DETAILED PROJECT REPORT

ORANGE JELLY MANUFACTURING UNIT.

INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY

Ministry of Food Processing Industries, Govt. of India

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Project At a Glance		
1	Name of the Project	Orange Jelly
2	Name of the entrepreneur/FPO/SHG/Cooperative	
3	Nature of proposed project	Proprietorship/Company/ Partnership
4	Registered office	
5	Project site/location	
6	Names of Partner (if partnership)	
7	No of share holders (if company/FPC)	
8	Technical advisor	
9	Marketing advisor/partners	
10	Proposed project capacity	150 MT/annum (55, 65, 75, 90 & 100% capacity utilization in the 2nd, 3rd, 4th, 5th and 6th years' onwards respectively
11	Raw materials	Orange Fruit
12	Major product outputs	Orange Jelly
13	Total project cost (Lakhs)	31.96
	Land development, building & civil construction	5.18
	Machinery and equipments	15.76
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	7.22
14	Working capital Management (In Lakhs)	
	Second Year	21.67
	Third Year	25.62
	Fourth Year	34.93
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	9.91
	Promoter's contribution (min 20%)	6.39
	Term loan (45%)	15.02
16	Debt-equity ratio	2.35 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	48.23
	3rd year	64.45
	4th year	77.73
18	Average DSCR	2.16
	Benefit Cost Ratio	1.90
	Term Loan Payment	7 Years with 1 year grace period
	Pay Back Period for investment	2 Years

Note: All the data/contents of this DPR are taken from the available information on IIFPT site.

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

1.1 INTRODUCTION

India ranks second for fruits and vegetables producer in the world followed by China. India, during 2017-18 has produced about 97358 thousand MT fruits and 184394 thousand MT vegetables in about 6506 Thousand Ha and 10259 Thousand Ha respectively (Horticulture statistics At a glance, 2018, MoA & FW Gol). In spite of this, the per capita availability of fruit in India is 107 gm/day which is below the recommended 120 gm/day. India's share of global exports of fresh fruits and processed fruit products is also quite meager compared to other major fruit producers of the world (Bung, 2012). Unfortunately, fruits and vegetables being perishable in nature get wasted to the tune of 20-30 % in the supply chain due to improper handling, transportation and poor post-harvest management; and only 2 % of them are processed in to value added products and the rest is consumed fresh. Orange is the third most important largest producer fruit following bananas and mangoes. Fruits of Orange are appreciated for their high content of flavonoids, vitamin C, citric acid and minerals.

Sweet orange (*Citrus sinensis* L.) is one of the most important subtropical fruits of India and belongs to the family Rutaceae. It is widely consumed fruit RTS by normal as well as sick people and is well known for its instant energy, pectins, vitamin C and potassium content. Sweet orange RTS is refreshing after any hectic activity or on a dry, hot day to quench thirst.

1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF ORANGE

The orange is the fruit of various citrus species in the family *Rutaceae*; it primarily refers to *Citrus × sinensis*, which is also called sweet orange, to distinguish it from the related *Citrus × aurantium*, referred to as bitter orange. The orange is a hybrid between pomelo (*Citrus maxima*) and mandarin (*Citrus reticulata*). Oranges are the most popular of all citrus fruits, and behind apples are also one of the most popular fruits grown and consumed globally. The orange originated in a region encompassing Southern China, Northeast India, and Myanmar, and the earliest mention of the sweet orange was in Chinese literature in 314 BC.

Oranges are believed to be native to the tropical regions of Asia, along with other citrus species, they have been cultivated from remote ages. Pomelo originated in India while mandarins originated in China. Orange culture probably spread from its native habitat to India and the east coast of Africa and from there to the eastern Mediterranean region. By the time Christopher Columbus sailed, orange trees were common in the Canary Islands. Today oranges are cultivated in subtropical and tropical America, northern and eastern Mediterranean countries, Australia, and South Africa.

Prior to 1920, the orange was mainly considered a dessert fruit. The spread of orange-juice drinking and consumption of value added products of orange, in contrast with eating of the fresh fruit, significantly increased the per capita consumption of oranges. Also important was the growing appreciation of the dietary value of citrus fruits; oranges are rich in vitamin C and also provide some vitamin A.

The orange has become the most commonly grown tree fruit in the world. It is an important crop in the Far East, the Union of South Africa, Australia, throughout the Mediterranean area, and subtropical areas of South America and the Caribbean. The United States leads in world production, with Florida, alone, having an annual yield of more than 200 million boxes, except when freezes occur which may reduce the crop by 20 or even 40%. According to UN's Food and Agriculture Organization in 2010, India ranked third orange producing country after Brazil and United states. Combined these countries accounts to almost half of the worl's production of 68 million tons. Other major producers are Spain, Japan, Mexico, Italy, Argentina and Egypt. Large quantities of fresh oranges and orange juice

concentrate are exported to the United States and small shipments go to East Germany, Canada and Argentina.

India exports sweet oranges to countries like Sri Lanka, France, the UK, Belgium, and Bangladesh in large scale. In India, major orange producing states are Andhra Pradesh, Maharashtra, Karnataka, Punjab, Haryana and Rajasthan. The areas producing mandarins are Coorg, Vidarbha, Darjeeling, Meghalaya, Asaam, Nagpur, Akola and Punjab. Area producing sweet oranges are Haryana, Punjab, Rajasthan, Maharashtra, Andhra Pradesh, Nagpur and Akola.

1.3 VARIETIES

There are different varieties of oranges growing worldwide. Varieties of oranges growing worldwide are described below.

Common Orange: Common oranges (also called "white", "round", or "blond" oranges) constitute about two-thirds of all the orange production. The majority of this crop is used mostly for juice extraction.

Navel: It is large but with a thick, easily removed rind; not very juicy; of excellent flavor, and seedless or nearly so. Ease of peeling and separation of segments makes this the most popular orange in the world for eating out-of-hand or in salads. Limonene content of the juice results in bitterness when pasteurized and therefore this cultivar is undesirable for processing. The tree needs a relatively cool climate and should not be grown below an elevation of 3,300 ft (1,000 in) in tropical countries. Today it is commercially grown, not only in Brazil and California, but also in Paraguay, Spain, South Africa, Australia and Japan.

Valencia: It is smaller than the 'Washington Navel', with a thinner, tighter rind; is far juicier and richer in flavor; nearly seedless. It needs a warm climate. In fact, it is the most satisfactory orange for the tropics, even though it may not develop full color in warm regions. The fruits

on the trees in spring will regreen, lose their orange color and turn green at the stem end, but the quality is not affected.

Hamlin: Hamlin, is small, smooth, not highly colored, seedless and juicy but the juice is pale. The fruit is of poor-to-medium quality but the tree is high-yielding and cold-tolerant. The fruit is harvested from October to December and this cultivar is now the leading early orange in Florida.

Other varieties of oranges growing worldwide are ‘Trovita’, 'Lue Gim Gong', ‘Rhode Red Valencia’, ‘Homosassa’, ‘Shamouti’, ‘Parson Brown’, ‘Pineapple’, ‘Queen’, ‘Blood Oranges’.

Varieties of oranges growing in India are described below.

Nagpur Orange: The fruit has a pockmarked exterior and sweet and juicy pulp. It gives the city of Nagpur its pseudonym *Orange City*. The Geographical Indication was applied for Nagpur orange with the registrar of GIs in India, and is effective as of April 2014. The Nagpur oranges blossom during the Monsoon season and are ready to be harvested from the month of December.

Coorg orange, also called **Coorg mandarin**, is a cultivar of orange from Kodagu in Karnataka. It was given the Geographical Indication status in 2006. Greenish-yellow in color, they have a tight skin and a sweet-sour taste, unlike Nagpur oranges which are known to have loose skin and sweet taste. Coorg oranges are said to have longer shelf life compared to other varieties.

Khasi Oranges trees are small, erect and evergreen. It is cultivator of orange from Meghalaya. They start bearing fruits in 3-5 years from planting, although full fruit yield happens only after eight years.

Darjeeling Mandarine is resembles to Khasi Mandarine.

The '**Kinnow**' is a high yield mandarin hybrid cultivated extensively in the wider Punjab region of India and Pakistan. In a hot climate, plants can grow up to 35 feet (11 m) high.[3] 'Kinnow' trees are highly productive. The fruit matures in January or February. It peels easily and has a high juice content.

Other varieties of oranges growing in India are Mudkhed, Shrinagar, Butwal, Dancy, Kara and Seedless.

1.4 HEALTH BENEFITS AND NUTRITIONAL INFORMATION

Oranges are known for their vitamin C content, a powerful antioxidant that helps protect cells from damage. Oranges are also a good source of fibre, B vitamins, vitamin A, calcium and potassium. This popular citrus fruit is particularly known for its vitamin C content. However, oranges contain a range of other plant compounds and antioxidants that may reduce inflammation and work against disease. They also contain health-promoting compounds known as flavanones. Research suggests that these citrus phytochemicals help support the body and protect us from conditions such as heart disease and cancer – they're also thought to have some anti-inflammatory, antiviral and antimicrobial benefits.

One medium orange will provide the NRV (nutrient reference value) of vitamin C for adults. Orange peel actually contains higher amounts of certain nutrients than the flesh, so using recipes that incorporate the zest of an orange will give your diet an extra boost.

- **Carbohydrates:** Oranges are mainly composed of Carbohydrates and water, with very little protein and fat and few calories. Oranges have a low glycemic index (GI) of 31-51.
- **Fiber:** Oranges are a good source of fiber. The main fibers found in oranges are pectin, cellulose, hemicellulose, and lignin. One large orange packs around 18% of the Reference Daily intake (RDI).

- **Vitamin C:** Oranges are an excellent source of Vitamin C. One orange provide 100% of RDI.

- **Folate:** Folate has many essential functions and is found in many plant foods.
- **Potassium:** Oranges are good source of Potassium. High intake of potassium can lower blood pressure and may reduce risk of heart disease.

Oranges are rich in various bioactive plant compounds, which are beneficial to health.

These are the main plant compounds in Oranges:

Citric acid: The most abundant organic acid in oranges, citric acid may help prevent the formation of kidney stones.

Hesperidin: This antioxidant may strengthen your blood vessels and prevent atherosclerosis — the buildup of fatty deposits (plaque) inside your arteries.

Anthocyanin: A class of antioxidant flavonoids, anthocyanin are responsible for the red flesh of blood oranges.

Beta-cryptoxanthin. This is one of the most abundant carotenoid antioxidants in oranges. Your body converts it into vitamin A.

Lycopene. An antioxidant found in high amounts in red-fleshed navel oranges, lycopene is also found in tomatoes and grapefruit. It has various health benefits.

Nutritional value per 100 g

Nutritional composition of orange fruit per 100ml	
Energy (Kcal)	42

Total sugars (g)	9
Vitamin – C (mg)	45
Potassium (mg)	176
Folate (mcg)	215
Total carbohydrates (mg)	0.7
Hesperidin (mg)	52
Pectins (mg)	33.4

CONSTITUENTS AND HEALTH BENEFITS OF ORANGES

Oranges also have many potential health benefits. Eating oranges may lower your risk of heart disease, cancer, and kidney stones.

Health benefits:

1. Heart health: Intake of fruits high in vitamin C is linked to reduced heart disease risk; Intake of isolated fibers from citrus fruits has been shown to decrease blood cholesterol levels, and the essential oils in oranges can protect LDL (bad) cholesterol particles from becoming oxidized. Flavonoids in citrus fruits (especially hesperidin) may help lower the risk of ischemic stroke in women and have protective effect against heart disease. Long term, regular consumption of foods that contain flavonoids might help protect against cancer and cardiovascular disease. Potassium may help lower the risk of stroke. Regular consumption of orange juice has a blood-thinning effect and lower risk of CVD.

2. Blood pressure: Consuming Orange can help reduce blood pressure.

3 Cancer prevention: Orange and orange juice are an excellent source of the antioxidant vitamin C. Antioxidants may help prevent free radicals from causing cell damage that can lead to cancer.

4 Prevent asthma: vitamin C also benefitted people with bronchial hypersensitivity when they also had a common cold and people with asthma.

5 Anemia prevention: Anemia is often caused by iron deficiency and most common in pre-menopausal women. Although Oranges are not good source of iron, but they are a great source of vitamin C and citric acid, which can increase the absorption of iron from other foods. It may help prevent anemia.

6. Prevention of kidney stones: The citric acid in Oranges may reduce your risk of kidney stones by diluting urine and increasing its citrate content. Potassium citrate is often prescribed to patients with the kidney stones. Citrates in oranges seem to have similar effects.

7. Boosting the immune system: Foods that are high in vitamin C and other antioxidants may help strengthen the immune system against the germs that cause the common cold and the flu.

8. Maintaining healthy complexion: Vitamin C plays a vital role in the formation of collagen, the support system of the skin. Sun exposure, pollution, age, and other factors can result in skin damage. By eating vitamin C in its natural form or applying it topically can help prevent this type of damage.

9. Scurvy: Scurvy is caused by deficiency of Vitamin C, connective tissues weaken due to the lack of vitamin C. Consumption of Orange prevent scurvy.

1.5 CULTIVATION, BEARING & POST HARVEST MANAGEMENT:-

The orange tree, reaching 25 ft (7.5 m) or, with great age, up to 50 ft (15 m), has a rounded crown of slender branches. The twigs are twisted and angled when young and may bear slender, semi-flexible, bluntish spines in the leaf axils. Leaves are 3 to 6 in (6.5-15 cm) long, 1 to 4 in (2.5-9.5 cm) wide. Borne singly or in clusters of 2 to 6, the sweetly fragrant white flowers, about 2 in (5 cm) wide. The fruit is globose, subglobose, oblate or somewhat oval, 3 to 4 in (6.5-9.5 cm) wide. Dotted with minute glands containing an essential oil, the outer rind (epicarp) is orange or yellow when ripe, the inner rind (mesocarp) is white, spongy and non-aromatic. The pulp (endocarp), yellow, orange or more or less red, consists of tightly packed membranous juice sacs enclosed in 10 to 14 wedge-shaped compartments which are readily separated as individual segments. In each segment there may be 2 to 4 irregular seeds, white externally and internally, though some types of oranges are seedless. The sweet orange differs physically from the sour orange in having a solid center.

Cultivation and Bearing:-

Mandarin orange (*Citrus reticulata*) is most common among citrus fruits grown in India. It occupies nearly 40% of the total area under citrus cultivation in India. The most important commercial citrus species in India are the mandarin (Citrus reticulata), sweet orange (*Citrus sinensis*) and acid lime (*Citrus aurantifolia*) sharing 41, 23 and 23 % respectively of all citrus fruits produced in the country.

Arid and semiarid regions of the southwest to humid tropical regions of northeast are best suitable for orange cultivation in India. They are best suited for subtropical type of climates where the temperature is around 13-37˚C. High humidity and frost are extremely dangerous for the plants. There could be a possible danger of fruit and flower drop due to hot winds during summer months. Some varieties can be grown at altitudes up to 2000 m above sea level. The soil that is best suited for orange plants should be light and well drained. Any soil such as sandy loam, alluvial, clay loam, lateritic etc. is favorable for orange plants. The pH of the soil may be around 4 to 9 but ideally deep soil with a pH of 5.5 to 7.5 is beneficial. The soil should not have high calcium carbonate content otherwise the feeder root zone may be badly affected.

The land for orange farming has to be ploughed thoroughly and properly levelled. Pits of dimensions 1 x 1 x 1 m are dug for planting. The best time for planting is from June till August. The normal spacing for planting the trees is 6 x 6 m such that one hectare of land can accommodate 277 plants.

The high density planting is practiced in hilly regions where planting is done on terraces against the slopes so as to accommodate more plants. These plants or trees are extremely sensitive to water logging and stagnation, so drainage channels of 3 to 4 ft depth along the slopes of the hilly regions are essential. The spacing for high density planting is 1.8 x 1.8 m between the plants such that one hectare of land can accommodate 2990 plants.

Fruit should be harvested when they attain full size, develop attractive orange color (Minimum 25%) with TSS (optimum sugar; acid blend) (8-10), since it is a non-climacteric fruit. Fully ripen fruits when turn to yellow color from green should be harvested. The common commercial practice of harvesting is to pull the fruits from the branch, which may rupture the skin near the stem and leading to fungal infection and subsequent rotting. Hence, fruit should neither be plucked nor torn off, but should be cut off preferably with clipper, shears or secateurs.

Post-harvest management:-

There are some fruit handling management after harvesting to avoid post-harvest losses. Following are Post-harvesting handling practices:

- Fruits are graded according to their size and color. All the diseased, deformed, bruised and unripe fruits are sorted out.
- Ethylene gas is used for treating the unripe green oranges such that they develop yellow or orange color.
- Oranges require a temperature of 7 to 8˚C and humidity of 85-90% such that they can be stored for 4 – 8 weeks.
- Do not leave harvested fruit out in the hot sun;

- Do not pick cold, wet fruit. When wet turgid fruit is handled the oil
- Glands can be ruptured. The released oil burns the fruit surface (oleocellosis) and also stimulates fungal spores to germinate. The burn Marks can take 2-3 days to develop;
- Wear cotton gloves when harvesting. This reduces puncture marks from Fingernails and jewellery;

- Use picking bags. This reduces damage as a result of abrasion on
- Wooden or metal picking bins and allows fruit to be gently lowered into
- Bulk harvesting bins;
- Do not leave stems on fruit or damage buttons by "plugging";
- Use clean, smooth harvesting bins;
- Make sure packing line equipment is cleaned regularly. This reduces dirt and wax buildup which can cause fruit abrasion;
- Reduce packing line abrasion by using foam, rubber and smooth belts to Cushion fruit;
- Remove old and rotten fruit regularly from the packing shed and surrounds;
- Treat harvested fruit with a registered fungicide within 24hrs of harvest;

The general practice is to wash the harvested fruits with chlorine and coat them with a shine wax so that the fruits look fresh. They are dried at a temperature of 50-55˚C after coating. If the fruits have to be transported over longer distances, then they are packed in wooden boxes else baskets made of bamboo and mulberry are used for packing oranges. The boxes or baskets have to be ventilated and the fruits should be wrapped in tissue paper or newspaper for protection.

1.6 PROCESSING & VALUE ADDITION:-

Jellies are clear substances since they are made of fruit juice or a water extract of fruit. Jams, however, contain all or most of the insoluble solids of the fruit because

whole, crushed, macerated, or pureed fruit is used in their manufacture. Technically, jams and preserves are identical, except the term preserves is used for products containing whole fruit.

Gelation of pectin is brought about by the addition of sugar in the presence of acid. Hydrogen bonding between hydroxyl groups and between hydroxyl and carboxyl groups (Whistler and Daniel, 1985) is responsible, at least in part, for the rigidity of fruit jellies. The relationships among the three essential ingredients, pectin, sugar, and acid, are important to the quality of the product. For example, insufficient pectin or acid may prevent gel formation and too little sugar results in a tough jelly (Woodroof, 1986).

Purified pectin is made from apple pomace and the white inner skin, or albedo, of citrus fruit. Pectins with high molecular weight and a relatively high proportion of methyl ester groups have the best jelly-forming ability. The quality of pectin is indicated by its ability to carry sugar when made into jelly and is expressed commercially by grade. Jelly grade is the proportion of sugar that one part of pectin is capable of turning, under prescribed conditions, into a jelly with suitable characteristics. If, for example, 1 lb of pectin will carry 150 lb of sugar to make a standard jelly, it is a 150-grade pectin.

The amount of sugar in a jelly depends on the amount and quality of the pectin used. When the sugar content of a mixture is increased or the pectin content decreased, a weaker jelly will result. Tougher gels result with reduction in sugar or an excess of pectin. In a normal finished jelly, the concentration of sugar is about that of a saturated sugar solution. The third essential ingredient for jelly is acid. The amount of acid required depends not on total but active acidity or pH. Apparently the acid acts by neutralizing the charge on the carboxyl groups of pectin, thus increasing the tendency of the molecules to associate and hence to form a gel. The pH must be below 3.5 for gel formation. As it is decreased below 3.5, the firmness of the jelly increases. Acids such as vinegar, lemon juice, lime juice, citric acid, lactic acid, malic acid, and tartaric acid often are added in making jellies and jams.

Water, a fourth ingredient in jelly, is taken for granted. In a natural fruit jelly, there are traces of other components, such as salts, proteins, and starches. Such

components are not essential, as shown by a formula for test jelly: 450 ml distilled water, 5.2 g of 150-grade pectin, and 775 g of sucrose (Cox and Higby, 1944). These ingredients are cooked until the batch weighs 1200 g and poured into four glasses, each of which contains 2.0 ml of tartaric acid solution (22.4 g of acid/50 ml of solution). This product is sometimes called a "synthetic" jelly because only purified ingredients are used in making it. The formula could be used in an experiment for studying the effects of ingredient variation on gel strength of jellies.

To make jelly without added pectin, fruits with adequate pectin levels (crab-apples, grapes, apples, currants, sour blackberries, cherries, quinces, lemons, sour oranges, and grapefruit) are best used (Woodroof, 1986, p. 428). Adding one of these fruits to lower pectin fruits (strawberries and apricots) (Woodroof, 1986), using partly underripe fruit, which is higher in pectin (USDA, 1988), or adding a commercial pectin will contribute needed pectin. Pectin content of juice is indicated by its viscosity because large molecules increase viscosity.

To make jelly, fruit is heated, and the juice is extracted and filtered. The mixture of sugar and juice is cooked in a kettle until the desired concentration of sugar (usually 65–69%) is achieved. In commercial operations, a vacuum system may be used for heating; the resultant lower cooking temperature minimizes hydrolysis of the pectin and maintains color and flavor (Woodroof, 1986). Methods of determining when jelly has cooked long enough can be divided into two groups: measurement of gelation and measurement of soluble solids content. Gelation can be measured by chilling a small amount of boiling jelly in a refrigerator or by the sheeting off test, in which the mixture is allowed to drip from a large cool spoon. If the syrup separates into two streams of drops that sheet off together, the jelly is done. The success of these crude tests depends on the experience of the operator.

The other tests are measures of soluble solids content. Measurements of solids are useful because if all the ingredients and other conditions are right, the mixture will form a jelly when it reaches a certain solids content. Juices poor in pectin or acid may not form jelly until the solids content is higher than normal, and juice rich in these constituents may gel at an unusually low solids content. The measures of soluble solids content used in

making jelly are boiling point, refractive index, and specific gravity. Boiling point is the only one of these methods available for home cooking. It is a useful guide, especially if applied to a standardized mixture that is cooked at a certain rate so that the extent of hydrolysis is controlled. Of course, the hydrolysis of sucrose caused by the fruit acid will increase the boiling point of the mixture without having a corresponding effect on soluble solids concentration. The boiling point ordinarily used for jelly is 104–105°C, or more accurately, 4–5°C above the boiling point of water (in order to correct for variation in atmospheric pressure and for inaccuracies in the thermometer). A boiling point 4.8°C above that of water corresponds to the 65% soluble solids content required for commercial jellies. The refractometer is used widely commercially because refractive index is the best measure of solids content. Another method that might be used is measurement of specific gravity with a hydrometer (Woodroof, 1986, pp. 429–430). Acid that is present during boiling hydrolyzes some of the sugar to invert sugar, which helps prevent crystallization of the sugar as the jelly is stored. The presence of acid in the boiling jelly may hydrolyze the pectin. For this reason, commercial manufacturers often add acid after jelly has cooked. Small lots of jelly cook so quickly that pectin hydrolysis seldom presents a problem.

2. MODEL ORANGE JELLY 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.

The ideal locations for establishment of exclusive Orange Jelly processing unit are in the production clusters of Orange growing states/Areas such as Andhra Pradesh, Maharashtra, Karnataka, Punjab, Haryana, Rajasthan, Meghalaya, Assam and Darjeeling where adequate quantities of surplus raw materials can be available for processing.

2.2 INSTALLED CAPACITY OF THE ORANGE JELLY PROCESSING UNIT

The maximum installed capacity of the Orange Jelly manufacturing unit in the present model project is proposed as 150 tonns/annum or 500 kg/day Orange Jelly. The unit is assumed to operate 300 days/annum @ 8-10 hrs/day. The 1st year is assumed to be construction/expansion period of the project; and in the 2nd year 70 percent capacity, 3rd year 80 percent capacity and 4th year onwards 90 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 Orange Jelly manufacturing project, the unit requires 350 kg/day,

400 kg/day and 450 kg/day Orange fruit at 70, 80 and 90 percent capacity utilization, respectively. The Mature Orange must be plucked from plant; and then stored below 6°C temperature.

2.4 MANUFACTURING PROCESS OF THE ORANGE JELLY

The typical Procedure for manufacturing of Orange Jelly is as below:

Orange fruits

(Mature and ripened fruits with characteristic flavor will be used)

↓

Sorting

↓

*Washing and cleaning

↓

Peeling & Slicing

↓

Boiling of orange slices in water

↓

Straining of Orange juice/Pulp

↓

Add sugar, citric acid, pectin, Preservatives (Colors and flavors optional)

*Brix Test

Hot Filling

*Storage

*Established Critical Control point

Receiving of Orange fruits: Fruit goes through inspection lines for removal of bruised or damages fruits.

Washing and cleaning: The fruits are graded and washed and rinsed with clean water, and inspected again to remove the damaged ones.

Peeling: Orange fruits are peeled by peeler machine

Slicing: Peeled orange fruits are sliced into slicer machine.

Boiling: Boiling of sliced oranges in water to extract juice or pulp.

Filtration: Clarification is done to separate juice/pulp. After Juice extraction, the juice is clarified and separated from the seed.

Addition of Sugar, Citric acid, Pectin and Color and flavor are optional.

Hot Filling of jelly is done

Packaging: Different types of packaging including plastic bottles, glass bottles and containers are used for Packaging of Orange Jelly.

2.5 MARKET DEMAND AND SUPPLY FOR ORANGE JELLY

Orange Fruits and peel were processed into various value added products like Orange Squash, Orange Crush, Orange marmalade, Orange sherbets, Orange candied peel, Orange candied peel with chocolate, Orange candied fruit slices, Orange candied fruit slices with chocolate, Orange jelly, Orange jam, and Orange ice lollies. Orange peel also processes into essential oil products. Due to sensitivity to chilling injury and limited shelf life of Orange fruit, it becomes important to process it in the form of valued added products to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of value added products has turn out to be the business activity of great significance and countries with rich fruit resources with short harvesting season are emphasizing more for establishes storage to keep up quality of fruits, enhance shelf life and preserve fruit for availability in off-season. In recent past the consumption of fruit based products has increased at a fast rate.

2.6 MARKETING STRATEGY FOR ORANGE JELLY

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 Orange fruit based products.

2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for Orange Jelly 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 jelly manufacturing 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. Orange cost considered @ Rs.13/-per kg.
    2. 1 kg Orange will produce 30% 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

Detailed Project Assumptions			
Parameter	Assumption		
Capacity of the Orange RTS Unit	150	MT/annum	
Utilization of capacity	1st Year Implementation, 70% in second, 80% in third and 90% in fourth year 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	13		
Average sale prices per Kg	200	Rs/kg	
Pulp extraction	30		
ORANGE JELLY	1 Kg Orange jelly from 3 kg Orange		

2.8 FIXED CAPITAL INVESTMENT

Rs. 5.18 lakhs required as Fixed Capital investment.

2.8.1 MACHINERY AND EQUIPMENT

Sr No.	Equipment	Capacity	Quantity	Price (Rs. In Lacs)
1	Cold store sq. meter	1	1500 Kg	6

2	Fruit Peeler	1	200 Kg/Hr	2.5
3	Fruit slicer	1	200 Kg/Hr	1
4	Double Jacketed Steam Kettle	1	200 liters	1.5
5	Blending/mixing Tank	1	200 liters	1.5
6	Bottle Filling machine	1	500 Bottle/hr	2.7
7	Weighing balance	1	Suitable	0.06
8	Accessories	1	Suitable	0.5
			Total	15.76

2.8.2 OTHER COSTS:-

Utilities and Fittings:-

Utilities and Fittings	
1.Water	Rs. 0.8 Lacs 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 31.96 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

Working Capital Requirement (Rs. in Lakh)

		55%	65%	75%
Particulars	Period	Year 2	Year 3	Year 4
Raw material stock	7 days	2.31	2.73	3.72
Work in progress	15 days	4.61	5.45	7.44
Packing material	15 days	1.20	1.42	1.93
Finished goods' stock	15 days	6.61	7.82	10.66
Receivables	30 days	13.23	15.63	21.31
Working expenses	30 days	0.94	1.11	1.51
Total current assets		28.90	34.15	46.57
Trade creditors		0.00	0.00	0.00
Working capital gap		28.90	34.15	46.57
Margin money (25%)		7.22	8.54	11.64
Bank finance		21.67	25.62	34.93

2.10 TOTAL 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	15.76
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	7.22
Total project cost (i to vii)	31.96
Means Of finance	
i. Subsidy	9.91
ii. Promoters Contribution	7.03
iii. Term Loan (@10%)	15.02

2.11 MANPOWER REQUIREMENTS

Total Monthly Salary (Rs.)	No	Wages	Total Monthly	Total Annualy
Supervisor (can be the owner)	1	18000	18000	216000
Technician	1	14000	14000	168000
Semi skilled	2	7600	15200	182400
Helper	1	5500	5500	66000
Sales man	1	8000	8000	96000
			60700	728400

2.12 EXPENDITURE, REVENUE AND PROFITABILITY ANALYSIS

		150	MT				
	Particulars	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th year**	**6th year**
A	Total Installed Capacity (MT)	450 MT Orange/Annum	82.5	97.5	112.5	135	150
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	**Expenditure (Rs. in Lakh)**	0					
	Orange Pulp (Av. Price @ Rs. 44/Kg)	0.00	31.22	36.89	42.57	51.08	56.76
	Sugar @ Rs. 35/kg	0.00	18.77	22.18	25.59	30.71	34.13
	Pectin @ Rs. 1400/Kg	0.00	0.09	0.11	0.13	0.15	0.17
	Other materials (Rs. 100/kg)	0.00	0.03	0.03	0.04	0.04	0.05
	Packaging materials (Rs 16 per Kg)	0.00	13.20	11.70	13.50	16.20	18.00
	Utilities (Electricity, Fuel)	0.00	1.32	1.55	1.79	2.15	2.39
	Salaries (1st yr only manager's salary)	2.16	7.28	7.28	7.28	7.28	7.28
	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	2.96	75.20	83.15	94.40	111.13	122.28
C	**Total Sales Revenue (Rs. in Lakh)**	0.00	165.00	195.00	225.00	225.00	225.00
	Sale of Orange Jelly (Av. Sale Price @ Rs.200/kg)	0.00	165.00	195.00	225.00	225.00	225.00
D	**PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows**	-2.96	89.80	111.85	130.60	113.87	102.75
	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	1.58	1.42	1.28	1.15	1.03	0.93
	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%	1.56	1.51	1.45	1.38	1.31	1.23
	Interest on working capital @ 12%	0.00	2.60	2.60	2.60	2.60	2.60
E	Profit after depreciation and Interest (Rs. in Lakh)	-6.48	86.52	108.80	127.77	111.26	100.31
F	Tax (assumed 30%) (Rs. in Lakh)	0.00	25.96	32.64	38.33	33.38	30.09
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	-6.48	60.56	76.16	89.44	77.88	70.22
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	1.56	1.51	1.45	1.38	1.31	1.23
I	Coverage available (Rs. in Lakh)	1.56	1.51	1.45	1.38	1.31	1.23
J	Total Debt Outgo (Rs. in Lakh)	0.52	0.58	0.64	0.70	0.77	0.86
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)	-4.52	62.33	77.76	90.88	79.19	71.40
M	Payback Period	2.5 Years					

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	15.02	2.08	1.56	0.52	14.50
2	14.50	2.08	1.50	0.57	13.92
3	13.92	2.08	1.44	0.63	13.29
4	13.29	2.08	1.38	0.70	12.58
5	12.58	2.08	1.30	0.77	11.81
6	11.81	2.08	1.22	0.85	10.95
7	10.95	2.08	1.13	0.94	10.01
8	10.01	2.08	1.04	1.04	8.97
9	8.97	2.08	0.93	1.12	7.82
10	7.82	2.08	0.81	1.27	6.54
11	6.54	2.08	0.68	1.40	5.14
12	5.14	2.08	0.53	1.54	3.59
13	3.59	2.08	0.37	1.70	1.88
14	1.88	2.08	0.19	1.88	(0.00)
		29.18	14.15	15.02	(15.02)

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	15.76	14.18	12.77	11.49	10.34	9.31	8.38	7.54
Depreciation	1.58	1.42	1.28	1.15	1.03	0.93	0.84	0.75
Depreciated value	14.18	12.77	11.49	10.34	9.31	8.38	7.54	6.78
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	21.74	19.79	18.02	16.42	14.98	13.67	12.49	11.41
Depreciation	1.96	1.77	1.60	1.44	1.31	1.18	1.07	0.97
Depreciated value	19.79	18.02	16.42	14.98	13.67	12.49	11.41	10.44

2.15 FINANCIAL ASSESSMENT OF THE PROJECT

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

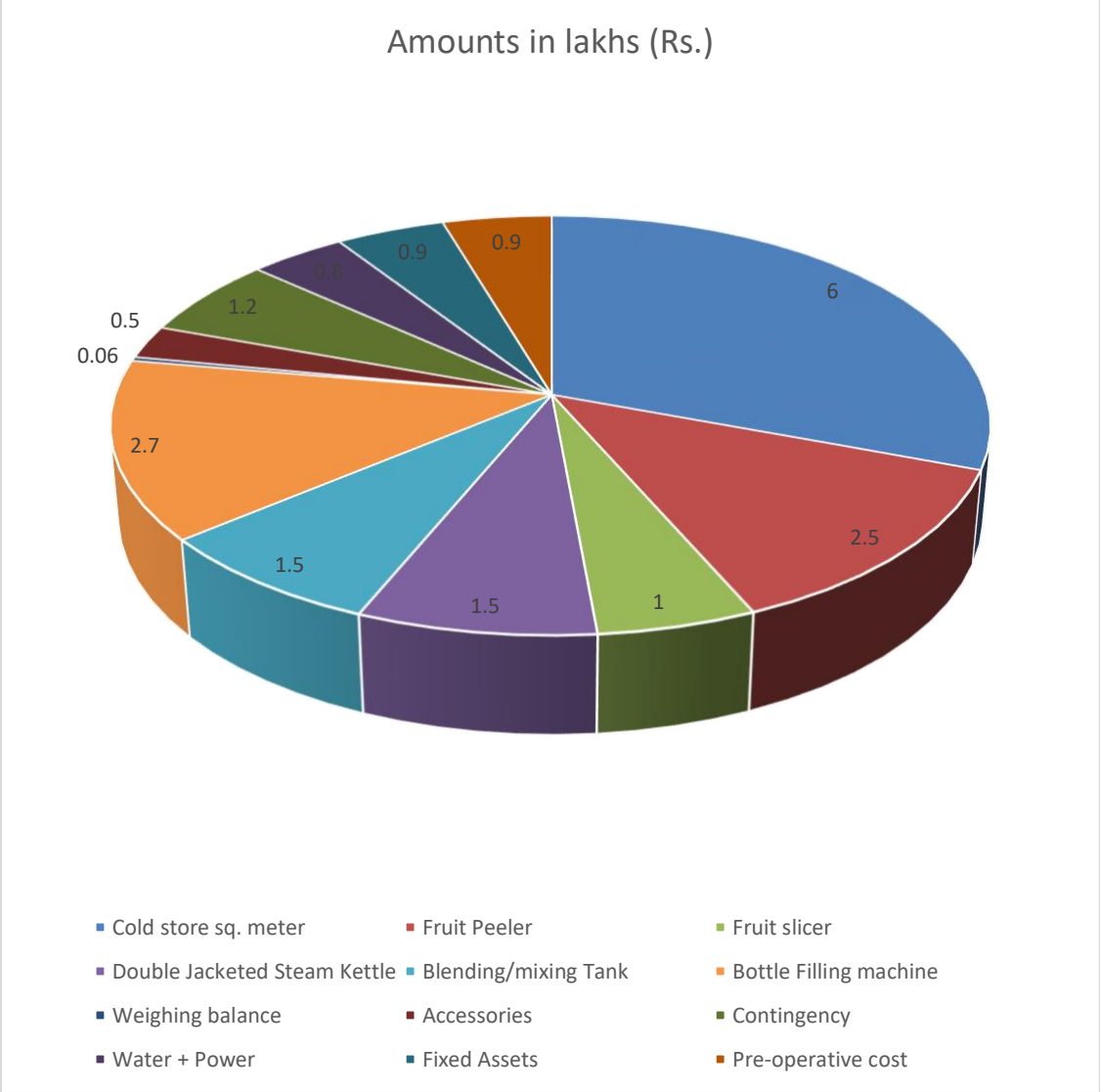
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year	
Capital cost (Rs. in Lakh)	31.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	75.20	83.15	94.40	111.13	122.28	122.28	122.28	
Total cost (Rs. in Lakh)	34.92	75.20	83.15	94.40	111.13	122.28	122.28	122.28	765.64
Benefit (Rs. in Lakh)	0.00	165.00	195.00	225.00	225.00	225.00	225.00	225.00	
Total Depreciated value of all assets (Rs. in Lakh)								10.44	
Total benefits (Rs. in Lakh)	0.00	165.00	195.00	225.00	225.00	225.00	225.00	235.44	1495.44
Benefit-Cost Ratio (BCR): (Highly Profitable project)	**1.953**								
Net Present Worth (NPW):	729.80								

2.16 BREAK EVEN ANALYSIS

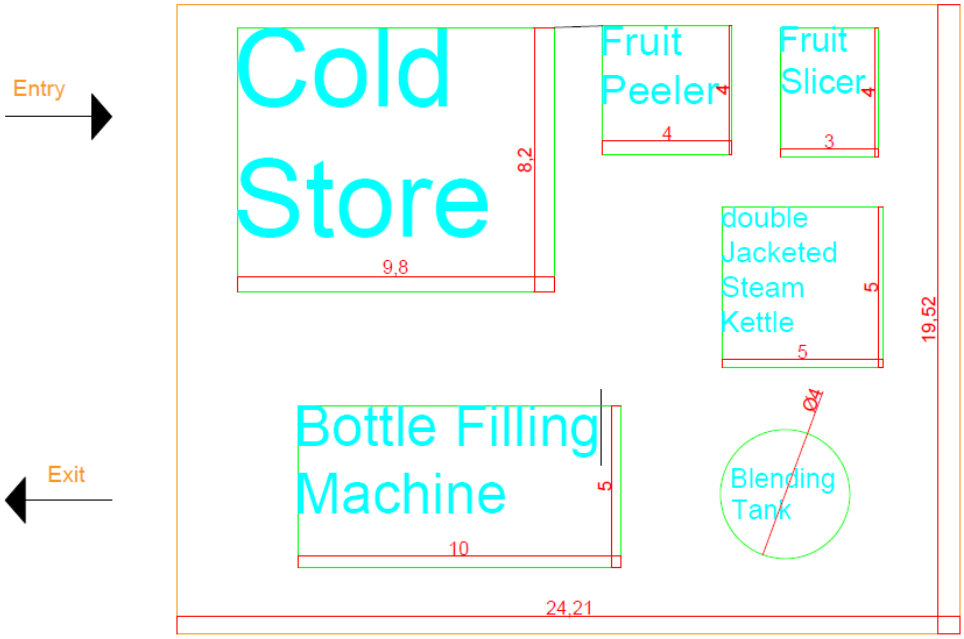
Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

Sr. No.	Particulars								
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
	Production MT/Annum		82.5	97.5	112.5	135	150	150	150
A	Fixed Cost (Rs. in Lakh)								
	Permanent staff salaries	7.284	7.284	7.284	7.284	7.284	7.284	7.284	7.284
	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	1.58	1.42	1.28	1.15	1.03	0.93	0.84	0.75
	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	1.56	1.51	1.45	1.38	1.31	1.23	1.14	1.04
	Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Total Fixed Cost (Rs. in Lakh)	**11.10**	**10.85**	**10.63**	**10.41**	**10.20**	**9.99**	**9.79**	**9.59**
B	**Sales Revenue (Rs. in Lakh)**	**0**	**165**	**195**	**225**	**225**	**225**	**225**	**225**
C	Variable Cost (Rs. in Lakh)								
	Orange Pulp(Av. Price @ Rs.44/Kg)	0.00	31.22	36.89	42.57	51.08	56.76	56.76	56.76
	Sugar @ 35 per kg	0.00	18.77	22.18	25.59	30.71	34.13	34.13	34.13
	Pectin @ 1400 per kg	0.00	0.09	0.11	0.13	0.15	0.17	0.17	0.17
	Other ingredients	0.00	0.03	0.03	0.04	0.04	0.05	0.05	0.05
	Packaging materials	0.00	13.20	15.60	18.00	21.60	24.00	24.00	24.00
	Casual staff salaries	0.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78
	Utilities (Electricity, Fuel)	0.00	1.32	1.55	1.79	2.15	2.39	2.39	2.39
	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	2.60	2.60	2.60	2.60	2.60	2.60	2.60
	Total Variable Cost (Rs. in Lakh)	**0.50**	**75.71**	**87.55**	**99.40**	**117.03**	**128.78**	**128.78**	**128.78**
D	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)	-	19.80	19.50	18.00	18.00	15.75	15.75	13.50
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%

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



2.18 TYPICAL ORANGE JELLY MANUFACTURING UNIT LAYOUT



2.19 MACHINERY SUPPLIE

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 0
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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