

DETAILED PROJECT REPORT
ORANGE READY TO SERVE MANUFACTURING UNIT.



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY

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Project At a Glance

1	Name of the Project	Orange RTS
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 (70, 80 & 90% capacity utilization in the 2nd, 3rd and 4th years' onwards respectively
11	Raw materials	Orange Fruit
12	Major product outputs	Orange RTS
13	Total project cost (Lakhs)	32.14
	Land development, building & civil construction	5.18
	Machinery and equipments	22.91
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	0.25
14	Working capital Management (In Lakhs)	
	Second Year	9.06
	Third Year	10.36
	Fourth Year	13.31
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	10.6062
	Promoter's contribution (min 20%)	6.428
	Term loan (45%)	15.1058
16	Debt-equity ratio	2.35 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	6.82
	3rd year	9.39
	4th year	11.94
18	Average DSCR	2.16
	Benefit Cost Ratio	1.29
	Term Loan Payment	7 Years with 1 year grace period
	Pay Back Period for investment	2 Years

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, 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 world'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 Mandarin is resembles to Khasi Mandarin.

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:-

Fruit beverages and drinks are one of the popular categories of beverages that are consumed across the globe. The fruit beverages and drinks are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to most of the synthetic and aerated drinks. In recent past the consumption of fruit based beverages and drinks has increased at a fast rate. Fruit RTSs or pulp used for the preparation of these products are subjected to minimal processing operations like filtration, clarification and pasteurization. The fruit RTS or pulp, are mixed with ingredients like sugar, acid, stabilizers, micronutrients

and preservative to develop beverages and drinks. The principle groups of fruit beverages are as follows:

- Ready-to-Serve (RTS) pre-packaged Beverages
- Fruit RTS and Nectars
- Dilutable beverages

Beverages are essential for growth, development as well for carrying out various physiological processes that are critical for living a healthy life. In adult individuals 70 percent of body weight, 73 percent of lean muscle, 25 percent of adipose tissues, 22 percent of bone and 80 percent of blood consists of water. Consumption of beverages help in maintaining the water content in body and prevent dehydration.

The water assists in digestion, assimilation and excretion of foods. It also helps in removing the toxic substances produced in body as a result of metabolisms such as urea, uric acid, ammonia etc. through kidney. Water in beverages help in regulating the temperature of body through the process of sweating. Beverages specially the fruit and vegetable based ones are source of micronutrients (vitamins and minerals) and antioxidants (carotenoids, flavonoids).

The ready-to-serve beverages as per FSSAI specifications should contain at least 10% fruit content and not less than 10 % TSS besides 0.3% acid maximum as citric acid. The levels of permitted preservatives include 70 ppm (maximum) for sulphur dioxide and 120 ppm (maximum) for benzoic acid. The total plate count and yeast and mold counts should not exceed, to 50.0 cfu/ml and 2.0 cfu/ml, respectively. The Coliform counts should be nil in 100 ml beverage samples. Since these beverages are consumed as such without dilution, hence are termed as Ready-to-serve beverage. The majority of packaged fruit beverages belong to this category.

Wide range of fruits including mango, citrus fruits, berries, litchi, guava, pineapple, grapes etc. are preferred for RTS beverages. Required amount of sugar, acid, stabilizer, colouring and flavouring ingredients are added in RTS or pulp along with water and the mixture is blending properly, filtered if desired. The RTS mix is pasteurized (80-90°C) in bottle (20-30 min), continuous RTS pasteurizer (few seconds to one minute) and cooled immediately. Nowadays, UHT processing of RTS beverages is quite popular because of longer shelf-life and less loss of nutrients during processing.

The amount of fruit RTS or pulp may vary according to fruit and cost effectiveness. The presence of oxygen in headspace often leads to oxidation resulting in off-flavour and loss of nutritive value, hence anti-oxidants such as ascorbic acid is often added in RTS beverages. Besides it, colour and flavour ingredients which are stable to heat and oxygen are preferred.

RTS and RTS products represent a very important segment of the total processed fruit industry. RTS products are being marketed as refrigerated, shelf-stable, and frozen, in a variety of packages with increased emphasis on functionality, health attributes, new flavours or blends, and in some cases fortified with vitamins and minerals. High-quality RTS operations are dependent upon a source of high-quality raw material. Most fruit RTSs are excellent sources of vitamin C, several are good sources of carotene and many contain moderate amounts of pyridoxine, inositol, folic acid and biotin. Fruit RTS is regarded as source of energy due to their rich carbohydrate content. The organic acids present in the fruit RTS plays a significant role in the maintenance of the acid-base balance in the body.

The process starts with sound fruit, freshly harvested from the field or taken from refrigerated or frozen storage. Thorough washing is usually necessary to remove dirt and foreign objects and may be followed by a sanitation step to decrease the load of contaminants. Sorting to remove decayed and mold contaminated fruit is necessary to make sure that the final RTS will not have a high microbial load, undesirable flavours, or mycotoxin contamination. For most fruits, preparation steps such as pitting and grinding is required prior to RTS extraction. Heating and addition of enzymes might also be included before the mash is transferred to the extraction stage. RTS extraction can be performed by pressing or by

enzymatic treatment followed by decanting. The extracted RTS will then be treated according to the characteristics of the final product.

For cloudy RTSs, further clarification might not be necessary or may involve a coarse filtration or a controlled centrifugation to remove large insoluble particles. For clear RTSs, complete de-pectinization by addition of enzymes, fine filtration, or high speed centrifugation is required to achieve visual clarity. The next step is usually a heat treatment or equivalent non-thermal process to achieve a safe and stable RTS and final packaging if single-strength RTS is being produced.

For a concentrate, the RTS is fed to an evaporator to remove water until the desired concentration level is obtained. Other processes used for water removal include reverse osmosis and freeze concentration, which are best suited for heat-sensitive RTSs. The concentrate is then ready for final processing, packaging, and storage.

2. MODEL ORANGE READY TO SERVE 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 Ready to Serve 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 READY TO SERVE PROCESSING UNIT

The maximum installed capacity of the Orange Ready to Serve manufacturing unit in the present model project is proposed as 150 tonns/annum or 500 kg/day Orange Ready to Serve. 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.

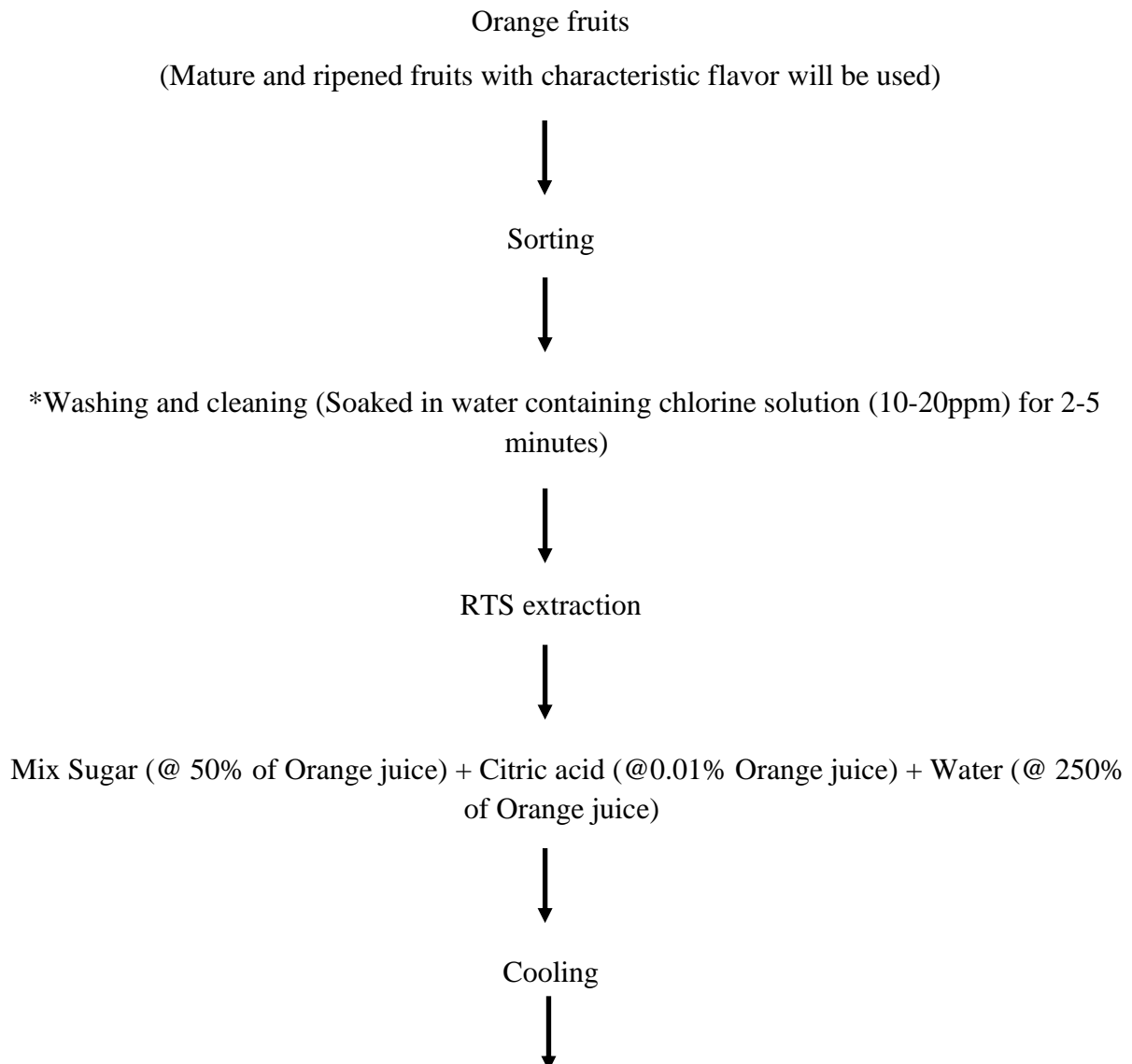
2.3 RAW MATERIAL REQUIREMENTS FOR THE UNIT

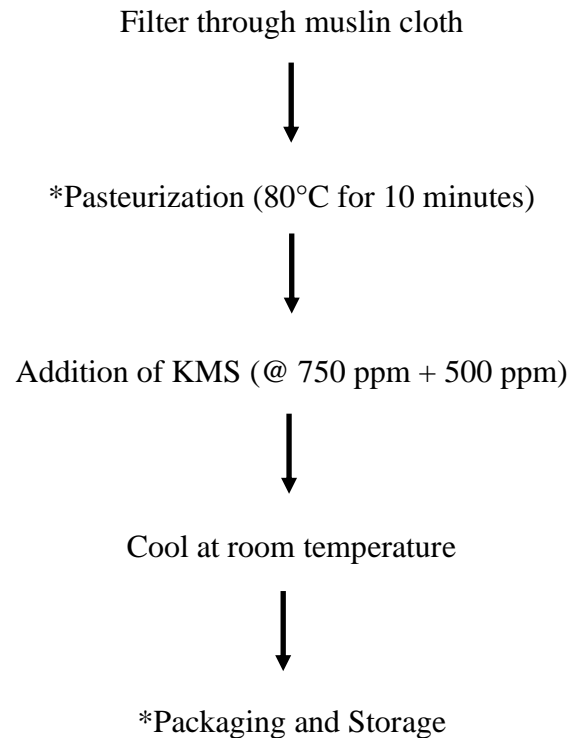
A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material inventory. The processor must have 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 Ready to Serve 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 READY TO SERVE

The typical Procedure for manufacturing of Orange Ready to Serve is as below:





*Established Critical Control point

Orange RTS is a complex product. A good understanding of the basic nature and properties of orange RTS is therefore needed for processing and packaging orange RTS. In fact, such knowledge is indispensable for ensuring that high product quality is maintained during RTS processing. The quality of orange fruit is important for the characteristics of the final orange RTS product. Oranges are natural products and therefore vary significantly in flavour, vitamin C content and colour according to the variety of orange, the time of season when harvested and the region of the world where they are grown.

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

Washing and cleaning: The fruits are graded and soaked in water containing chlorine solution (10-20ppm) for 2-5 minutes, scrubbed by revolving brushes, rinsed with clean water, and inspected again to remove the damaged ones.

RTS extractor: RTS is extracted by pressing of whole oranges to get juice in machine. These extractors produces RTS free of peel extractives.

Filtration: Clarification is done to separate RTS by removing pulp. Extracted fruit RTS contains varying amount of suspended solids – broken fruit tissue, seed, skin & various gums, pectic substances and proteins in colloidal suspension. After Juice extraction, the juice is clarified and separated from the pulp. The mechanical separation of sieving is used as the final process. The pulp strain containing seeds, sacs further subjected to pulp washing and recovery.

Pasteurization: Pasteurization deactivates the enzymes present in the RTS and makes the RTS microbiologically stable. It is carried out using tubular or plate heat exchangers. RTS beverages is more sensitive to microbial contamination and also dissolved oxygen causes vitamin-c deterioration during storage. Hence pasteurization is major concern in RTS processing to enhance the shelf life of RTS beverage. In pasteurization tank orange RTS is preheated at 74°C and then pasteurized to kill bacteria. Two main aim of pasteurization of RTS beverages are

- 1) To deactivate enzymes
- 2) To make the RTS microbiologically safe.

Packaging: Different types of packaging including cans, bottles, cartons, drums and barrels made up of glass, metals, plastic, or laminates are used for the packaging of Orange juice.

2.5 MARKET DEMAND AND SUPPLY FOR ORANGE READY TO SERVE

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 RTS to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of

RTS 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 RTS for availability in off-season. Fruit beverages and drinks are one of the popular categories of beverages that are consumed across the globe. The fruit beverages and drinks are easily digestible, highly refreshing, thirst quenching, appetizing and nutritionally far superior to most of the synthetic and aerated drinks. In recent past the consumption of fruit based beverages and drinks has increased at a fast rate.

2.6 MARKETING STRATEGY FOR ORANGE READY TO SERVE

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 Ready to Serve 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 juice 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 Implemetation, 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	75	Rs/kg
Pulp extraction	30	
ORANGE RTS	1 Kg RTS from 0.9 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 Washer	1	100 kg/hr	1.5
3	Citrus juice Extractor	1	100 kg/hr	0.8
4	Pulper	1	100 kg/hr	1.2
5	Storage Tank	1	100 liters	0.8
6	Feed Pump	1	Suitable	0.25
7	Filter press	1	100 liters	0.7
8	Homogenizer	1	100 liters/hr	2.3
9	Steam kettle	1	100 liters/hr	1.7
10	Boiler	1	50 kg/hr	1.5

11	Pasteurizer	1	100 liters/hr	1.6
12	Carbonation Unit	1	Suitable	0.7
13	Filling & Capping	1	500 BPH	2.7
14	Compressor	1	Suitable	0.6
15	Weighing balance	1	Suitable	0.06
16	Accessories	1	Suitable	0.5
			Total	22.91

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 Assests	
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 32.14 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	0.61	0.72	0.98
Work in progress	15 days	1.21	1.44	1.96
Packing material	15 days	0.90	1.06	1.45
Finished goods' stock	15 days	2.75	3.25	4.44
Receivables	30 days	5.51	6.51	8.87
Working expenses	30 days	1.10	1.30	1.78
Total current assets		12.08	14.28	19.47
Trade creditors		0.00	0.00	0.00
Working capital gap		12.08	14.28	19.47
Margin money (25%)		3.02	3.57	4.87
Bank finance		9.06	10.71	14.60

2.10 TOTAL PROJECT COST AND MEANS OF FINANCES

Project Cost and Means of Finance

Particulars

Particulars	Amount in Lakhs
i. Land and building (20 x 32 x 12 ft - LxBxH)	5.18
ii. Plant and machinery	22.91
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	3.02
Total project cost (i to vii)	34.91

Means Of finance	
i. Subsidy	11.52
ii. Promoters Contribution	6.98
iii. Term Loan (@10%)	16.41

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	4 th Year	5th year	6th year
A	Total Installed Capacity (MT)	135 MT Orange/Annum	105	120	135	135	135
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	Expenditure (Rs. in Lakh)	0					
	Orange (Av. Price @ Rs. 13/Kg)	0.00	11.60	13.26	14.92	14.92	14.92
	Sugar @ Rs. 35/kg	0.00	4.59	5.25	5.91	5.91	5.91
	Other materials (Rs. 100/kg)	0.00	0.01	0.01	0.01	0.01	0.01
	Packaging materials (Rs 12 per Kg)	0.00	12.60	14.40	16.20	16.20	16.20
	Utilities (Electricity, Fuel)	0.00	2.81	3.21	3.61	3.61	3.61
	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	42.20	46.82	51.44	51.44	51.44
C	Total Sales Revenue (Rs. in Lakh)	0.00	61.88	73.13	84.38	84.38	84.38
	Sale of Orange RTS (Av. Sale Price @ Rs.75/kg)	0.00	61.88	73.13	84.38	84.38	84.38
D	PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows	-2.96	19.67	26.31	32.94	32.94	32.94
	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	2.29	2.06	1.86	1.67	1.50	1.35
	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%	1.71	1.65	1.58	1.51	1.43	1.34
	Interest on working capital @ 12%	0.00	1.09	1.09	1.09	1.09	1.09
E	Profit after depreciation and Interest (Rs. in Lakh)	-7.34	15.62	22.55	29.46	29.73	29.99
F	Tax (assumed 30%) (Rs. in Lakh)	0.00	4.68	6.76	8.84	8.92	9.00
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	-7.34	10.93	15.78	20.63	20.81	20.99

H	Surplus available for repayment (PBDIT- Interest on working capital-Tax) (Rs. in Lakh)	1.71	1.65	1.58	1.51	1.43	1.34
I	Coverage available (Rs. in Lakh)	1.71	1.65	1.58	1.51	1.43	1.34
J	Total Debt Outgo (Rs. in Lakh)	0.57	0.63	0.69	0.77	0.85	0.93
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)	-4.67	13.34	17.96	22.59	22.59	22.60
M	Payback Period	2.5 Years					

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	16,40,791.98	2,27,609.32	1,70,642.37	56,966.96	15,83,825.03
2	15,83,825.03	2,27,609.32	1,64,717.80	62,891.52	15,20,933.51
3	15,20,933.51	2,27,609.32	1,58,177.08	69,432.24	14,51,501.27
4	14,51,501.27	2,27,609.32	1,50,956.13	76,653.19	13,74,848.08
5	13,74,848.08	2,27,609.32	1,42,984.20	84,625.12	12,90,222.95
6	12,90,222.95	2,27,609.32	1,34,183.19	93,426.14	11,96,796.82
7	11,96,796.82	2,27,609.32	1,24,466.87	1,03,142.45	10,93,654.36
8	10,93,654.36	2,27,609.32	1,13,740.05	1,13,869.27	9,79,785.09
9	9,79,785.09	2,27,609.32	1,01,897.65	1,25,711.67	8,54,073.42
10	8,54,073.42	2,27,609.32	88,823.64	1,38,785.69	7,15,287.73
11	7,15,287.73	2,27,609.32	74,389.92	1,53,219.40	5,62,068.34
12	5,62,068.34	2,27,609.32	58,455.11	1,69,154.22	3,92,914.12
13	3,92,914.12	2,27,609.32	40,863.07	1,86,746.25	2,06,167.87
14	2,06,167.87	2,27,609.32	21,441.46	2,06,167.87	0.00

		31,86,530.52	15,45,738.54	16,40,791.98	(16,40,791.98)
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2.14 ASSET'S DEPRECIATION

Assets' 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	22.91	20.62	18.56	16.70	15.03	13.53	12.18	10.96
Depreciation	2.29	2.06	1.86	1.67	1.50	1.35	1.22	1.10
Depreciated value	20.62	18.56	16.70	15.03	13.53	12.18	10.96	9.86
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	28.89	26.22	23.81	21.63	19.67	17.89	16.28	14.83
Depreciation	2.67	2.41	2.18	1.97	1.78	1.61	1.45	1.32
Depreciated value	26.22	23.81	21.63	19.67	17.89	16.28	14.83	13.52

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)	34.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	42.20	46.82	51.44	51.44	51.44	51.44	51.44	
Total cost (Rs. in Lakh)	37.87	42.20	46.82	51.44	51.44	51.44	51.44	51.44	384.07
Benefit (Rs. in Lakh)	0.00	61.88	73.13	84.38	84.38	84.38	84.38	84.38	

Total Depreciated value of all assets (Rs. in Lakh)								13.52	
Total benefits (Rs. in Lakh)	0.00	61.88	73.13	84.38	84.38	84.38	84.38	97.89	570.39
Benefit-Cost Ratio (BCR): (Highly Profitable project)	1.485								
Net Present Worth (NPW):	186.33								

2.16 BREAK EVEN ANALYSIS

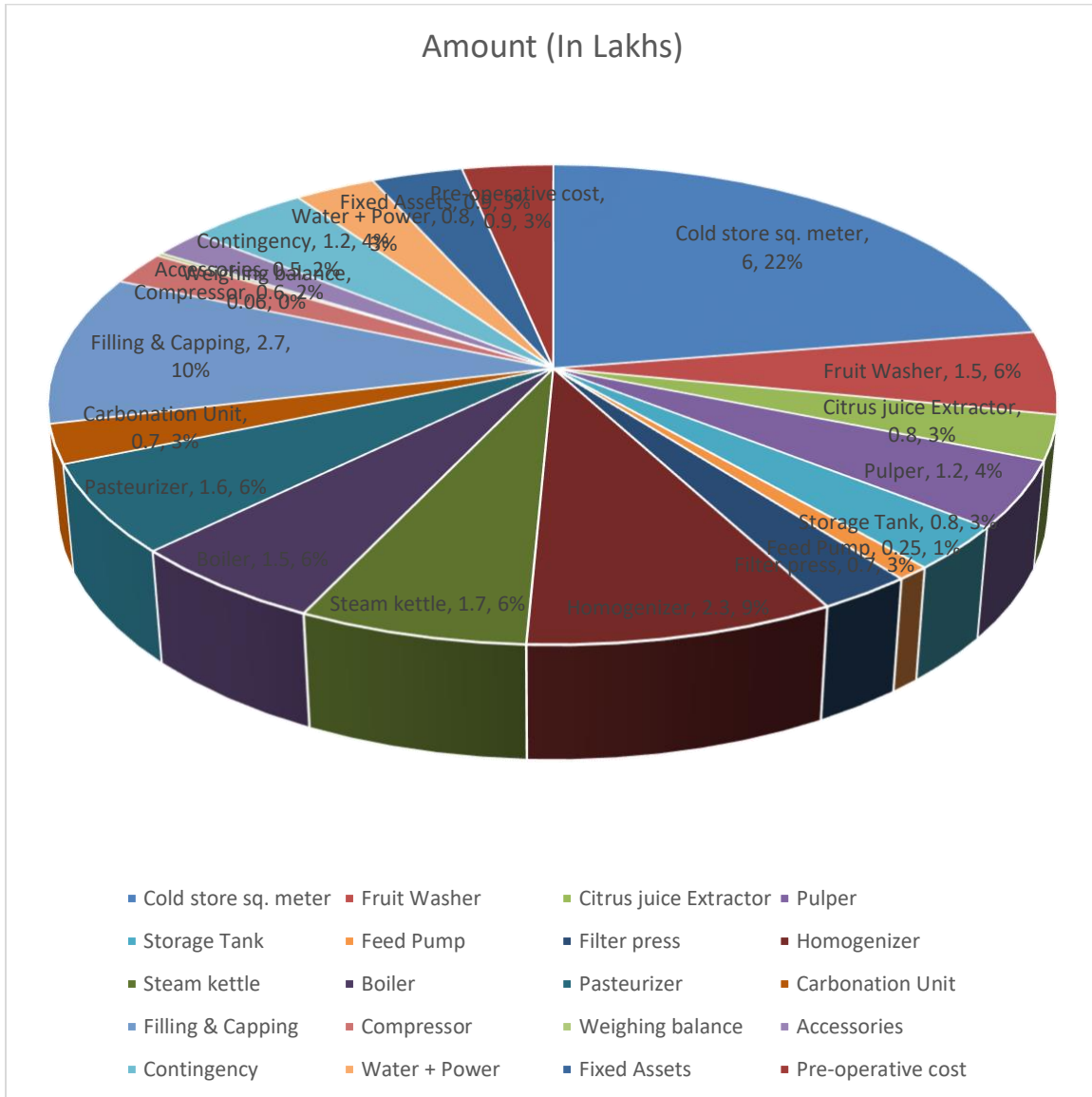
Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

Break-Even Analysis

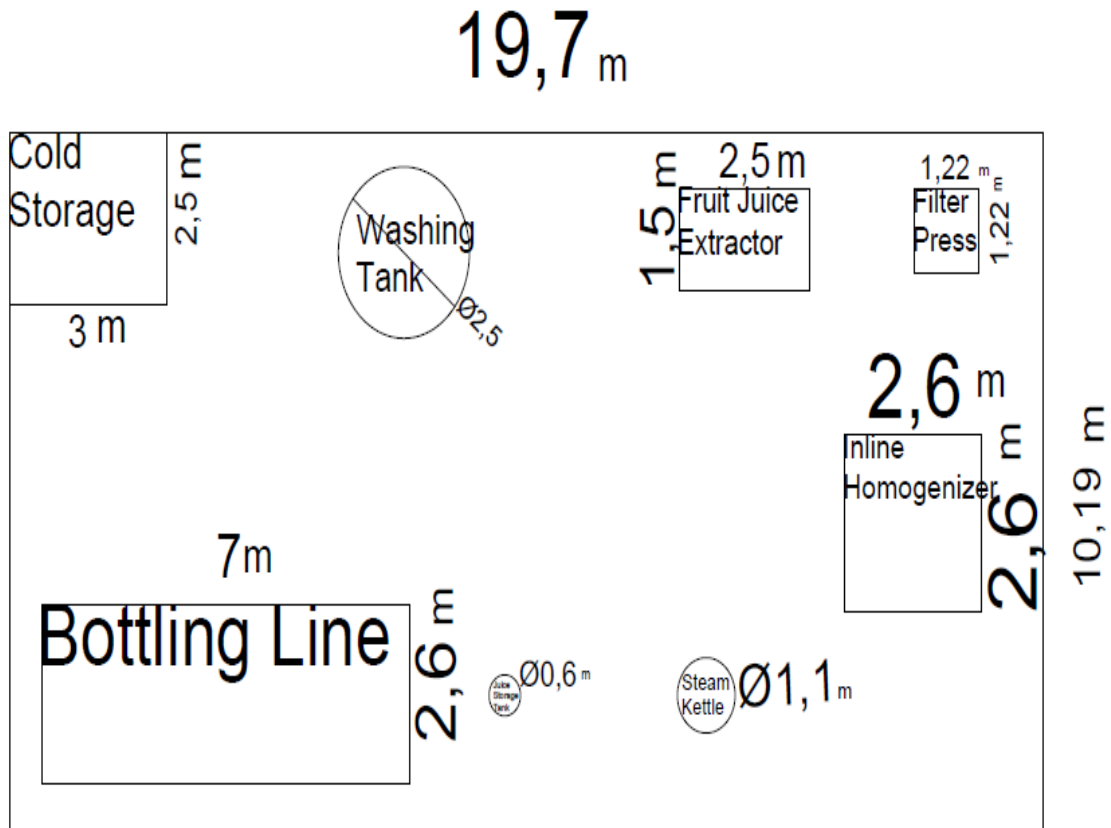
Sr. No.	Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
	Production MT/Annum		82.5	97.5	112.5	135	150	150	150
A	Fixed Cost (Rs. in Lakh)								
	Permanent staff salaries	7.284	7.284	7.284	7.284	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	2.29	2.06	1.86	1.67	1.50	1.35	1.22	1.10
	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	1.71	1.65	1.58	1.51	1.43	1.34	1.24	1.14
	Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Total Fixed Cost (Rs. in Lakh)	11.96042366	11.64113	11.34192835	11.05946	10.79056	10.5323	10.28185	10.03652
B	Sales Revenue (Rs. in Lakh)	0	61.875	73.125	84.375	84.375	84.375	84.375	84.375
C	Variable Cost (Rs. in Lakh)								
	Orange (Av. Price @ Rs.13/Kg)	0.00	9.12	10.77	12.43	14.92	16.58	16.58	16.58
	Sugar @ 35 per kg	0.00	3.61	4.27	4.92	5.91	6.56	6.56	6.56
	Other ingredients	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	Packaging materials	0.00	9.90	11.70	13.50	16.20	18.00	18.00	18.00
	Casual staff salaries	0.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78
	Utilities (Electricity, Fuel)	0.00	2.21	2.61	3.01	3.61	4.02	4.02	4.02
	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	1.09	1.09	1.09	1.09	1.09	1.09	1.09
	Total Variable Cost (Rs. in Lakh)	0.50	34.41	39.03	43.65	50.42	54.94	54.94	54.94
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)	-	7.43	7.31	6.75	6.75	5.91	5.91	5.06

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



2.18 TYPICAL ORANGE READY TO SERVE 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 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.



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