Copper:** This essential mineral is often lacking in the typical Western diet. Copper deficiency may increase your risk of heart disease.
- **Calcium:** The most abundant mineral in your body, calcium is essential for bone, muscle, and nerve function.
- **Sodium:** Most olives contain high amounts of sodium since they're packaged in brine or saltwater.

Olive Oil

Principle	Nutrient Value(per 100 g)	Percentage of RDA
Energy	884 Kcal	44%
Carbohydrates	0 g	0%
Protein	0 g	0%
Total Fat	100 g	500%

Cholesterol	0 mg	0%
Dietary Fiber	0 g	0%
Vitamins		
Folates	0 µg	0%
Niacin	0 mg	0%
Pantothenic acid	0 mg	0%
Pyridoxine	0 mg	0%
Riboflavin	0 mg	0%
Thiamin	0 mg	0%
Vitamin-A	0 IU	0%
Vitamin-C	0	0%
Vitamin-E	14.39 mg	96%
Vitamin-K	60.2 µg	50%
Electrolytes		
Sodium	2 mg	0%
Potassium	1 mg	0%
Minerals		
Calcium	1 mg	0%
Copper	0 mg	0%
Iron	0.56 mg	7%
Magnesium	0 mg	0%
Manganese	0 mg	0%
Phosphorus	0 mg	0%
Selenium	0 µg	0%
Zinc	0.01 mg	<1%
Phyto-nutrients		
Carotene-ß	0 µg	--
Crypto-xanthin-ß	0 µg	--

Lutein-zeaxanthin	0 µg	--
Phytosterols	221 mg	--

CONSTITUENTS AND HEALTH BENEFITS OF OLIVE

- **Antioxidant properties**

Dietary antioxidants have been shown to reduce your risk of chronic illnesses, such as heart disease and cancer.

Olives are rich in antioxidants, with health benefits ranging from fighting inflammation to reducing microorganism growth.

One study showed that eating a pulpy residue from olives significantly increased blood levels of glutathione, one of the most powerful antioxidants in your body. Improved heart health

High blood cholesterol and blood pressure are both risk factors for heart disease.

Oleic acid, the main fatty acid in olives, is associated with improved heart health. It may regulate cholesterol levels and protect LDL (bad) cholesterol from oxidation. Furthermore, some studies note that olives and olive oil may reduce blood pressure.

- **Improved bone health**

Osteoporosis is characterized by decreased bone mass and bone quality. It can increase your risk of fractures.

The rates of osteoporosis are lower in Mediterranean countries than in the rest of Europe, leading to speculation that olives might protect against this condition.

Some of the plant compounds found in olives and olive oil have been shown to help prevent bone loss in animal studies. While human studies are lacking, animal studies and the data linking the Mediterranean diet to decreased fracture rates are promising).

- **Cancer prevention**

Olives and olive oil are commonly consumed in the Mediterranean region, where rates of cancer and other chronic diseases are lower than in other Western countries. Thus, it's possible that olives may help reduce the risk of cancer.

This may be partly due to their high antioxidant and oleic acid contents. Test-tube studies reveal that these compounds disrupt the life cycle of cancer cells in the breast, colon, and stomach. However, human studies are needed to confirm these results.

- Olive oil has distinct flavor and taste. Unlike many other oils, which are extracted from nuts and seeds, the olive is obtained from the olive berries and hence, carries large amounts of plant-derived antioxidants, phytosterols, and vitamins.
- Olive oil is recognized as one of the healthiest edible oils since it contains less saturated fats. Additionally, it composes linoleic (omega-6) and linolenic (omega-3) essential fatty acids at a recommended 8:1 ratio.
- The oil is high in calories. Its high-calorie content chiefly comes from its fats. However, it is especially rich in mono-unsaturated fatty acids (MUFA) like oleic acid (18:1) and palmitoleic acid (16:1) that help to decrease LDL or "bad cholesterol" and to increase HDL or "good cholesterol" in the blood. Research studies suggest that Mediterranean diet which is rich in monounsaturated fatty acids help to prevent coronary artery disease and strokes by favoring healthy blood lipid profile.
- Olive oil, especially extra virgin, contains tyrosol phenolic compounds such as oleuropein and oleocanthal. These compounds are responsible for its bitter, and pungent taste. Oleocanthal, oleuropein, and its derivative hydroxytyrosol are nature's most powerful antioxidants. Together with vitamin-E and carotenoids, they play a vital role fighting

against cancer, inflammation, coronary artery disease, degenerative nerve diseases, diabetes, etc.

- Studies suggest that oleocanthal has ibuprofen (NSAID) like anti-inflammatory activities. The Mediterranean diet that uses olive oil may be responsible in part for the low incidence of coronary artery disease.
- Being a vegetable source, it has very high levels of plant sterols, especially ß-sitosterol. The FDA has approved the following claim for phytosterols: "Foods containing at least 0.4 gram per serving of plant sterols, eaten twice a day with meals for a daily total intake of at least 0.8 gram, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease". Phyto-sterols competitively inhibit cholesterol absorption in the gut and thereby can reduce total cholesterol levels by 10% to 15%.
- Olive oil is rich in vitamin E. 100 g fresh extra-virgin oil contains 14.39 mcg (about 96% of RDA) of alpha-tocopherol. Vitamin E is a powerful lipid soluble antioxidant, required for maintaining the integrity of cell membrane of mucosa and skin by protecting it from harmful oxygen-free radicals.
- Additionally, extra-virgin oil is also an excellent source of vitamin-K; 100 g provides about 50% of DRI. Vitamin-K has a potential role in the increase of bone mass by promoting osteotropic activity in the bone. It also has established role in the treatment of Alzheimer's disease patients by limiting neuronal damage in the brain.

1.5 CULTIVATION, BEARING & POST HARVEST MANAGEMENT:-

The olive tree, *Olea europaea*, is an evergreen tree or shrub native to Mediterranean Europe, Asia, and Africa. It is short and squat, and rarely exceeds 8–15 m (26–49 ft) in height. '*Pisciottana*', a unique variety comprising 40,000 trees found only in the area around Pisciotta in the Campania region of southern Italy, often exceeds this, with

correspondingly large trunk diameters. The silvery green leaves are oblong, measuring 4–10 cm (1.6–3.9 in) long and 1–3 cm (0.39–1.18 in) wide. The trunk is typically gnarled and twisted.

The small, white, feathery flowers, with ten-cleft calyx and corolla, two stamens, and bifid stigma, are borne generally on the previous year's wood, in racemes springing from the axils of the leaves.

The fruit is a small drupe 1–2.5 cm (0.39–0.98 in) long when ripe, thinner-fleshed and smaller in wild plants than in orchard cultivars. Olives are harvested in the green to purple stage. Canned black olives have often been artificially blackened (see below on processing) and may contain the chemical ferrous gluconate to improve the appearance. *Olea europaea* contains a seed commonly referred to in American English as a "pit", and in British English as a "stone".

Cultivation and Bearing:-

While olives are on the tree, the oil inside the fruit is in perfect condition (low acidity level, flavorful as to variety, and non-oxidized. Changes that influence quality occur during and after harvest. Harvest methods all vary regarding how much damage they do to the fruit. Hand harvest is the best, but very expensive. If done properly with the right equipment, mechanical harvest can be almost as good and much less expensive. The key is to not break the fruit skin in any way and to process the fruit within a few hours. Farm labor for olive harvest is expensive ($200 - 400/ton) for hand picking making it the single most expensive aspect of olive growing. In order to help make olive oil production more profitable researchers around the world have been experimenting with various pruning methods, different tree forms, and mechanical or machine assisted harvest. Tree shakers and tarps are used in many countries where land is flat enough and varieties are grown that have fruit that are easily removed from the tree. Hand held vibrating combs that knock the fruit down onto tarps could also significantly reduce costs compared to hand harvest. Many oil olives around me world are still hand harvested where machine use is not practical. In areas where hand harvest is too expensive and mechanical harvest is impossible the fruit are allowed to fall naturally and

then picked up from the ground. Ground fruit produces a low quality, low value oil that is refined. In many countries, this oil forms the base for low cost oils. Mechanical harvesting of fruit will be essential to economically rationalize oil olive production in California. Future olive orchards will have to be planted and pruned to accommodate mechanical harvesting of some type. Most production systems do not allow branch development below three feet in order to accommodate a shaker head. High-density plantings (900 trees/acre) using dwarf varieties and over-the-row harvesters are in the early stages of experimental evaluation. A new vibrating-finger type harvester for large trees is also being studied as an alternative to shakers for mechanical fruit removal. These systems should be available in the near future to reduce harvest costs. One tree form, the central leader system has advantages for better fruit harvest, but comes into bearing later and is difficult to maintain. The bush system attempts to keep the trees low for hand harvest, but hard pruning to limit tree size in olives trees often promotes excessively vigorous vegetative growth. The open center pruned olive tree is still the most popular. Olive trees tend to be alternate bearing: heavy crops are usually followed by light ones the next year. Cultural practices, such as heavier pruning during flowering, in years with excessive bloom, should be employed to moderate crops from year to year. The best overall oil yields are obtained from moderate crops of 3-6 tons per acre produced on an annual basis. Late January harvesting of black fruit also causes lighter cropping the following year. The best-quality oil comes from olives matured to the red-ripe stage. Fully mature black fruit yield a "sweeter" oil, but during harvest they are soft and easily damaged. Immature olives that are green or straw colored are sometimes processed because of the unique flavor that less mature fruit impart to oil. The trend is to harvest earlier to achieve an oil with a green color and piquant character. Harvest date, however, is a maze of choices between type of oil desired, long-term stability of the oil, color, and linoleic acid content. For example, with low polyphenol content varieties a one-month delay in harvest can cause a four-month loss in oil stability due to the drop in polyphenol content. Later harvest usually yields a better percentage of oil per ton of fruit so growers are often interested in harvesting as late as possible to allow the fruit to accumulate the greatest quantity of oil. The olive tree manufactures and stores oil in the fruit throughout the season but the rate of oil storage flattens out before maturity due to

low Fight intensity and cool temperatures providing no real gain in oil content. Olives naturally lose moisture in the maturation process. The perceived rise in oil content, late in the growing season, is actually a loss of moisture. Post-harvest handling has a major effect on olive oil quality. Olives left in bins for long periods before pressing will ferment and mold; the resulting oil must be refined to remove the disagreeable flavor. Olives should be transported in shallow bins to prevent smashing bottom fruit and the bins must have ventilation holes (to reduce fermentation). If possible olives should not be stored but harvested, transported to the processing plant, and processed immediately. If storage is necessary olives should be kept cool by harvesting in the morning, placed in the shade, or in cold storage at 45°F with 90-96% relative humidity. Olives will keep well with little quality deterioration for up to 15 days in cold storage if the fruit is in perfect condition. Fruit quality can be maintained for longer periods with controlled atmosphere storage at 3% CO2 and 5% O2.

1.5 PROCESSING & VALUE ADDITION:-

Olive oil is the oily juice of the olive, separated from the other components of the fruit. Properly extracted from fresh, mature fruit of good quality, the oil has a characteristic sensory profile. Its fatty-acid composition is characterized by a good balance between saturated, monounsaturated, and polyunsaturated acids. It is also unique among common vegetable oils in that it can be consumed in the crude form, thus conserving vitamin content and phenolic compounds of nutritional importance. According to the Codex Alimentarius, IOOC, and EC regulations: Virgin olive oil is the oil obtained from the fruit of the olive tree solely by mechanical or other physical means under conditions that do not lead to alteration in the oil, which has not undergone any treatment other than washing, decantation, centrifugation, or filtration, to the exclusion of oils obtained using solvents or using adjuvants having a chemical or biochemical action. The ideal objective of any extraction method is to extract the largest possible amount of oil without altering its original quality. However, if the quality is not to be modified, it is

essential to use only mechanical or physical methods for extracting the oil, avoiding chemical and enzymatic reactions that might change its natural composition.

When treating the olive as prime material, one must consider two groups of phases: the solid elements of the skin, pulp, and kernel, and the liquid phases made up of the oil and the vegetable water. The preparation of olive oil is an industrial process, the purpose of which is to separate one of the liquid phases—the oil—from the other constituents of the fruit. Thus, beginning with healthy, whole, clean fruit, harvested at the moment of optimum maturity, it is necessary to make a paste preparation by means of breaking the vegetal structure; to liberate the oil from the cells and finally achieve the formation of solid and liquid phases. By means of pressure, percolation, or centrifugation, the solid and liquid phases are then separated. Finally, the liquid phases are separated into oil and vegetable water by decantation and/or vertical centrifugation. The separation between the solid and the liquid phases is not complete: the mass of solids with varying percentages of humidity and oil content form the sub-product called olive pomace and the liquids with varying percentages of fine solid material constitute the oily must. Extraction methods became more effective with the use of hydraulic presses and transmission mechanisms. Over the years they became more and more mechanized, driven by the need to spare labor expenses in order to lower costs, but the whole process was discontinuous. The first tests conducted on continuous-flow facilities date back to the second half of the 1960s by Alpha Laval. Improvements enabled the oil to be extracted through the centrifugal effect produced by devices rotating at high speed; the use of stainless steel instead of ordinary steel raised the quality and hygiene standards of the oils produced. These facilities exploit the effect of centrifugal force, which operates by drawing off the liquids. When they came into use after years of testing, they helped to lower labor costs and raise processing capacity. The extraction of olive oil commences from the olive tree and ends with the storage of the product. There are limitations in a series of factors prior to the extraction process which influence the quantity and quality of the oils.

Any step in the production process that improves the product for the customer and results in a higher net worth, is known as value addition. Typical value-

added products include jams, jellies, preserves, fruit sauces and spreads, pickles, preserved vegetables, tapenades, hot chili sauces, extra virgin olive oils, herb-flavored olive oils and vinegars, and salsas. Typically fruits and vegetables have a low price when they are in the raw state, but can be processed into a range of dried foods, jams, juice, pickles and etc, which have a considerably higher value. The high added value means that the amount of food that must be processed to earn a reasonable income is relatively small. Hence, the size and type of equipment required to operate at this scale can kept to levels that are affordable to most aspiring entrepreneurs. In many countries, vegetables and fruits are among the most accessible raw materials for processing.

Olive is one of the popular fruits and is liked by majority of the people irrespective of their age group. As is the case with most of the fruits and vegetables, their availability is limited during off-seasons. Many techniques have been developed to make available seasonal fruits as well as vegetables even during off-season. The olive does not lend itself well to freezing, as it tends to develop off flavours and lose texture or crispiness. This fruit is highly perishable and seasonal. Hence processing is necessary. Processed olive is popular and is exported by many countries. Brazil is considered the main olive producing country in the world since 2005. During processing, nutritional quality of olive can be affected but there are recent researches carried out which use new technologies to retain the nutritional quality of the olive fruit.

2. MODEL OLIVE OIL PROCESSING UNDER FME SCHEME

2.1 LOCATION OF THE PROPOSED PROJECT AND LAND

The entrepreneur must provide description of the proposed location, site of the project, distance from the targeted local and distant markets; and the reasons/advantages thereof i.e. in terms of raw materials availability, market accessibility, logistics support, basic infrastructure availability etc. . Olive being grown in some parts of Jammu and Kashmir like Ramban, Uri, and Srinagar etc. Recently Rajasthan state had started cultivation of olive plants. In Rajasthan, Olive farms are basically situated in 7 districts - Bikaner,

Sriganganagar, Nagaur, Jhunjhunu, Alwar, Jaipur & Jalore. It is also grown in some parts of UP and Himachal Pradesh.

2.2 INSTALLED CAPACITY OF THE OLIVE OIL PROCESSING UNIT

The maximum installed capacity of the Olive oil manufacturing unit in the present model project is proposed as 30 tonns/annum or 100 kg/day Olive oil. The unit is assumed to operate 300 days/annum @ 8-10 hrs/day the 1styear is assumed to be construction/expansion period of the project; and in the 2nd year 55 percent capacity, 3rd year 65 percent capacity, 4th year 75 percent capacity, 5th year 90 percent capacity & 6th year onwards 100 percent capacity utilization is assumed in this model project.

2.3 RAW MATERIAL REQUIREMENTS FOR THE UNIT

A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material inventory. The processor must have linkage with producer organizations preferably FPCs through legal contract to get adequate quantity and quality of raw materials which otherwise get spoiled. In the Olive oil manufacturing project, the unit requires **341.8 kg/day, 404 kg/day, 466 kg/day, 560 Kg/day & 621 kg/day** Olive fruits at **55, 65, 75, 90 & 100** percent capacity utilization, respectively.

2.4 MANUFACTURING PROCESS OF THE OLIVE OIL

Flow chart for olive oil:

Harvesting

Harvesting and Transport

The optimal harvesting time is when oil levels are high in the olive fruit. Harvest should begin before natural fruit drop. In normal-ripening varieties the time to start harvesting can be judged by the color of the fruit skin. When there are no green olives left on the tree, perhaps only some fruits at color-change, oil biosynthesis has ceased and harvesting can begin. Improper handling during these phases can result in undesirable enzymatic reactions and the growth of yeasts and molds. The best way to transport the olives is in open-mesh plastic crates that allow air to circulate and prevent the harmful heating caused by the catabolic activity of the fruit. When stored before processing, the olives must be spread in shallow layers and kept in well-ventilated, cool, dry areas. Storing of the olives in jute sacks has to be avoided. To ensure that the olives retain the quality characteristics they possessed at the time of harvesting they must be delivered immediately to the extraction plant for processing.

Fruit cleaning and washing

Fruit cleaning entails two operations: leaf removal and washing. Defoliators suck the leaves, twigs, and dirt through a powerful airflow generated by an exhaust fan. After that, the olives are washed in a current of water. This water is recycled after decanting and clean water is constantly mixed in pre-set proportions. To improve washer efficiency, the washing vat is equipped with a shaker that shakes any impurities through screens as well as with an air injection system to create turbulence in the mass.

Milling

Olive fruit is made up of approximately 1/3 solid material, 1/3 water, and 1/3 oil. The objective of the first true step of olive oil production, crushing the olives, is to produce a paste with easily extracted oil droplets. Two types of machines are used to crush olives: stone mills and stainless-steel hammer mills. Each has advantages. A new system just introduced, removes the olive pits prior to crushing.

Stone mills the older of the two methods, stone crushers consist of a stone base and upright millstones enclosed in a metal basin, often with scrapers and paddles to guide the

fruit under the stones and to circulate and expel the paste. The slow movement of the stone crushers does not heat the paste and results in less emulsification so the oil is easier to extract without as much mixing (malaxation).

The major disadvantages of this method are the bulky machinery and its slowness, its high cost, and its inability to be continuously operated. The stones are also more difficult to clean, and the slow milling time can increase oxygen exposure and paste fermentation. Stone mills, because of their inefficiency, have been replaced by hammer mills in most large operations.

Hammer mills generally consists of a metal body that rotates at high speed, hurling the olives against a metal grate. The major advantage of metal crushers is their speed and continuous operation, which translate into high output, compact size, and low cost. Their major disadvantage is the type of paste produced. The oil is more emulsified, requiring a longer mixing period to achieve a good oil extraction and the speed of metal crushing can produce elevated temperatures and possible metal contamination. Both factors reduce oil quality.

Mixing of the Olive Paste (Malaxation)

Malaxation prepares the paste for separation of the oil from the pomace. This step is particularly important if the paste was produced in a hammer mill. The mixing process optimizes the amount of oil extracted through the formation of larger oil droplets and a reduction of the oil-water emulsion.

The paste is slowly mixed, bringing small droplets of oil in contact with each other to form larger droplets. This improves the extractability of the oil. Optimally, the malaxator is designed to assure thorough mixing, leaving no portion unmixed. Malaxation usually requires 45 minutes to one hour. The longer the contact between the oil and the fruit water, the more the final polyphenol content of the oil is reduced.

The temperature of the paste during malaxation is very important. It should be warm (26° to 30° C, which is still cold to the touch) to improve the viscosity of the oil and improve extractability. Temperatures above 30° C can cause problems such as loss of fruit flavors, increases in bitterness, and increases in astringency.

Sometimes it is difficult to get good oil extraction from certain pastes and it is usually because the olives have too much moisture. The solution is to let the olives sit for a few days in a well-ventilated area, raise the temperature of the paste, or add talc to absorb the excess moisture. A paste moisture content of < 45% is easily worked but the moisture content of > 50% is more difficult to extract oil.

Oil Extraction from the Paste

The next step is extracting the oil from the paste and fruit water (water of vegetation). The oil can be extracted by pressing, centrifugation, percolation, or through combinations of the different methods. Traditional Press: Pressing is the oldest method of oil extraction. The method involves applying pressure to stacked filter mats, smeared with paste, that alternate with metal disks; a central spike allows the expressed oil and water (olive juice) to exit. The machinery, however, is cumbersome, the process requires more labor than other extraction methods, the cycle is not continuous, and the filter mats can easily become contaminated. Cleanliness of the mats is extremely important. Each time the mats are used small particles of paste plug the filtration channels and can cause a loss of oil. The number one problem with the use of traditional presses is in getting fermentation defects into the oil from the mats. Mats can start to ferment if not used continuously or if not cleaned regularly. The solution is to wash the mats every day, or to use the presses continuously until harvest is finished.

Vertical Centrifuge

A vertical centrifuge spin at two times the velocity of a decanter and provides four times the separation force for the solid, water, and oil phases. They provide an additional separation of the three phases to further remove solid particles and water from the oil. Fresh warm water is added to "clean" the oil, creating a greater interface area between the phases. Many processors use two centrifuges, one for the "wet" oil from the decanter and a

second one to separate the oil from the wastewater of the first centrifuge. Added water is only 2-4°F warmer than the water/oil mixture to be separated.

Oil Storage & Bottling

Premium quality oils should be stored in stainless steel and maintained at a constant temperature of between 7 - 20°C after processing oil should be stored in bulk for 1-3 months to further settle out any particulate matter and fruit water.

Bulk storage and decantation eliminate the problems of sediment in bottles and oil contact with processing water residues that could lead to off-flavors in the oil. Oils bottled and sold immediately after processing must be consumed quickly (within a few weeks) to avoid flavor changes within the bottle.

2.5 MARKET DEMAND AND SUPPLY FOR OLIVE OIL

Olive oil, edible oil is being increasingly consumed by people from across the globe. Considering its nutritional value and the taste, olive oil is being consumed by a big pool of the global population. The market offers various types of olive oils such as extra virgin olive oil, light olive oil, pure olive oil, virgin olive oil, olive pomace oil, and refined olive oil. At present, the extra virgin olive oil is the highest quality olive oil, consumed by a majority of health-conscious people. As the extra olive oil carries less than 1% acidity, it has gained popularity across the globe. By region, the global olive oil market is divided into Europe, Asia Pacific, North America, and Rest of the World. Nations such as the United States and Australia are on the verge of standardization of olive oil on an international level. This would support the consistently rising demand for olive oil. The rising demand for olive oil in Europe and North America is expected to make these two regions two of the most promising markets for olive oil. Currently, the production of olive oil in countries such as Brazil and India is low. However, consistent efforts are being made by emerging nations to propel their production so as to meet the rising demand. The report on the global olive oil market highlights key factors driving the growth and factors challenging the market. Factors such as market structure, the feasibility of new projects,

current market trends, future projections, and key players operating in the market are measured in the report. A detailed analysis of technological improvements and market trends is carried out by analysts. The report briefs readers about key product segments and also gives a clear picture of the competitive landscape. By using industry-standard tools such as SWOT analysis, strengths, weaknesses, opportunities, and threats of key companies are measured in the report.

Extra virgin olive oil is the least processed, unrefined, and high-quality olive oil that contains no chemicals and is rich in nutrients. It retains the original taste of olives and has lower levels of oleic acid; thus, regarded as one of the healthiest oils around.

Its nutritional composition includes vitamins D and K, monosaturated fats, and high levels of antioxidants. Extra virgin olive oil is also perceived to reduce the risk of cardiovascular disease, inflammation, and bad cholesterol. The ongoing health consciousness trend promotes the use of extra virgin olive oil, significantly boosting the sales of products containing this super healthy oil. This is one of the main factors expanding the global olive oil market size.

Olives are mostly cultivated in the Mediterranean region in countries such as Spain, Greece, Italy, Turkey, Morocco, and Egypt. These countries are among the leading producers of olives, and olive farming is one of the important businesses across these countries.

Europe accounts for more than 60% share of global olive oil production, whereas, the Middle East & Africa accounts for more than 30% of the market share. As such, these regions are the most attractive for new entrants in the global olive oil market.

The markets in China and India are projected to experience high growth in East Asia and South Asia, respectively. The increasing popularity and high rate of adoption of healthy extra virgin olive oil in a wide range of applications is an important factor, on the back of which, these economies are expected to witness exponential growth rates in the global olive oil market. However, the presence of fraudulent products and adulteration of olive oil is also hindering the growth of the global olive oil market.

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2.6 MARKETING STRATEGY FOR OLIVE OIL

The increasing urbanization and income offers huge scope for marketing of fruit based products. Urban organized platforms such as departmental stores, malls, super markets can be attractive platforms to sell well packaged and branded olive products.

2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for Olive oil unit is basically prepared as a template based on certain assumptions that may vary with capacity, location, raw materials availability etc. An entrepreneur can use this model DPR format and modify as per requirement and suitability. The assumptions made in preparation of this particular DPR are given in This DPR assumes expansion of existing fruit processing unit by adding new oil processing line. Therefore, land and civil infrastructures are assumed as already available with the entrepreneurs.

- Herewith in this DPR, we have considered the assumptions as listed below in the tables of different costs, which may vary as per region, seasons and machinery designs and supplier.
    1. Olive cost considered @ Rs.120/-per kg.
    2. 1 kg Olive will produce 17% recovery.
    3. 1 Batch size is approximately 100 kg.
    4. No. of hours per day are approximately 8-10 hours.
    5. Batch yield is 95%.

Detailed Project Assumptions		
Parameter	Assumption	
Capacity of the Olive oil Unit	30	MT/annum
Utilization of capacity	1st Year Implementation, 55% in second, 65% in third, 75% in fourth year, 90% in fifth & onwards	

Working days per year	300	days
Working hours per day	10	hours
Interest on term and working capital loan	12%	
Repayment period	Seven year with one year grace period is considered.	
Average prices of raw material	120	
Average sale prices per Kg	1500	Rs/kg
Pulp extraction	17	
OLIVE OIL	1 kg Olive oil from 6.21 kg Fresh olive	

2.8 FIXED CAPITAL INVESTMENT

2.8.1 MACHINERY AND EQUIPMENT

Sr No.	Equipment	Capacity	Quantity	Price (Rs. In Lacs)
1	Cold storage	1	1500 kg	5
2	Rotary type washing machine with screen	1	Suitable	0.8
3	Hammer Miller	1	suitable	1.4
4	Malaxator	1	Suitable	0.9
5	Oil expeller	1	Suitable	1.5
6	Vertical centrifuge machine	1	Suitable	0.8
7	Oil storage tank with heater	1	100 liter	0.3
8	Induction sealer	1	suitable	0.25
9	Bottle filling machine	1	suitable	0.75
10	Weighing balance	1	Suitable	0.06

11	Accessories	1	Suitable	0.5
			Total	12.26

2.8.2 OTHER COSTS:-

Utilities and Fittings:-

Utilities and Fittings	
1.Water	Rs. 0.8Lacs total
2.Power	

Other Fixed Assests:

Other Fixed Assets	
1. Furniture & Fixtures	Rs. 0.9 lac total
2. Plastic tray capacity	
3. Electrical fittings	

Pre-operative expenses

Pre-operative Expenses	
Legal expenses, Start-up expenses, Establishment cost, consultancy fees, trials and others.	0.9 LAC
Total preoperative expenses	0.9 LAC

Contingency cost to be added as approx.1.2 Lac.

So total startup cost at own land & Premise may be somewhat similar to 26.40 lacs. This is according to survey done at X location India. This may vary on location, situation and design change over.

2.9 WORKING CAPITAL REQUIREMENTS

Particulars	Period (Days)	Year 2 (55%)	Year 3 (65%)	Year 4 (75%)
Raw material stock	3	2.36	2.78	3.80
Work in progress	6	4.71	5.57	7.59
Packing material	10	0.55	0.65	0.89
Finished goods' stock	5	4.30	5.08	6.92
Receivables	10	8.59	10.15	13.84
Working expenses	7	0.13	0.16	0.22
Total current assets		20.63	24.39	33.25
Trade creditors		0.00	0.00	0.00
Working capital gap		20.63	24.39	33.25
Margin money (25%)		5.16	6.10	8.31
Bank finance		15.48	18.29	24.94

2.10TOTAL PROJECT COST AND MEANS OF FINANCES

Particulars	Amount in Lakhs
i. Land and building (20 x 32 x 12 ft - LxBxH)	5.18
ii. Plant and machinery	12.26
iii. Utilities & Fittings	0.8
iv. Other Fixed assets	0.9
v. Pre-operative expenses	0.90
vi. Contingencies	1.20
vii. Working capital margin	5.16
Total project cost (i to vii)	26.40
Means Of finance	
i. Subsidy	9.90

ii. Promoters Contribution	6.86
iii. Term Loan (@10%)	9.64

2.11 MANPOWER REQUIREMENTS

Total Monthly Salary (Rs.)	No	Wages	Total Monthly	Total Annually
Supervisor (can be the owner)	1	15000	15000	180000
Technician	1	12000	12000	144000
Semi-skilled	1	6000	6000	72000
Sales man	1	6000	6000	72000
			39000	468000

2.12 EXPENDITURE, REVENUE AND PROFITABILITY ANALYSIS

	Particulars	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th year**	**6th year**
A	Total Installed Capacity (MT)	187 MT Fresh olives/Annum	16.5	19.5	22.5	27	30
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	**Expenditure (Rs. in Lakh)**	0					
	Olive (Av. Price @ Rs. 120/Kg)	0.00	122.96	145.31	167.67	201.20	223.56
	Packaging materials	0.00	9.08	2.34	2.70	3.24	3.60
	Utilities (Electricity, Fuel)	0.00	0.47	0.55	0.64	0.77	0.85
	Salaries (1st yr only manager's salary)	1.80	4.68	4.68	4.68	4.68	4.68
	Repair & maintenance	0.00	0.70	0.80	0.90	0.90	0.90
	Insurance	0.30	0.30	0.30	0.30	0.30	0.30
	Miscellaneous expenses	0.50	2.30	2.30	2.30	2.30	2.30
	Total Expenditure	**2.60**	**140.48**	**156.29**	**179.19**	**213.39**	**236.19**
C	**Total Sales Revenue (Rs. in Lakh)**	**0.00**	**247.50**	**292.50**	**337.50**	**405.00**	**450.00**
	Sale of Olive oil (Av. Sale Price @ Rs.1500/kg)	0.00	247.50	292.50	337.50	405.00	450.00
D	**PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows**	**-2.60**	**107.02**	**136.21**	**158.31**	**191.61**	**213.81**
	Depreciation on civil works @ 5% per annum	0.26	0.25	0.23	0.22	0.21	0.20
	Depreciation on machinery @ 10% per annum	1.23	1.10	0.99	0.89	0.80	0.72
	Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05
	Interest on term loan @ 12%	1.00	0.97	0.93	0.89	0.84	0.79
	Interest on working capital @ 12%	0.00	1.86	2.19	2.99	2.99	2.99
E	Profit after depreciation and Interest (Rs. in Lakh)	**-5.21**	**104.60**	**133.97**	**156.23**	**189.69**	**212.04**
F	Tax (assumed 30%) (Rs. in Lakh)	**0.00**	**31.38**	**40.19**	**46.87**	**56.91**	**63.61**

G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	**-5.21**	**73.22**	**93.78**	**109.36**	**132.78**	**148.43**
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	1.00	0.97	0.93	0.89	0.84	0.79
I	Coverage available (Rs. in Lakh)	1.00	0.97	0.93	0.89	0.84	0.79
J	Total Debt Outgo (Rs. in Lakh)	0.33	0.37	0.41	0.45	0.50	0.55
K	Debt Service Coverage Ratio (DSCR)	3.00	2.62	2.28	1.97	1.69	1.44
	Average DSCR	2.16					
L	Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)	-3.60	74.67	95.09	110.55	133.86	149.41
M	Payback Period	2.5 Years					
	(on Rs. 26.40 Lakhs initial investment)						

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	963,552.71	133,663.24	100,209.48	33,453.76	930,098.94
2	930,098.94	133,663.24	96,730.29	36,932.95	893,165.99
3	893,165.99	133,663.24	92,889.26	40,773.98	852,392.01
4	852,392.01	133,663.24	88,648.77	45,014.48	807,377.53
5	807,377.53	133,663.24	83,967.26	49,695.98	757,681.55
6	757,681.55	133,663.24	78,798.88	54,864.36	702,817.19
7	702,817.19	133,663.24	73,092.99	60,570.26	642,246.93
8	642,246.93	133,663.24	66,793.68	66,869.56	575,377.37
9	575,377.37	133,663.24	59,839.25	73,824.00	501,553.37
10	501,553.37	133,663.24	52,161.55	81,501.69	420,051.68
11	420,051.68	133,663.24	43,685.37	89,977.87	330,073.81

12	330,073.81	133,663.24	34,327.68	99,335.57	230,738.25
13	230,738.25	133,663.24	23,996.78	109,666.47	121,071.78
14	121,071.78	133,663.24	12,591.47	121,071.78	(0.00)
		1,871,285.42	907,732.71	963,552.71	(963,552.71)

2.14 ASSET'S DEPRECIATION

Assets' Depreciation (Down Value Method)							Amounts in Lakhs	
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Civil works	5.18	4.92	4.67	4.44	4.22	4.01	3.81	3.62
Depreciation	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciated value	4.92	4.67	4.44	4.22	4.01	3.81	3.62	3.44
Plant & Machinery	12.26	11.03	9.93	8.94	8.04	7.24	6.52	5.86
Depreciation	1.23	1.10	0.99	0.89	0.80	0.72	0.65	0.59
Depreciated value	11.03	9.93	8.94	8.04	7.24	6.52	5.86	5.28
Other Fixed Assets	0.80	0.68	0.58	0.49	0.42	0.35	0.30	0.26
Depreciation	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04
Depreciated value	0.68	0.58	0.49	0.42	0.35	0.30	0.26	0.22
All Assets	18.24	16.64	15.18	13.87	12.68	11.60	10.62	9.74

Depreciation	1.61	1.45	1.31	1.19	1.08	0.98	0.89	0.81
Depreciated value	16.64	15.18	13.87	12.68	11.60	10.62	9.74	8.93

2.15 FINANCIAL ASSESSMENT OF THE PROJECT

Benefit Cost Ratio (BCR) and Net Present Worth (NPW)

Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year	
Capital cost (Rs. in Lakh)	26.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.60	140.48	156.29	179.19	213.39	236.19	236.19	236.19	
Total cost (Rs. in Lakh)	29.00	140.48	156.29	179.19	213.39	236.19	236.19	236.19	1426.93
Benefit (Rs. in Lakh)	0.00	247.50	292.50	337.50	405.00	450.00	450.00	450.00	
Total Depreciated value of all assets (Rs. in Lakh)								8.93	
Total benefits (Rs. in Lakh)	0.00	247.50	292.50	337.50	405.00	450.00	450.00	458.93	2641.43
Benefit-Cost Ratio (BCR): (Highly Profitable project)	**1.851**								
Net Present Worth (NPW):	1214.50								

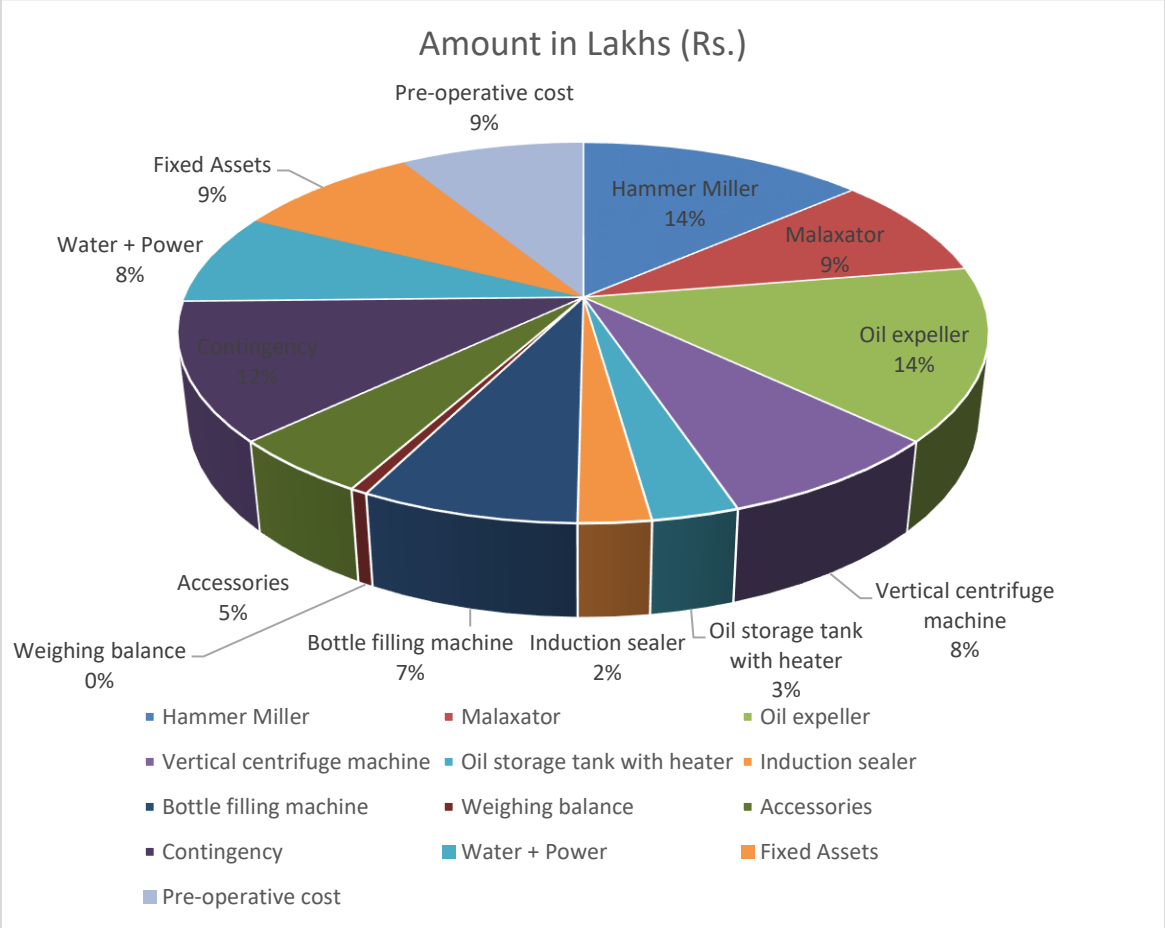
2.16 BREAK EVEN ANALYSIS

Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

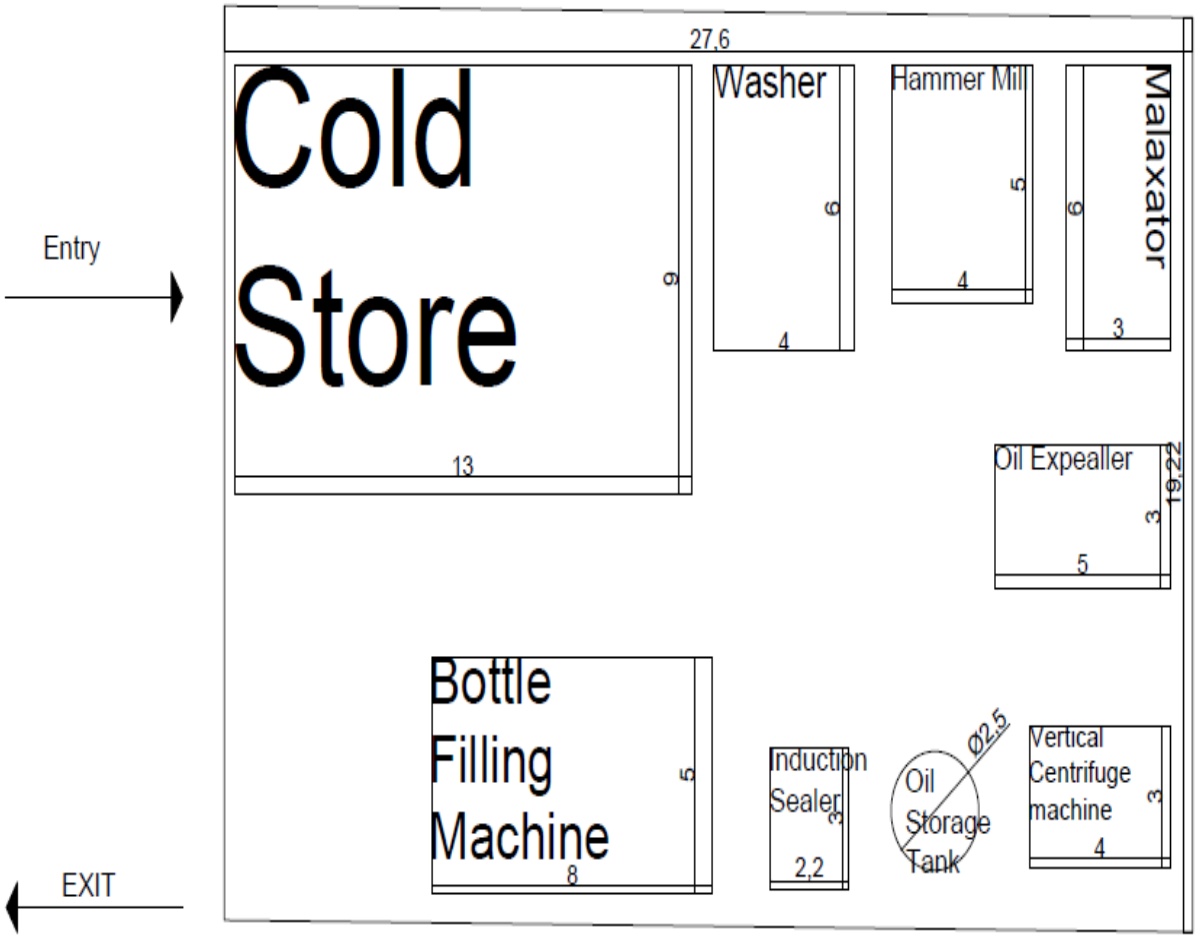
Particulars	**1st Year**	**2nd year**	**3 rd year**	**4th year**	**5th year**	**6th year**	**7th year**	**8th year**
Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
Production MT/Annum		16.5	19.5	22.5	27	30	30	30
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	4.68	4.68	4.68	4.68	4.68	4.68	4.68	4.68
Depreciation on building @ 5% per annum	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciation on machinery @ 10% per annum	1.23	1.10	0.99	0.89	0.80	0.72	0.65	0.59
Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04
Interest on term loan	1.00	0.97	0.93	0.89	0.84	0.79	0.73	0.67
Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Fixed Cost (Rs. in Lakh)	**7.58**	**7.39**	**7.22**	**7.05**	**6.89**	**6.74**	**6.59**	**6.45**
Sales Revenue (Rs. in Lakh)	**0**	**247.5**	**292.5**	**337.5**	**405**	**450**	**450**	**450**
Variable Cost (Rs. in Lakh)								
Fresh olives(Av. Price @ Rs.120/Kg)	0.00	122.96	145.31	167.67	201.20	223.56	223.56	223.56
Packaging materials	0.00	9.08	10.73	12.38	14.85	16.50	16.50	16.50
Casual staff salaries	0.00	3.18	3.18	3.18	3.18	3.18	3.18	3.18
Utilities (Electricity, Fuel)	0.00	0.47	0.55	0.64	0.77	0.85	0.85	0.85
Repair & maintenance	0.00	0.70	0.80	0.90	0.90	0.90	0.90	0.90
Miscellaneous expenses	0.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Interest on working capital @ 12%	0.00	1.86	2.19	2.99	2.99	2.99	2.99	2.99

Total Variable Cost (Rs. in Lakh)	**0.50**	**140.24**	**164.77**	**189.76**	**225.89**	**249.99**	**249.99**	**249.99**
Break Even Point (BEP)								
as % of sale	-	12.00	10.00	8.00	8.00	7.00	7.00	6.00
Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	29.70	29.25	27.00	32.40	31.50	31.50	27.00

2.17 PIE CHART FOR BETTER UNDERSTANDING OF EXPENSES OF EACH HEAD:



2.18 TYPICAL OLIVE OIL MANUFACTURING UNIT LAYOUT



2.19 MACHINERY SUPPLIERS

There are many machinery suppliers available within India for fruits based beverage processing machineries and equipment. Some of the suppliers are:

1. Bajaj Process pack Limited, Noida, India
2. Shriyan Enterprises. Mumbai, India

3. LIMITATIONS OF MODEL DPR & GUIDELINES FOR ENTREPRENEURS

3.1 LIMITATIONS OF THE DPR

i. This DPR has provided only the basic standard components and methodology to be adopted by an entrepreneur while submitting a proposal under the Formalization of Micro Food Processing Enterprises Scheme of MoFPI.

ii. This DPR is made to provide general methodological structure not for specific entrepreneur/crops/location. Therefore, information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of business, background of proposed project, location, raw material base/contract sourcing, entrepreneur's own SWOT analysis, market research, rationale of the project for specific location, community advantage/benefit, employment generation etc are not given in detail.

iii. The present DPR is based on certain assumptions on cost, prices, interest, capacity utilization, output recovery rate and so on. However, these assumptions in reality may vary across places, markets and situations; thus the resultant calculations will also change accordingly.

3.2 GUIDELINES FOR THE ENTREPRENEURS

i. The success of any prospective food processing project depends on how closer the assumptions made in the initial stage are with the reality of the targeted market/place/situation. Therefore, the entrepreneurs must do its homework as realistic as possible on the assumed parameters.

ii. This model DPR must be made more comprehensive by the entrepreneur by including information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of entrepreneur's business, project location, raw material costing base/contract sourcing, detailed market research, comprehensive dehydrated product mix based on demand, rationale of the project for specific location, community advantage/benefit from the project, employment generation, production/availability of the raw materials/crops in the targeted area/clusters

and many more relevant aspects for acceptance and approval of the competent authority.

iii. The entrepreneur must be efficient in managing the strategic, financial, operational, material and marketing aspects of a business. In spite of the assumed parameter being closely realistic, a project may become unsustainable if the entrepreneur does not possess the required efficiency in managing different aspects of the business and respond effectively in changing situations.

iv. The machineries should be purchased after thorough market research and satisfactory demonstration.

v. The entrepreneur must ensure uninterrupted quality raw materials' supply and maintain optimum inventory levels for smooth operations management.

vi. The entrepreneur must possess a strategic look to steer the business in upward trajectory.

vii. The entrepreneur must maintain optimum (not more or less) inventory, current assets. Selecting optimum source of finance, not too high debt-equity ratio, proper capital budgeting and judicious utilization of surplus profit for expansion is must.

viii. The entrepreneur must explore prospective markets through extensive research, find innovative marketing strategy, and maintain quality, adjust product mix to demand.

ix. The entrepreneur must provide required documents on land, financial transaction, balance sheet, further project analysis as required by the competent authority for approval.

x. The entrepreneur must be hopeful and remain positive in attitude while all situations.

Contact Us

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