

**PM Formalization of
Micro Food Processing Enterprises Scheme**

**DETAILED PROJECT REPORT
FOR
MALTA SYRUP PROCESSING**



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Project At a Glance

1	Name of the Project	Malta Syrup
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 % capacity utilization in the 2 nd , 3 rd , 4 th , & 5 th years' onwards respectively
11	Raw materials	Malta Fruit
12	Major product outputs	Malta Syrup
13	Total project cost (Lakhs)	34.57
	Land development, building & civil construction	5.16
	Machinery and equipment	14.36
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	11.25
14	Working capital Management (In Lakhs)	
	Second Year	33.74
	Third Year	39.88
	Fourth Year	54.38
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	10.02
	Promoter's contribution (min 20%)	8.46
	Term loan (46%)	15.90
16	Debt-equity ratio	1.87 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	56.75
	3rd year	68.80
	4th year	80.84
18	Average DSCR	2.31
	Benefit Cost Ratio	1.84
	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 MALTA 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.

Malta (*Citrus sinensis*) is an orange-coloured fruit. Malta fruit is a hybrid of grapefruit and orange. It's grown commercially in tropical, subtropical, arid-irrigated and mountains regions in varying soil and weather conditions. It is known by many names in different parts of the world like Sweet Orange, Blood Orange etc. Commonly called as "sangtra" in India, Malta is a round-shaped, medium-sized fruit, weighing an average of 142.3 grams. The flesh is yellow to orange and may be very sweet. Fruit centres are solid (not hollow as in the sour orange). It has a rough-surfaced orange rind covered in small oil glands. Sweet orange is one of the most important subtropical fruits of India and belongs to the family Rutaceae. It is widely consumed fruit RTS/juice concentrates 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 MALTA

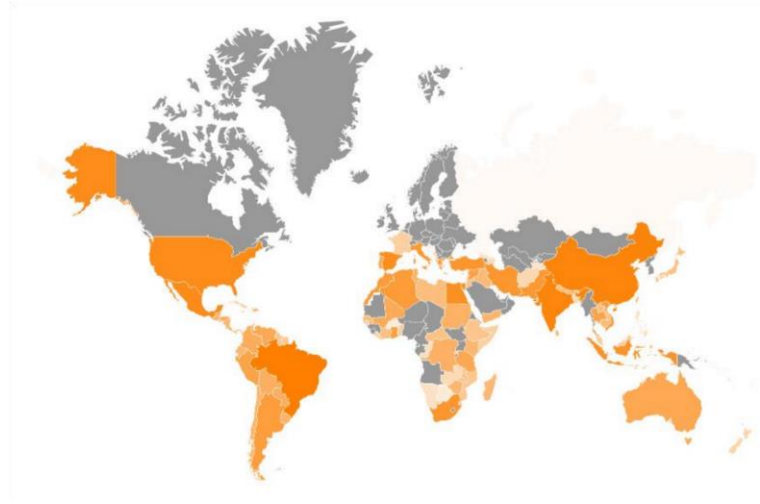
As a species, sweet orange is thought to have originated in southern China, north-eastern India, and Southeast Asia. The orange has become the most commonly grown tree fruit in the world, commercially cultivated in the Far East, South Africa, Australia, throughout the Mediterranean, and subtropical areas of North, Central, and South America and the Caribbean.

Malta is citrus fruit grown in India. It is commonly called as sangtra. It occupies nearly 30% of total area under citrus cultivation. Mandarin, Sweet Orange is commercially grown citrus species in India. Production of Mandarin orange is increasing every year in central and western parts of country. India ranks third in the production of orange after banana and mango fruits. In India, Orange is being grown in Rajasthan, Himachal Pradesh, Punjab and Uttar Pradesh.

Production:

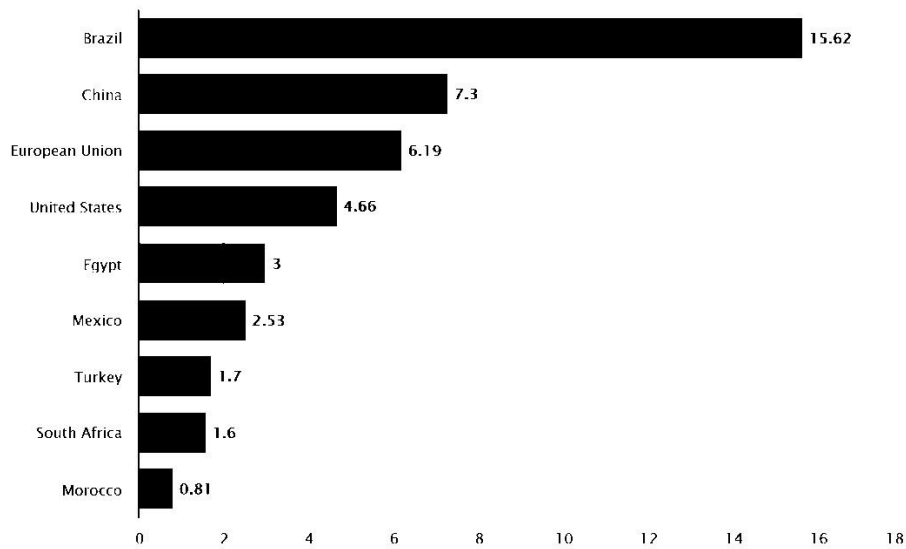
World Scenario

Global orange production for 2020/21 is forecast to rise 3.6 million metric tons (tons) from the previous year to 49.4 million as favourable weather leads to larger crops in Brazil and Mexico, offsetting declines in Turkey and the United States. Consequently, consumption, fruit for processing, and fresh exports are also forecast higher.



Countries Producing Malta fruit

Leading producer of Oranges in the year 2019-2020 was Brazil, China, EU, USA, Mexico and others. (Source: USDA)

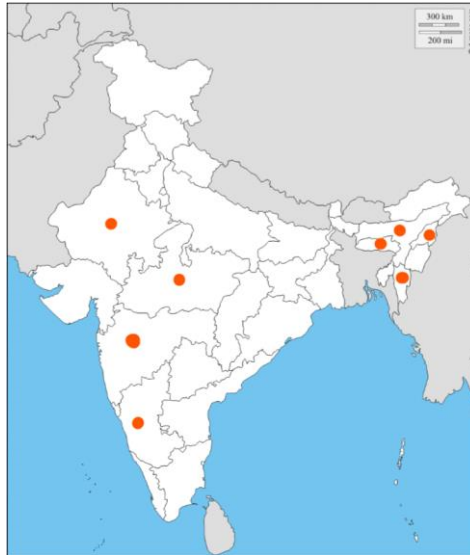


Leading orange producing countries worldwide in 2019/2020 (in million metric tons)

Indian Scenario

As per Third Advance Estimates 2019-20, India's orange output has been pegged at 63.97 lakh tonnes from the total land under Orange (Mandarin Orange/Kinnow) of 4.79 Lakh Hectare.

Rajasthan and Haryana and North eastern states.



Export

Oranges' worth over two billion Indian rupees was exported from India to Bangladesh in fiscal year 2020, making the neighboring country the leading importer of oranges. Nepal followed with 337 million rupees worth of fresh and dried orange exports from the India.

1.3 VARIETIES

There are different varieties of Sweet orange (malta) growing worldwide. Varieties of Malta 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.

Jaffa: Bigger sized fruits, round in shape with yellowish orange skin colour. 9-12 seeds are present in single fruit.

Sathukudi: Fruits are medium in size. Juice is totally acid less with 10% TSS.

Valencia Late: Medium size, oval shaped fruit. At ripening the colour of skin turns to golden yellow.

Blood Red: Fruits are medium-sized. Deep orange colour fruits at maturity with red colour flesh.

Pineapple: Medium-size juicy fruits. 10-20 Seeds are present per fruit.

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 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

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

- **Carbohydrates:** Maltas are mainly composed of Carbohydrates and water, with very little protein and fat and few calories. Maltas have a low glycemic index (GI) of 31-51.
- **Fiber:** Maltas are a good source of fiber. The main fibers found in maltas are pectin, cellulose, hemicellulose, and lignin. One large malta packs around 18% of the Reference Daily intake (RDI).
- **Vitamin C:** Maltas are an excellent source of Vitamin C. One malta provide 100% of RDI.
- **Folate:** Folate has many essential functions and is found in many plant foods.
- **Potassium:** Maltas are good source of Potassium. High intake of potassium can lower blood pressure and may reduce risk of heart disease.

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

These are the main plant compounds in Malta's:

Citric acid: The most abundant organic acid in malta's, 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 1 malta fruit (69 g)	
Energy (calories)	42.1
Carbohydrates (g)	10.1
Fiber (g)	2.1
Calcium (mg)	23.5
Magnesium (mg)	11.7
Phosphorus (mg)	23.5
Potassium (mg)	215
Copper (mcg)	90

Vitamin C (mg)	64
Folate (mcg)	17.2
Beta carotene (mcg)	35.9
Lutein & zeraxanthin (mcg)	84.2
Vitamin E (mg)	1.0
Vitamin K (mcg)	27.8

CONSTITUENTS AND HEALTH BENEFITS OF MALTA FRUITS

Malta fruits also have many potential health benefits.

Health benefits:

1. High Source of Vitamin C:

According to the nutritional break-up of malta fruit, per 100 grams contain 92.7 mg of Vitamin C, which is almost twice that of lemons and oranges. Vitamin C acts as powerful antioxidant, eliminating free radicals that could cause inflammation or cancer. It also helps in boosting the immunity of the body against harmful pathogens.

2. Sleep Inducer:

According to a research done by Taipei Medical University, “Numerous studies have revealed that malta fruit contains many medicinally useful compounds, among which antioxidants and serotonin may be beneficial in the treatment of sleep disorders.” It is said that having two malta fruits one hour before bedtime can help immensely in inducing sleep.

3. Good Source of Dietary Fiber:

This exotic fruit is loaded with dietary fiber, which helps in the prevention of numerous diseases. According to a study done by the University of Leeds, “Increasing consumption of fibre-rich foods can lower risks of both cardiovascular disease (CVD) and coronary heart disease (CHD).” According to researchers at the University of Massachusetts Medical School, high fiber foods keep one full for longer and control metabolic markers like blood pressure, cholesterol and blood sugar. It also facilitates weight loss and is often recommended to diabetics.

4. *Helps in Digestion:*

Malta fruit contains an enzyme known as actinidain which is known for its protein dissolving properties, similar to that of papain in papaya. This is the reason why it is commonly used as a meat tenderiser. Moreover, it helps in the digestion of proteins in the body and is also known to help patients suffering from irritable bowel syndrome.

5. *Good Source of Folate:*

It is a good source of folate, which is said to be beneficial for pregnant women because it helps in the development of the foetus, making it healthy. It is also considered to be good for growing children.

6. *Powerhouse of Vitamins and Minerals*

Malta fruit is loaded with vitamins and minerals such as Vitamins A, B6, B12, E, and potassium, calcium, iron and magnesium. These contribute collectively to the proper functioning of the body such as blood circulation through the vessels, fight stress, iron absorption for healthy bones and teeth, good vision, etc. The high levels of potassium, 312 mg per 100 grams, help in maintaining blood pressure whereas magnesium helps in the nerve and muscle functions.

7. *Beautiful Skin*

Malta is alkaline in nature, which means it helps in countering the effects of acidic foods that we quite often consume. A healthy body is one which has a good pH balance, which helps in keeping you active, full of energy, and with a youthful skin. The vitamins prevent

in malta (C and E) are said to be great for the skin as they act as antioxidant, preventing skin degradation. Take a few slices and apply them on your skin for good results. In addition to the above mentioned qualities, malta fruits contain omega 3 fatty acids, carotenoids, polyphenols, and promotes heart health. Meaning, benefits of malta are innumerable, adding them to your diet will be quite beneficial.

8. *May protect brain*

The flavonoids in citrus fruits may help ward off neurodegenerative diseases, such as Alzheimer's and Parkinson's, which result from the breakdown of cells in the nervous system. In part, these diseases are caused by inflammation. Flavonoids found in citrus fruits have anti-inflammatory capabilities that are thought to help protect against the chain of events that causes the nervous system to deteriorate. Specific types of flavonoids, including hesperidin and apigenin, have been shown to protect brain cells and improve brain function in mice and test tube studies.

1.5 CULTIVATION, BEARING & POST HARVEST MANAGEMENT:-

The Malta Fruit 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:-

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. It can be grown on wide variety of soils. Medium-Light Loam soils with pH of 6.0-8.0 are suitable for its best growth.

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. Land need to be prepare properly for growing seedlings. Land should be ploughed, Cross ploughed and leveled. Terrace planting is done on hills. High density planting is possible in hilly areas.

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. In Punjab planting is done in Spring season (February to March) and Monsoon season.

Spacing:

For sweet oranges use spacing of 5m x 5m is recommended. Dig pit of 1m x 1m x 1m, kept open in sun for some days. Add 15-20kg of well decomposed cow dung, SSP@500gm per Pit.

Sowing Depth:

Pits of size 60x60x60cm should be dug for planting seedlings.

Propagation:

Root stock raising: Sow citrus seeds in nursery on bed of 2m x 1m size and with 15cm distance between the row. When seedlings are of 10-12cm height, transplanting is to be done. Select healthy and uniform size seedling for transplantation purpose. Remove dwarf and weak seedlings. If needed, pruned roots slightly before planting. In nursery, Budding is done when plant are of pencil thickness. Shield budding or T shape budding is done for that, T shaped slot is made in bark of tree at distance of 15-20cm from ground. Horizontal cut of about 1.5-2cm long is given, and vertical cut of 2.5cm long is made from middle of horizontal cut. Remove bud from bud stick and insert it into T shape slots, afterward wrapped it with plastic paper.

The budding is done during February-March and also in August-September. Propagation in sweet orange, kinnow, grape fruit is done by T budding while for lime and Lemon, it is propagated by Air layering method.

Seed Rate:

Minimum plant density of 160 plants/acre should be maintained

PRUNING AND TRAINING

For proper growth of trunk of plant, Shoots in 50-60cm near ground level should be removed. Centre of plant should remain open. Water suckers should be removed at early stages of growth.

WEED CONTROL

Weed can be controlled by hand-hoeing and also controlled by chemically, use glyphosate@1.6litre per 150 litre of water. Use glyphosate only on weeds not on crop plants.

IRRIGATION

Sangtra require irrigation at regular intervals. Lifesaving irrigation should be given in winters and summers. Irrigation is necessary for Flowering, Fruiting and proper plant growth. Over irrigation may also led to diseases like Root rot and collar rot. High frequency irrigation is beneficial. Salty water is injurious for crop plants. Partial drying out of soil in spring may not affect plants.

PLANT PROTECTION

Insect-Pest and Their Management

Leaf miner: Larvae inside the upper or lower surface of young and newly emerged leaves are curled and look distorted. Young trees show a reduction in growth due to leaf miner. Best management for leaf miner is to leave it alone and let the natural enemies to feed upon them and parasitize their larvae. It can also be controlled by spraying Phosphamidon @1ml or Monocrotophos @1.5ml per 3-4 times fortnightly. Pheromone traps are also available for detecting leaf minor moths.

Citrus Psylla: These are Juice sucking pests. Damage is mainly caused by Nymphs. It injects a plant toxin liquid which burns foliage and skin of fruit. Leaves curl and fall off prematurely. It can be controlled by pruning of diseased plants, burning them. Spraying of Monocrotophos- 0.025% or carbaryl- 0.1% can also be helpful.

Scale Insects: Citrus scale insects are small insects that suck sap from the citrus trees and fruits. Honeydew is produced which is feasted upon by ants. They do not have much mouth parts. Male citrus scale has a short life span. There are mainly two types of scale on citrus plants armored scale and soft scales. Armored scale insects insert their mouth parts in the plant and never move again, eating and reproducing in the same spot. Soft scale bugs on citrus form a protective coating, which in turns cover citrus leaves and prevents photosynthesis. Once dead and soft scale will fall from tree instead of remaining stuck, they can be controlled with the introduction of indigenous parasitic wasps. Neem oil is also effective against them. Spraying of Parathion (0.03%) emulsion, dimethoate 150ml or malathion @0.1% are effective against scale control.

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

Value addition of fruit creates the opportunity for turning perishable fruit into a product that can store for longer periods of time. This can result in increased income for farmers, availability of nutritious fruit for a longer part of the year, and less fruit wasted. For Malta, this includes the creation of jams, jellies, juice, pulp, nectar, peel oil, essence etc and dried product that can be sold to businesses, restaurants, and consumers for an increased profit.

Malta Syrup

Malta syrup is concentrated Malta juice used as sweeteners. It is thick and viscous Malta juice that is obtained through dissolving sugar in cold juice or with short heating. It should not contain more than 65% sugar. Malta syrup can widely be used in preparation of

beverages and drinks such as milkshakes, cocktails, ice lollies, baking and confectionary products, sauces and marinades, dessert or breakfast toppings etc. Since Malta is a popular fruit, its syrup too is enjoyed by people of all the ages.

2. MODEL MALTA SYRUP 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 Malta syrup processing unit are in the production clusters of Malta growing states/Areas such as Andhra Pradesh, Maharashtra, Telangana, Madhya Pradesh, Karnataka, Punjab, Tamil Nadu, and Jammu and Kashmir where adequate quantities of surplus raw materials can be available for processing.

2.2 INSTALLED CAPACITY OF THE MALTA SYRUP PROCESSING UNIT

The maximum installed capacity of the Malta syrup manufacturing unit in the present model project is proposed as 150 tonns/annum or 500 kg/day Malta syrup. 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 55 percent capacity, 3rd year 65 percent capacity, 4th year 75 percent capacity, 5th year onwards 90 percent capacity utilization is assumed in this model project.

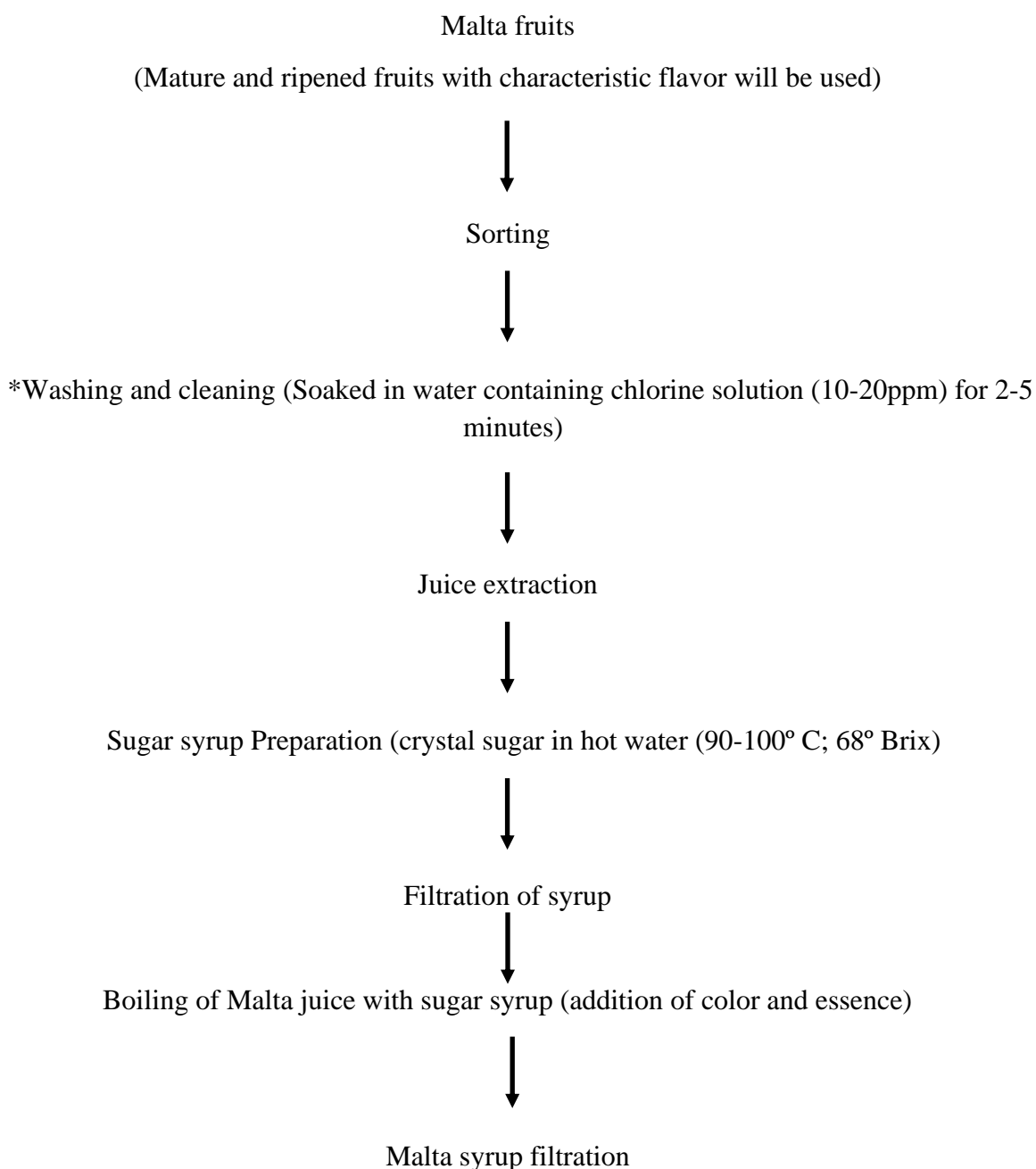
2.3 RAW MATERIAL REQUIREMENTS FOR THE UNIT

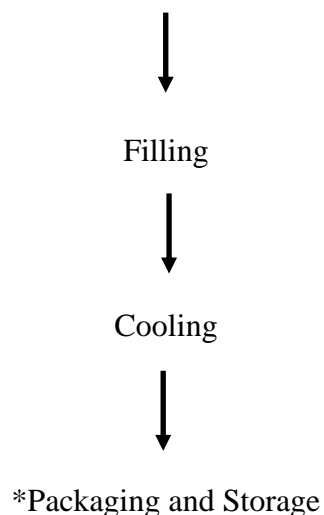
A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material inventory. The processor must have linkage with producer organizations preferably FPCs through legal contract to get adequate quantity and quality of raw materials which otherwise get spoiled. In the Malta syrup manufacturing project, the unit requires 282.33 kg/day, 333.66 kg/day, 385 kg/day, and 462 kg/day Malta fruit at 55, 65, 75, and 90

percent capacity utilization, respectively. The Mature Malta must be plucked from plant; and then stored below 6°C temperature.

2.4 MANUFACTURING PROCESS OF THE MALTA SYRUP

The typical Procedure for manufacturing of Malta syrup is as below:





*Established Critical Control point

Harvesting

Postharvest practices include everything after Malta is harvested to when it gets to the final market or consumer. This includes harvesting, packing, storing, transporting, processing, and marketing of produce. Good postharvest practices will increase the quality and the worth of the Malta while decreasing the amount that deteriorates.

Malta do not continue to ripen after being harvested, so they must be left on the tree until fully mature. They might remain green even if fully ripe. If it is not sure that Malta is ready to be harvested, it is removed from the tree and cut into half. If juice from the orange drips down and the flavour and colour of the pulp are sufficient, the Maltas are ready to harvest.

When harvesting Maltas, cut them off the tree with a bit of stem remaining so the point of attachment from the stem to the fruit does not leave a wound. Any type of wound on the fruit will cause rapid deterioration as moisture will move out of the fruit and pathogens will move in.

Postharvest handling of Maltas

Fruit should be handled gently and with care. They are living tissues that can be bruised, can get too wet, too dry, too hot, too much sun, or too crowded.

The Processing of harvested Maltas into syrup includes following steps:

1. Fruit reception:

Fruit is delivered in trucks that discharge their loads at the fruit reception area. The fruit may be prewashed to get rid of immediate surface dirt and pesticide residue before any leaves and stems still attached are removed. Then follows pre grading by manual inspection to remove any unsuitable fruit. Sound fruit is conveyed to storage bins. Damaged fruit goes directly to the feed mill or are discarded.

2. Extraction of juice

Extraction involves squeezing or reaming juice out of either whole or halved Malta by means of mechanical pressure. After final washing and inspection, the fruit is separated according to size into different streams or lanes. Individual Malta is directed to the most suitable extractor in order to achieve optimum juice yield. As the extraction operation determines juice yield and quality, the correct setting of extractor operating conditions is very important.

3. Sugar Syrup Preparation

It is done by dissolving crystal sugar in hot water (90-100° C). After the sugar has been dissolved, the syrup is boiled briefly. Removal of impurities and coagulated substances is then performed by foaming / scumming. An addition of about 0.3% citric acid helps syrup clarification, followed by filtration through cloth.

Syrups have to contain 68% soluble substances (refractometric extract) and minimum 1 g/100 ml citric acid. Up to a maximum 10% of sugar can be replaced by corn syrup.

4. Boiling

Boiling of Malta juice with sugar syrup can be done by following any one of the following methods.

a. Boiling in open kettles

- Malta juice -350-400 litre
- Sugar syrup -650-660 litre
- Citric acid -10 kg (max)

The juice is added to the prepared sugar syrup; the total time has to be as short as possible in order to avoid flavour loss and a too high sugar inversion degree (optimum inversion degree is 40%). Acid is added preferably towards the end of boiling.

During all boiling processes it is necessary to remove foam / scum. In order to avoid caramelization, the syrup has to be cooled rapidly. This can be carried out in baths with double bottoms through which water is circulated. One alternative to this method is to boil syrup in closed vessels to avoid flavour losses.

b) Boiling in a vacuum

The basic recipe is the same as above. Sugar syrup and Malta juice are mixed previously in a pre-heating kettle and then transported to vacuum equipment.

Boiling is performed at 50° C and at the end the temperature is raised slowly up to 65-70° C. The syrup can be cooled directly in vacuum equipment by closing the steam inlet and by increasing the vacuum. In this boiling method it is possible to incorporate a flavour recovery

device. Colour and Essence is added at the last in order to get the maximum flavour and aroma without its loss.

5. Syrup Filtration

This is a crucial step which is needed in order to clarify crystals and to get a clear translucent syrup. The filtration of syrup is done in warm conditions through cloth or using filtering sieve for syrups.

6. Filling

Filling of Malta syrup in bottles is done in aseptic conditions as much as possible in order to avoid syrup infection with osmophilic yeasts. Syrup preservation is assured by the high sugar content with respect to a low water activity. Regardless of the type of container, Malta syrup should be packed into cleaned and sterilized containers. Because filling into any kind of container, sterilized or not, may cause contamination, containers hot-filled with syrup should be inverted for 1-2 minutes immediately after being hot-filled and sealed.

7. Storage and Handling

Once containers/bottles are filled with syrup, they should be cooled before they are boxed and packed close together. Cooling will be more rapid, and the quality of the product will be maintained, if air can circulate around containers as they are cooling. It can take place in well ventilated storage rooms, avoiding sunlight at 10-15° C.

2.5 MARKET DEMAND AND SUPPLY FOR MALTA SYRUP

Malta Fruits and peel were processed into various value added products like Malta jam, Malta jelly, Malta marmalade, Malta sherbets, Malta puree, Malta Nectar, Malta Juice, Malta Juice concentrates, Malta candied peel, Malta candied peel with chocolate, Malta candied fruit slices, Malta candied fruit slices with chocolate, Malta ice lollies and Malta peel also processes into essential oil products. Due to sensitivity to chilling injury and limited shelf life of Malta fruit, it becomes important to process it in the form of

syrup/juice concentrates to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of syrup/juice concentrates has turned out to be the business activity of great significance and countries with rich fruit resources with short harvesting season are emphasizing more for establishing storage to keep up quality of fruits, enhance shelf life and preserve fruit syrup/juice concentrates 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 MALTA SYRUP

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 Malta fruit based products.

2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for Malta syrup 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 concentrate 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. Malta cost considered @ Rs.60/-per kg.
 2. 1 kg Malta 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		
Parameter	Assumption	
Capacity of the Malta syrup mfg. Unit	150	MT/annum
Utilization of capacity	1st Year Implementation, 55% in second, 65% in third, 75% in fourth, 90% in fifth 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	60	
Average sale prices per Kg	210	Rs/kg
Pulp extraction	30	
Malta syrup	1 Kg Malta syrup from 1.02 kg malta fruit	

2.8 FIXED CAPITAL INVESTMENT

2.8.1 MACHINERY AND EQUIPMENT

Sr No.	Equipment	Capacity	Area (ft)	Quantity	Price (Rs. In Lacs)
1	Cold store	1	9.2*8.6*10	1500 kg	6
2	Fruit washer	1	6*4	100 kg/hr	1.2
3	Pulper	1	3*4	100 kg/hr	1
4	Sugar syrup preparation tank	1	3 ft dia	100 liters	0.8
5	Filter press	2	3*2	100 liter	1.2
6	Thermic Fluid heating kettle	1	4 ft dia	100 liters/hr	2.2
7	Filling & Capping	1	8*4	Suitable	1.4
8	Weighing balance	1		Suitable	0.06
9	Accessories	1		Suitable	0.5
				Total	14.36

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 34.57 lacs. This is according to survey done at X location India. This may vary on location, situation and design change over.

2.9 WORKING CAPITAL REQUIREMENTS

Particulars	Period	Year 2 (55%)	Year 3(65%)	Year 4 (75%)
Raw material stock	15 days	6.23	7.37	10.04
Work in progress	15 days	12.46	14.73	20.09
Packing material	15 days	1.20	1.42	1.93
Finished goods' stock	15 days	7.99	9.44	12.88
Receivables	30 days	15.98	18.89	25.76
Working expenses	30 days	1.12	1.32	1.80

Total current assets		44.99	53.17	72.50
Trade creditors		0.00	0.00	0.00
Working capital gap		44.99	53.17	72.50
Margin money (25%)		11.25	13.29	18.13
Bank finance		33.74	39.88	54.38

2.10 TOTAL PROJECT COST AND MEANS OF FINANCES

Particulars	Amount in Lakhs
i. Land and building (20 x 32 x 12 ft - LxBxH)	5.16
ii. Plant and machinery	14.36
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	11.20
Total project cost (i to vii)	34.57
Means Of finance	
i. Subsidy	10.02
ii. Promoters Contribution	8.46
iii. Term Loan (@46%)	15.90

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

	Particulars	1st Year	2nd Year	3rd Year	4 th Year	5th year
A	Total Installed Capacity (MT)	154 MT Malta/Annum	82.5	97.5	112.5	135
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%
B	Expenditure (Rs. in Lakh)	0				
	Malta (Av. Price @ Rs. 60/Kg)	0.00	50.82	60.06	69.30	83.16
	Sugar @ Rs. 35/kg	0.00	12.42	14.67	16.93	20.32
	KMS	0.00	0.10	0.12	0.14	0.16
	other material	0.00	1.12	1.33	1.53	1.84
	Packaging materials	0.00	13.20	15.60	18.00	21.60
	Utilities (Electricity, Fuel)	0.00	1.56	1.84	2.13	2.55
	Salaries (1st yr only manager's salary)	1.80	6.43	6.43	6.43	6.43
	Repair & maintenance	0.00	0.70	0.80	0.90	0.90
	Insurance	0.30	0.30	0.30	0.30	0.30
	Miscellaneous expenses	0.50	2.30	2.30	2.30	2.30
	Total Expenditure	2.60	88.95	103.45	117.96	139.56
C	Total Sales Revenue (Rs. in Lakh)	0.00	173.25	204.75	236.25	283.50
	Sale of Malta Syrup (Av. Sale Price @ Rs.210/kg)	0.00	173.25	204.75	236.25	283.50
D	PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows	-2.60	84.30	101.30	118.29	143.94
	Depreciation on civil works @ 5% per annum	0.26	0.25	0.23	0.22	0.21
	Depreciation on machinery @ 10% per annum	1.44	1.29	1.16	1.05	0.94
	Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06
	Interest on term loan @ 12%	1.65	1.60	1.53	1.46	1.39
	Interest on working capital @ 12%	0.00	4.05	4.79	6.53	6.53
E	Profit after depreciation and Interest (Rs. in Lakh)	-6.07	81.06	98.28	115.49	141.34
F	Tax (assumed 30%) (Rs. in Lakh)	0.00	24.32	29.48	34.65	42.40
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	-6.07	56.75	68.80	80.84	98.94
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	1.65	1.60	1.53	1.46	1.39
I	Coverage available (Rs. in Lakh)	1.65	1.60	1.53	1.46	1.39
J	Total Debt Outgo (Rs. in Lakh)	0.55	0.61	0.67	0.74	0.82
K	Debt Service Coverage Ratio (DSCR)	3.00	2.62	2.28	1.97	1.69
	Average DSCR	2.31				
L	Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)	-4.25	58.38	70.28	82.18	100.15
M	Payback Period	2.5 Years				
	(on Rs. 34.57 Lakhs initial investment)					

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	1,590,088.10	220,575.72	165,369.16	55,206.56	1,534,881.54
2	1,534,881.54	220,575.72	159,627.68	60,948.04	1,473,933.50
3	1,473,933.50	220,575.72	153,289.08	67,286.64	1,406,646.86
4	1,406,646.86	220,575.72	146,291.27	74,284.45	1,332,362.41
5	1,332,362.41	220,575.72	138,565.69	82,010.03	1,250,352.38
6	1,250,352.38	220,575.72	130,036.65	90,539.07	1,159,813.31
7	1,159,813.31	220,575.72	120,620.58	99,955.14	1,059,858.17
8	1,059,858.17	220,575.72	110,225.25	110,350.47	949,507.70
9	949,507.70	220,575.72	98,748.80	121,826.92	827,680.78
10	827,680.78	220,575.72	86,078.80	134,496.92	693,183.86
11	693,183.86	220,575.72	72,091.12	148,484.60	544,699.25
12	544,699.25	220,575.72	56,648.72	163,927.00	380,772.26
13	380,772.26	220,575.72	39,600.31	180,975.41	199,796.85
14	199,796.85	220,575.72	20,778.87	199,796.85	0.00
		3,088,060.10	1,497,972.00	1,590,088.10	(1,590,088.10)

2.14 ASSET'S DEPRECIATION

Assets' Depreciation (Down Value Method)	Amounts in Lakhs							
	1st Year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
Civil works	5.16	4.90	4.66	4.42	4.20	3.99	3.79	3.60
Depreciation	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciated value	4.90	4.66	4.42	4.20	3.99	3.79	3.60	3.42
Plant & Machinery	14.36	12.92	11.63	10.47	9.42	8.48	7.63	6.87
Depreciation	1.44	1.29	1.16	1.05	0.94	0.85	0.76	0.69
Depreciated value	12.92	11.63	10.47	9.42	8.48	7.63	6.87	6.18
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	20.32	18.51	16.87	15.38	14.04	12.83	11.73	10.73
Depreciation	1.81	1.64	1.48	1.34	1.21	1.10	1.00	0.91
Depreciated value	18.51	16.87	15.38	14.04	12.83	11.73	10.73	9.82

2.15 FINANCIAL ASSESSMENT OF THE PROJECT

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

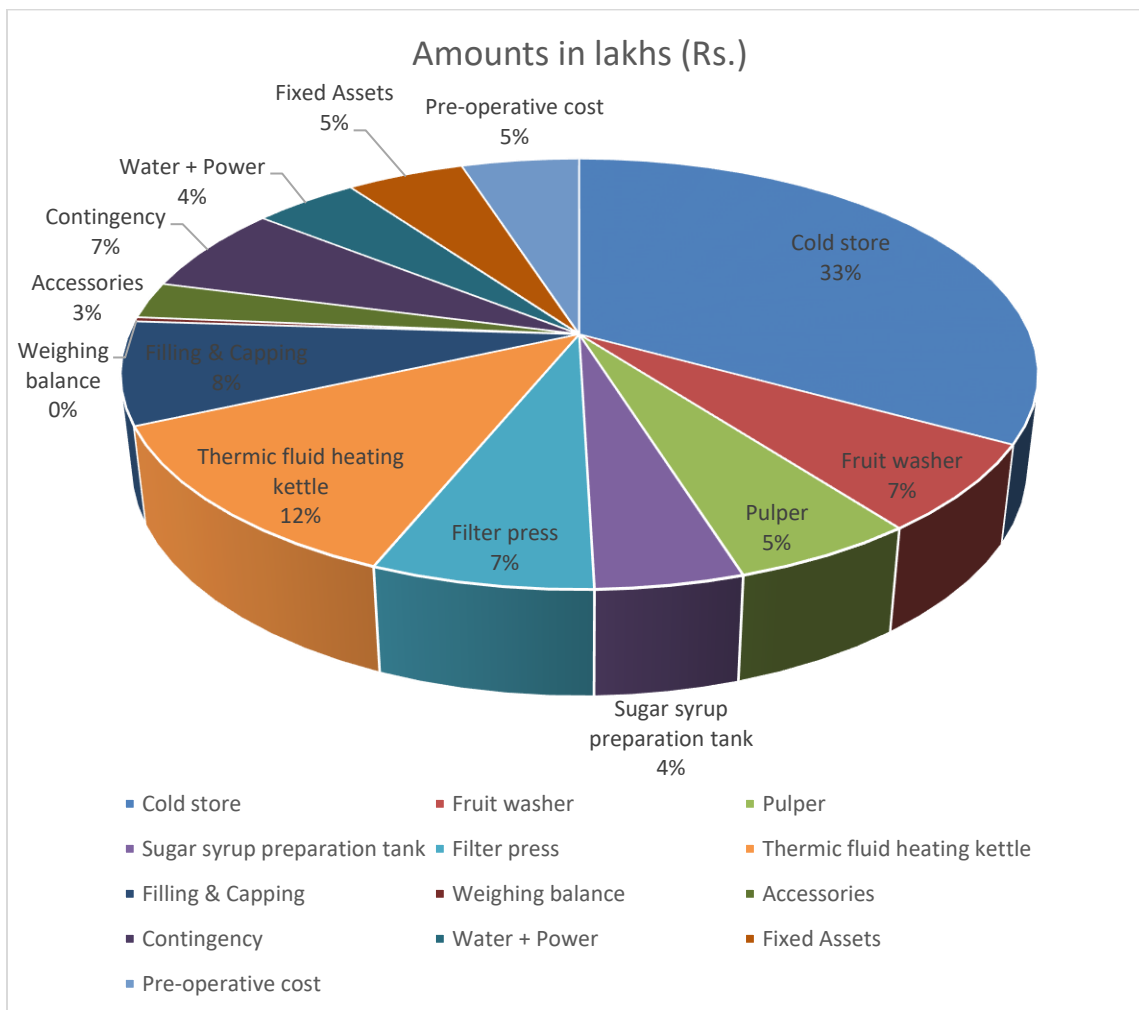
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	
Capital cost (Rs. in Lakh)	34.57	0.00	0.00	0.00	0.00		
Recurring cost (Rs. in Lakh)	2.60	88.95	103.45	117.96	139.56		
Total cost (Rs. in Lakh)	37.17	88.95	103.45	117.96	139.56		487.09
Benefit (Rs. in Lakh)	0.00	173.25	204.75	236.25	283.50		
Total Depreciated value of all assets (Rs. in Lakh)						9.82	
Total benefits (Rs. in Lakh)	0.00	173.25	204.75	236.25	283.50	9.82	897.75
Benefit-Cost Ratio (BCR): (Highly Profitable project)	1.843						
Net Present Worth (NPW):	410.66						

2.16 BREAK EVEN ANALYSIS

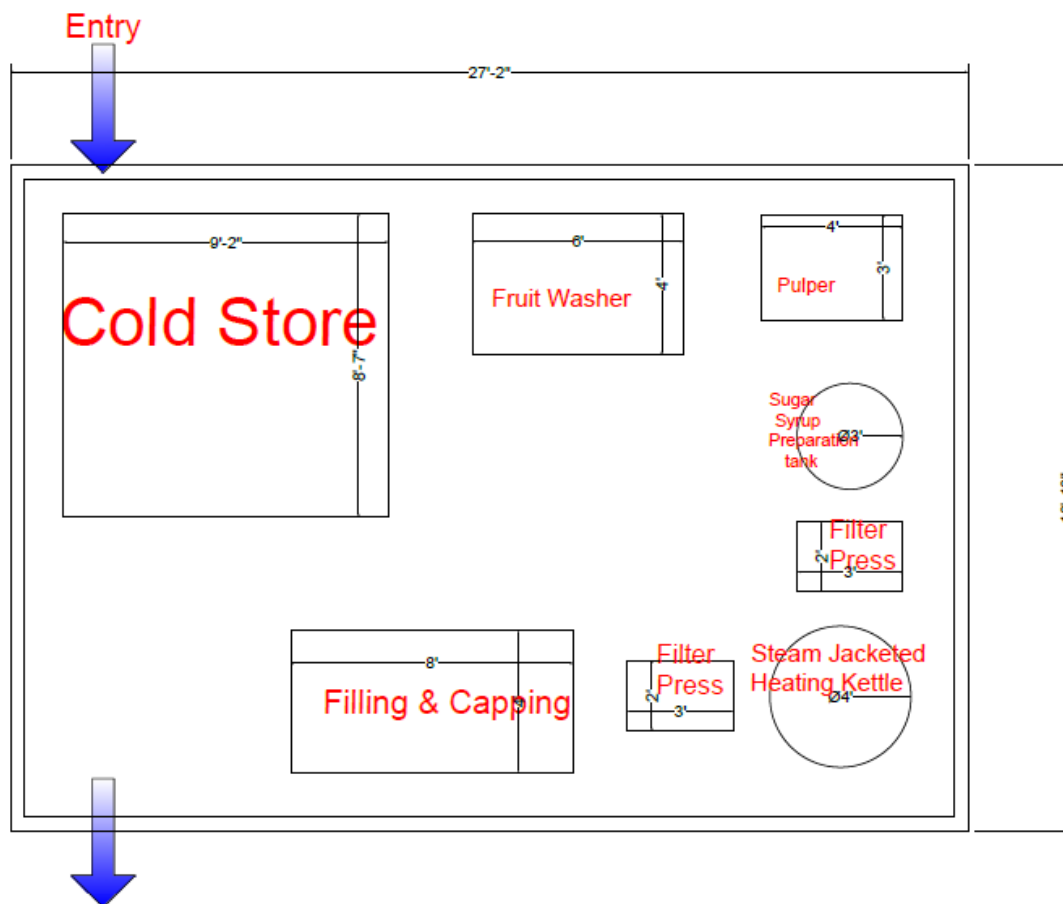
Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

Particulars	1st Year	2nd year	3 rd year	4th year	5th year
Capacity utilization (%)	Under Const.	55%	65%	75%	90%
Production MT/Annum		82.5	97.5	112.5	135
Fixed Cost (Rs. in Lakh)					
Permanent staff salaries	6.432	6.432	6.432	6.432	6.432
Depreciation on building @ 5% per annum	0.26	0.25	0.23	0.22	0.21
Depreciation on machinery @ 10% per annum	1.44	1.29	1.16	1.05	0.94
Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06
Interest on term loan	1.65	1.60	1.53	1.46	1.39
Insurance	0.3	0.3	0.3	0.3	0.3
Total Fixed Cost (Rs. in Lakh)	10.19	9.96	9.74	9.53	9.33
Sales Revenue (Rs. in Lakh)	0	173.25	204.75	236.25	283.5
Variable Cost (Rs. in Lakh)					
Malta (Av. Price @ Rs.60/Kg)	0.00	50.82	60.06	69.30	83.16
Sugar @ 35 per kg	0.00	12.42	14.67	16.93	20.32
KMS	0.00	0.10	0.12	0.14	0.16
Other material	0.00	1.12	1.33	1.53	1.84
Packaging materials	0.00	13.20	15.60	18.00	21.60
Casual staff salaries	0.00	4.93	4.93	4.93	4.93
Utilities (Electricity, Fuel)	0.00	1.56	1.84	2.13	2.55
Repair & maintenance	0.00	0.70	0.80	0.90	0.90
Miscellaneous expenses	0.50	2.00	2.00	2.00	2.00
Interest on working capital @ 12%	0.00	4.05	4.79	6.53	6.53
Total Variable Cost (Rs. in Lakh)	0.50	90.90	106.14	122.38	143.99
Break Even Point (BEP)					
as % of sale	-	12.00	10.00	8.00	8.00
Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	20.79	20.48	18.90	22.68

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



2.18 TYPICAL MALTA SYRUP MANUFACTURING UNIT LAYOUT



2.19 MACHINERY SUPPLIERS

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

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

3. LIMITATIONS OF MODEL DPR & GUIDELINES FOR ENTREPRENEURS

3.1 LIMITATIONS OF THE DPR

- i. This DPR has provided only the basic standard components and methodology to be adopted by an entrepreneur while submitting a proposal under the Formalization of Micro Food Processing Enterprises Scheme of MoFPI.
- ii. This DPR is made to provide general methodological structure not for specific entrepreneur/crops/location. Therefore, information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of business, background of proposed project, location, raw material base/contract sourcing, entrepreneur's own SWOT analysis, market research, rationale of the project for specific location, community advantage/benefit, employment generation etc are not given in detail.
- iii. The present DPR is based on certain assumptions on cost, prices, interest, capacity utilization, output recovery rate and so on. However, these assumptions in reality may vary across places, markets and situations; thus the resultant calculations will also change accordingly.

3.2 GUIDELINES FOR THE ENTREPRENEURS

- i. The success of any prospective food processing project depends on how closer the assumptions made in the initial stage are with the reality of the targeted market/place/situation. Therefore, the entrepreneurs must do its homework as realistic as possible on the assumed parameters.
- ii. This model DPR must be made more comprehensive by the entrepreneur by including information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of entrepreneur's business, project location, raw material costing base/contract sourcing, detailed market research, comprehensive dehydrated product mix based on demand, rationale of the project for specific location, community advantage/benefit from the project, employment generation, production/availability of the raw materials/crops in the targeted area/clusters

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

- iii. The entrepreneur must be efficient in managing the strategic, financial, operational, material and marketing aspects of a business. In spite of the assumed parameter being closely realistic, a project may become unsustainable if the entrepreneur does not possess the required efficiency in managing different aspects of the business and respond effectively in changing situations.
- iv. The machineries should be purchased after thorough market research and satisfactory demonstration.
- v. The entrepreneur must ensure uninterrupted quality raw materials' supply and maintain optimum inventory levels for smooth operations management.
- vi. The entrepreneur must possess a strategic look to steer the business in upward trajectory.
- vii. The entrepreneur must maintain optimum (not more or less) inventory, current assets. Selecting optimum source of finance, not too high debt-equity ratio, proper capital budgeting and judicious utilization of surplus profit for expansion is must.
- viii. The entrepreneur must explore prospective markets through extensive research, find innovative marketing strategy, and maintain quality, adjust product mix to demand.
- ix. The entrepreneur must provide required documents on land, financial transaction, balance sheet, further project analysis as required by the competent authority for approval.
- x. The entrepreneur must be hopeful and remain positive in attitude while all situations.



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