सत्यमेव जयते

MOFPI

PM Formalisation of

Micro Food Processing Enterprises Scheme

MODEL DETAILED PROJECT REPORT

MANDARIN ORANGE MARMALADE PROCESSING

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CHAPTER 1: THE PROJECT AT A GLANCE

1.	Name of the proposed project	:	Orange Marmalade Processing Unit
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 Partners (if partnership)	:	
7.	No. of share holders (if company/FPC)	:	
8.	Technical advisor	:	
9.	Marketing advisor/partners	:	
10.	Proposed project capacity	:	120 MT/ annum (60,70%, 80% & 90% capacity utilization in the 2nd, 3rd, 4th & 5th years respectively)
11.	Raw materials	:	Mandarin Orange
12.	Major product outputs	:	Mandarin Orange Marmalade
13.	Total Project Cost	:	Rs. 34.80 Lakhs
	• Land development, building & civil construction(only for expansion of existing built-up area)	:	*Rs 2.00 Lakhs*
	• Machinery and equipments	:	*Rs 20.00 Lakhs*
	• Utilities (Power & water facilities)	:	*Rs 2.00 Lakhs*
	• Miscellaneous fixed assets	:	*Rs 2.00 Lakhs*
	• Pre-operative expenses	:	*Rs 0.25 Lakhs*
	• Contingencies	:	*Rs 2.00 Lakhs*
	• Working capital margin	:	*Rs 6.54 Lakhs*
14.	Working capital requirement		
	• 2 nd year	:	*Rs 26.15 Lakhs*
	• 3 rd year	:	*Rs 32.13 Lakhs*
	• 4 th year	:	*Rs 36.67 Lakhs*
15.	Means of Finance		
	• Subsidy grant by MoFPI (max 10 lakhs)	:	*Rs 10.00 Lakhs*
	• Promoter's contribution (min 20%)	:	*Rs 8.80 Lakhs*
	• Term loan (42%)	:	*Rs 16.00 Lakhs*
16.	Debt-equity ratio	:	1.82:1
17.	Profit after Depreciation, Interest & Tax		
	• 2 nd year	:	*Rs 1.45 Lakhs*
	• 3 rd year	:	*Rs 15.92 Lakhs*
	• 4 th year	:	*Rs 20.18 Lakhs*
18.	Average DSCR	:	3.86
19.	Benefit-Cost Ratio	:	1.15
20.	Term loan repayment	:	5 years with 1year grace period
21.	Payback period for investment	:	4 years

CHAPTER 2

General Overview of Production, Post Harvest Management and Value Addition of Mandarin Oranges in India

2.1. Introduction

Mandarin is a group name for a class of oranges with thin, loose peel. These are treated as members of a distinct species, *Citrus reticulata Blanco*. The name "tangerine" could be applied as an alternate name to the whole group, but in the trade, it is usually confined to the types with red-orange skin. Mandarins include a diverse group of citrus fruits that are characterized by bright coloured peel and pulp, excellent flavor, easy-to-peel rind and segments that separate easily. The exact location of origin of Mandarin fruits is not clearly identified. It is believed that Mandarins is a native of south eastern Asia and the Philippines. In Asia, it is most abundantly grown in Japan, southern China, and India. Mandarin is very important fruit crop, second only to banana.

Mandarin is very important fruit crop, second only to banana. It is the most common among citrus fruits grown in India. Mandarin is grown mainly in Assam, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Mizoram, Nagaland, Rajasthan, Tamil Nadu and West Bengal. It is usually consumed in raw form or in fruit salads as well as juice. It occupies nearly 40% of the total area under citrus cultivation in India.

In India, in terms of area under cultivation, citrus is the third largest fruit after Banana and Mango. Nagpur mandarin is one of the best mandarins in the world. Production of this fruit crop in central and western part of India is increasing every year.

The potential for value added products provides an extremely viable opportunity for sustainable promotion of rural as well as urban livelihoods. Processing of mandarin orange into value added products such as marmalades at small scale/ village level and selling to the markets directly/ tying up with big aggregators will help both the farmers and the consumers.

Therefore, processing of mandarin oranges into value added products can ensure nutritional and food security, improved profitability and also offers huge scope for entrepreneurship development at micro, small or medium scale levels using effective government schemes such as PM-Formalization of Micro Food Processing Enterprises Scheme of MoFPI, Government of India.

2.2. Origin and distribution of Mandarin Oranges

Oranges are native to tropical and sub-tropical regions of Southeast Asia, particularly India, China & in the regions between these two countries. The north-eastern region of India is one of the natural homes for atleast few species of citrus. Certain non-edible species like *Citrus indica, C. inchangensis, C. macroptera, C. latipes* are found to grow in wild and semi-wild state in North Eastern regions. *C. medica, C. megalaxycarpa, C. jambhiri* and *C. aurantium* also found to grow in semi-wild condition in different NE states of India.

The mandarin orange (*C. reticulata*) is considered a native of south-eastern Asia and the Philippines. It is most abundantly grown in Japan, southern China, India, and the East Indies. It gravitated to the western world by small steps taken by individuals interested in certain cultivars. Therefore, the history of its spread can be roughly traced in the chronology of separate introductions. Two varieties from Canton were taken to England in 1805. They were adopted into cultivation in the Mediterranean area and by 1850, were well established in Italy. Sometime between 1840 and 1850, the 'Willow-leaf' or 'China Mandarin' was imported by the Italian Consul and planted at the Consulate in New Orleans. It was carried from there to Florida and later reached California. The 'Owari' Satsuma arrived from Japan, first in 1876 and next in 1878, and nearly a million budded trees from 1908 to 1911 for planting in the Gulf States. Six fruits of the 'King' mandarin were sent from Saigon in 1882 to a Dr. Magee at Riverside, California. The latter sent 2 seedlings to Winter Park, Florida. Seeds of the 'Oneco' mandarin were obtained from India by P.W. Reasoner, in 1888. In 1892 or 1893, 2 fruits of 'Ponkan' were sent from China to J.C. Barrington of McMeskin, Florida, and seedlings from there were distributed and led to commercial propagation.

There is limited culture in Guatemala and some other areas of tropical America. These fruits have never been as popular in western countries as they are in the Orient, Coorg, a mountainous region of the Western Ghats, in India, is famous for its mandarin oranges. For commercial exploitation, mandarins have several disadvantages: the fruit has poor holding capacity on the tree, the peel is tender and therefore the fruits do not stand shipping well, and the tree has a tendency toward alternate bearing.

2.3. Production of Mandarin Oranges in India

The total area of Mandarin, during 2008-09 was 245.49 thousand hectares in the country. Maharashtra is the main Mandarin producing state in the country, having the highest area 126.00 thousand hectares (51.33 per cent), followed by Madhya Pradesh, 31.47 thousand hectares (12.82 per cent) and Meghalaya 10.06 thousand hectares (4.09 per cent) during the same period. More than 65 per cent of the total area under Mandarin in India is in these three important Mandarin growing states. In other Mandarin growing states, the area was less than 4 per cent of the total area covered under Mandarin in the country.

In Maharashtra, the Mandarins are mainly grown at Satpura hills (Vidharba region) while in West Bengal they are grown at the hilly slopes of Darjeeling. In Karnataka, Coorg is the main producing area. In Tamil Nadu, Wyanad, Nilgiri, Palani and Shevroy hills are the major Mandarin growing belts. The hills of Meghalaya (Khasi, Dusha, Garo, Jaintia), Mizoram, Tripura, Sikkim and Arunachal Pradesh are the others Mandarin growing states. Similarly, Assam, Brahmaputra valley and Dibrugarh districts are famous for Mandarin production.

2.3.1. Production and yield of Mandarin Oranges in major states in India

Assam, Karnataka, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Rajasthan and Tamil Nadu are the main Mandarin producing states in India. The total production of Mandarin in India during 2017-18 was 5101.11 thousand tones. The share of Madhya Pradesh in Mandarin production was the highest with 41.24 per cent (2103.4 thousand tonnes) of the total production of the country, followed by Punjab, Maharashtra and Rajasthan with 23.69 per cent, 15.64 per cent, and 6.23 per cent respectively. These four states account for more than 86 per cent of Mandarin production in India.

Table 1: State-wise production of Mandarin Orange (2017-18)

S. No	State	Production (‘000 Tonnes)	% share
1	Madhya Pradesh	2,103.64	41.24
2	Punjab	1,208.42	23.69
3	Maharashtra	797.95	15.64
4	Rajasthan	317.68	6.23
5	Assam	203.72	3.99

6	Karnataka	79.07	1.55
7	Arunachal Pradesh	69.74	1.37
8	Nagaland	47.33	0.93
9	Meghalaya	45.24	0.89
10	Others	228.32	4.48
	Total	5101.11	

Source: National Horticulture Board

2.4. Composition and Nutritional value of Mandarin Oranges

Table 2: Composition of mandarin Oranges (per 100 g of edible portion)

Composition	Nagpur Mandarins	Coorg Mandarins	Kinnow
Average weight of fruit (g.)	100-125	97-101	145-189
Peel (g.)	20-27	2.62-2.67	0.45
Juice(g)	45-55	49.5-54.0	38.6- 40.2
Pomace (g.)	25-28	-	39.3- 42.0
TSS (° Brix)	8-14	10.0-11.5	9.0- 9.5
Acidity (as anhydrous citric acid, %)	0.3-0.5	0.87-1.1	0.64- 0.77
Essential oil (%) (v/w)	2.2-3.1	-	-
Pectin (%) (fresh wt. basis)	3.5- 4.5	-	-
Ascorbic acid (mg/100 ml juice)	33.6-35.0	40.2-41.6	18.7

Source: Mandarin in India- CFTRI, Mysore

Table 3: Nutritive Value of Cucumbers (per 100 g of edible portion)

Parameter	Per 100 g
Moisture	82.6-90.2 g
Protein	0.61-0.215 g
Fat	0.05-0.32 g
Fiber	0.3-0.7 g

Ash	0.29-0.54 g
Calcium	25.0-46.8 mg
Phosphorus	11.7-23.4 mg
Iron	0.17-0.62 mg
Carotene	0.013-0.175 mg
Thiamine	0.048-0.128 mg
Riboflavin	0.014-0.041 mg
Niacin	0.199-0.38 mg
Ascorbic acid	13.3-54.4 mg

Source: Nutritive value of Indian foods, NIN, 2019

2.5. Health benefits of Mandarin Oranges

The health benefits of oranges are well known for centuries. The oranges are not just known for its high vitamin C content; these are also a good source of beta carotene, a powerful antioxidant to check free radical damage, magnesium for blood pressure, potassium for cardio vascular health, and thiamin for converting food to energy. It is also rich in dietary fiber and contains folates, niacin, pantothenic acid, pyridoxine, riboflavin, vitamins A, E and K, and phytonutrients. Folates in oranges helps prevent birth defects and is good for the heart. The importance of folate to human health to reduce neural tube birth defects by up to 75% when taken by women prior to conception and during pregnancy. Folate has also been associated with a reduced risk of heart disease by lowering blood serum homocystine levels.

Pectin found in oranges is a dietary fiber reported to reduced the serum cholesterol, hypercholesterolemia and promote the excretion of fats, bile acid, cholesterol and posses growth suppression of prostate cancer cell. Therapeutical value of carotenoids found in orange could be the important first line of defence against ROS and also took part in catalytic activity. It helps in the deactivation of carcinogens. In orange good quantity of naringenin is found and this helps the management of diabetic neuropathies. Citrus fruit extracts represent an excellent candidate for nutraceuticals and functional foods geared towards the management of diabetes, cardiovascular diseases and cancer.

2.6. Mandarin Orange Varieties in India

- Khasi Orange

Grown in Assam and Meghalaya, this variety's fruits globose to oblate, surface smooth, colour orange-yellow to bright orange, rind thin with very little adherence, segments usually 10, pulp vesicles uniformly orange, texture coarse, juice abundant with well-blended flavour.

- Coorg Orange

Prevalent in Karnataka, these fruits are oblate, colour bright yellow and uniform, rind medium thick with little adherence, segments usually between 9 to 11, pulp yellow with fine texture and abundant juice.

- Kinnow Orange

Popular in Punjab and Haryana regions, these fruits are medium-size, slightly oblate in shape, rind moderately thick, adherence with the pulp quite strong, thick mesocarp, easily peelable surface, smooth and glossy, fruit colour yellowish orange at full maturity, segments 9 to 10, firm, pulp yellowish orange, very juicy somewhat acidic. The variety is cold resistant.

- Darjeeling Orange

Cultivated in West Bengal and Sikkim, these fruits are comparatively smaller in size, slightly flat in shape, colour yellowish to orange when fully ripe, rind thin, adherence little, juice abundant and sweet flavour.

- Nagpur Oranges

These fruits are yellowish green to orange, oblate, rind thin, fine texture and good flavour and taste. Size is medium and the skin is easily peelable. This variety is prevalent in Maharashtra, Tamil Nadu and Bihar.

- Kinnow orange (hybrid Mandarin).

In Haryana and Punjab Kinnow orange (hybrid Mandarin) is grown.

2.7. Cultivation and Harvesting of Mandarin Oranges

2.7.1 Climatic and soil requirements

Citrus plants being sub-tropical, cannot withstand extended cold conditions. Mandarins grow successfully in all frost free tropical and sub-tropical regions upto 1,500 m. above mean sea level. An annual rainfall of 100-120 cm and temperature ranging from 10-35°C is conducive to the production of high quality fruits. Very high temperature is not good as it leads to sun burn of exposed fruits.

Mandarins can be grown in a wide variety of soils but medium or light loamy soils with slightly heavy sub-soil, well-drained with pH of 6.0-8.0 are ideal for cultivation. There should be no hard pan within 2m depth of the soil. Water table should be below 3 m. Water logging is harmful to the tree.

2.7.2. Land preparation

Land is prepared by ploughing, levelling and removing weeds. Mandarins are usually planted in pits of 50 cm X 50 cm X 50 cm size in a square system with a spacing of 4.5-6 m, accommodating 350-450 plants/ha. In north-eastern parts of India, Khasi mandarins are very closely spaced (4.5 m X 4.5 m), accommodating more than 500 plants/ha.

2.7.3. Planting

Mandarin orange is propagated by seeds and also vegetatively propagated by T-budding. Seedlings are mostly transplanted in the month of July-August after commencement of monsoon. Budding should preferably be done in last week of January or first week of February following the 'T' or shield budding method. If adequate irrigation facilities are available, the plantation can be done in spring (February- March).

Newly planted trees need to be irrigated to get high survival rate. While planting, earth wall should not be disturbed. The plant should not be planted deeper than their natural position in the nursery and bud union should be 8-10" above ground level. During winters, thatching of plants should be done to protect against frost.

2.7.4. Manuring

The recommended fertilizer dose in terms of N, P & K is given:

Age of the plant	**Year-wise fertilizer applied (g./plant)**		
	N	P	K
1	150	50	25
2	300	100	50
3	450	150	75
4 & above	600	200	100

About one third of the recommended dose of nitrogen should be applied through organic manures like FYM, cakes etc. In case of non-bearing trees, nitrogen should be applied in split

doses during April, August and November; phosphorus in August and November and potassium in November. Nitrogen should be applied in three split doses in case of bearing trees during April, August and November along with 200 g. phosphorus in two split doses in August and November and 100 g. potassium in November for mandarin grown in black clay soil.

Micro-nutrients viz. zinc, copper, manganese, iron, boron and molybdenum are required in ample quantities. Improper supply of nutrients may cause serious disorders which may lead to decline of the whole orchard. The micro-nutrients should be supplied through foliar spraying.

2.7.5. Irrigation & weed management

Water requirement of citrus trees is generally higher than most of the other sub-tropical fruits due to recurrent growth and development. The water requirement varies from 900 to 1100 mm. per year depending upon the location. Water requirement of young (1-4 years old), middle (5-8 years old) and mature (9 and more) Nagpur mandarin trees varies from 5-15 litres/day, 35-105 litres/day and 60-170 litres/day respectively. Drip irrigation leads to effective, efficient and economic use of irrigation water and is recommended specially in low rainfall regions of Maharashtra, MP and Rajasthan which are some of the major producing areas.

Irrigation is provided at an interval of 10-15 days during winter months whereas during summer months it is provided at an interval of 5-7 days.

Pre-emergence herbicides (Diuron @ 3 kg./ha. or Simazine @ 4 kg./ha.) should be sprayed twice at an interval of 120 days from the last week of May for effective and economical control of dicot and monocot weeds in the orchard. Application of dry leaf mulch or paddy husk to a thickness of about 8 cm. in the basin keeps down the weed growth and decreases the number of irrigations and also improves fruit quality.

2.7.6. Training & Pruning

Trees are trained to single stem with 4-6 well-spaced branches for making the basic framework. The lowermost branches are not allowed to grow below the height of 50 cm. from the soil surface.

Pruning is done during the initial years of planting. The bearing trees require little or no pruning. Main objective of pruning the bearing trees is to maintain the framework and to secure higher yields with better quality fruits. Pruning of bearing trees though differs with variety but chiefly consists of removal of dead, diseased, criss-crossed and weak branches.

Removal of water sprouts and suckers of rootstocks is also highly essential. Pruning of non-bearing trees can be done at any time of the year, but for bearing trees the best time is after harvesting, during late winter or early spring when these are in somewhat dormant stage. Root pruning is also practiced in some parts of central and southern India to regulate flowering season.

2.7.7. Growth regulators

Fruit drop in mandarin orange can be controlled in early stages of fruit development by applying two sprays of growth regulators- 2,4 D (15 ppm.) or GA3 (15 ppm) alongwith Benomyl (1000 ppm.) and urea (1%) after fruit set at monthly interval in May and June. The same spray schedule may be followed in September and October in order to control the pre-harvest fruit drop.

2.7.8. Plant protection measures

Devitalization of plants due to poor fruit set, fruit drop both at bearing and maturity stage, stem tunnelling, bark removal, girdling etc., on account of the attack of the different insect pests viz. citrus black fly, citrus psylla, citrus leaf miner, bark eating caterpillar, mealy bugs, citrus aphids, citrus thrips, fruit fly, mites etc. results in poor performance by the tree in terms of quality fruit production. Spraying with insecticides viz. monocrotophos, phosalone, dimethoate, phosphamidon, quinalphos etc. depending upon the type of pest infestation has been found to be effective in most cases.

The main diseases reported are twig blight, gummosis, damping off, root and collar rot. The affected plants should be sprayed with Ridomil MZ 72, Bavistin, Benomyl etc. depending on the type of infection.

2.7.9. Harvesting

Fruits are harvested when they attain full size, develop attractive colour with optimum sugar and acid blend. Generally, the Mandarins are harvested in 32-36 weeks after the fruit is set. In Coorg district, the fruits are harvested in 36-38 weeks; otherwise there is every possibility of shrivelling of fruits and heavy drops.

However, the most commonly used measures to access maturity for harvesting the Mandarin is peel colour. Fruits are considered mature, if they have a yellow orange colour on 25% or more of the fruit surface. Fruit quality for harvesting depends upon SS (soluble solids

contents, sugar) and acidity of the juice. The juice should have a SS of 8.5% or higher. SS content is determined by squeezing a few drops of juice on a hand-held refractometer. Unlike climacteric fruits, Orange doesn't improve in taste after harvesting. Therefore, fruits should be harvested when they attain full size, develop attractive colour with optimum sugar.

Fruits should be harvested preferably with clipper, shears or secateurs. Mandarins should not be harvested in wet weather or during rains.

Mandarins start bearing from the fourth year but substantial yield can be expected only from sixth year onwards. Mandarin produces 500-800 fruits after about 9-10 years. However, its plants attain the level of full bearing at the age of 10-12 years. The net productive life span of mandarin orchards after deducting the first 5 pre bearing years is only 15-20 years.

Degreening of mandarins by applying ethrel (50 ppm) one week before the actual date of harvesting has become a commercial practice in most of the developed mandarin growing countries. Further, fruits dipped in 50 ppm ethrel after harvesting develop golden yellow colour within 5 days of the treatment. Average yield is 4.8 tonnes/ acre.

2.8 Post Harvest Operations, Processing and Storage of Mandarin Oranges

2.8.1 Post harvest operations for Mandarin Oranges

a. Grading

Fruits are graded on the basis of their size and colour. The fruits which are oblong, high collard, immature, puffy, blemished, deformed, deep green coloured, bruised and diseased are removed during the sorting operation.

b. Packing

Fruits are usually packed in wooden boxes for distant markets, while for local marketing baskets of split bamboo and mulberry are used. Chopped straw and dry grasses are mostly used for padding. The fruits should be cleaned and polished lightly with a piece of cloth, before wrapping them in tissue paper or newspaper. Use of ventilated corrugated fibre board cartons in place of wooden boxes is highly beneficial.

c. Storage & Transportation

The initial sorting of marketable versus unmarketable fruits should be made in the field at the time of harvest. Severely damaged, decayed, over-ripe fruits, or unmarketable fruits should be put into a separate container and discarded.

Plastic crates or boxes are used for storing fruit. Oranges should be stored with only one or

two layers per box as too many layers in one box may cause bruising of the fruit.

Since the shelf life of fruit is limited, adequate storage is very essential for extending the consumption period of fruits as well as for regulating their supply to the markets. Oranges can be stored at farm level for a period of 2 to 3 weeks in simple storage in wooden boxes, plastic crates, etc. It is possible to store the fruits for a period of 3 to 5 weeks in cold storage in boxes. Orange fruits can also be stored in evaporative cool chamber at 8-10°C & 90-95% relative humidity for a period of three weeks after post-harvest treatment with 1000 ppm Bavistin. The oranges are generally shipped via truck to juice extraction facilities.

The post harvest quality of the fruit depends fully on the proper care taken after harvesting of the crop. The removal of undesirable and unsuitable fruits at initial stage improves the appearance and quality of the product and reduces the spoilage during later stages.

2.8.2 Processing of Mandarin Orange Marmalade

a. Washing

The fruits are washed to remove extraneous matter. Simultaneously, the fruits are inspected to remove any immature, spoiled, bruised or damaged ones.

b. Preparation of fruit

The yellow portion of the peel is peeled off thinly from the fruit with a stainless steel knife. This peel goes to Shredding. The fruit goes to pulp extraction.

c. Shredding

The peel is cut into shreds that are 1.9-2.5 cm long and 0.08-0.12 cm thick. The shreds are softened by boiling before being added to the marmalade. If added directly the sugar solution and boiled without prior softening, the shreds become tough.

Three methods are employed for softening the shreds.

- Boiling for 10-15 minutes in water (changing the water many times). The bitter principles present in the peel are also removed in this process.
- Boiling in 0.25 percent solution of sodium carbonate or 0.1 percent ammonia solution.
- Autoclaving the shreds at 116°C to 121°C (70-105 k Pa).

The time required to soften shreds depends upon their size and shape.

d. Pulp extraction

The fruits can be crushed or cut into thin slices. The crushed fruit or the slices are boiled with water (2 kg water to 1 kg fruit). The boiling is done for around 40- 45 minutes, along with Citric acid at 2 g per kg of fruit

The extract is then strained using a muslin cloth (for jam marmalade) or filter press for a clear extract (for jelly marmalade). The extract is subjected to pectin test.

e. Pectin test

This is done to estimate the amount of pectin present in the fruit extract. Depending on pectin strength, extra pectin is added if required.

One ml of boiled fruit extract is taken in a test tube and 3 ml alcohol (90%)is added. The test tube is left for few minutes till clotting is formed. If a single clot is formed, it indicates that the fruit extract contains rich pectin. If small unstable clot is formed it indicates poor availability of pectin. If the pectin test shows poor pectin presence, fruit based pectin needs to be added.

Pectin is available commercially as a powder. It is stable if stored in cool, dry place and it will only lose about 2% of its gelling power per year. Powdered pectin should be added to fruit pulp at 3-6g per kg of final product, but it should first be mixed with about five times its weight of sugar to prevent lumps forming when it is added to the pulp or juice. For marmalades, slow setting pectin should be used so that the product sets slowly during the overnight cooling process.

f. Concentration

Required amount of sugar is added to the extract. Generally, sugar is added at the ratio 1:1 for the extract. The mix is boiled in a steam-jacketed kettle with low heat and continuous stirring. Impurities rising to the surface are removed.

When the temperature of the boiling mixture reaches 1030C, the shreds are added at the level of 62 g for each kg of the original extract. Boiling is continued at the same pace till end point is achieved

g. Judging the Endpoint

When the mixture starts to thicken, it is important to test for the end point at frequent intervals. Endpoint should be measured using a Refractometer for consistency. Temperature/ other tests can be used, but these are not consistent methods.

In case of jelly marmalade, for every kg of whole fruit extract, around 10 gm of ready-made fruit pectin & 7 gm of citric acid (to obtain pH 3.0-3.3) are sprinkled on the boiling mixture, while nearing endpoint. The final Total Soluble Solids (TSS) content of marmalade should be 65° Brix. At this point the boiling is stopped.

h. Cooling

The marmalade is cooled in a shallow pan or in a water-cooled pan. The shreds due to their low density tend to accumulate in the top layer; hence slow stirring is done to enable the uniform distribution of shreds in the marmalade. When the temperature falls to 82 to 88^{0}C, a thin film begins to form on the surface of the marmalade. This layer becomes sufficiently thick and helps to prevent floating of the shreds onto the surface.

Most of the natural flavour volatilizes during the boiling and cooking processes. Hence, flavouring is added to compensate the flavor loss during cooking process. Generally, orange oil is added to the marmalade at the time of filling into jars or cans.

i. Packing

After cooling the marmalade can be filled into jelly glasses or glass jars, at about 82°C. The bottles/ jars are closed air-tight. The marmalade is allowed to set overnight. On cooling a thin layer of molten paraffin wax is poured on the top. The packed marmalades are stored in a cool dry place.

Hermetically sealed cans can also be used for packing marmalades. The cans are inverted upside down to sterilize the lids

The jars should be warm to prevent them from cracking when the hot marmalade is poured in. If the marmalade is cooled too much it will be difficult to pour. The filled jars can be placed in water to cool down the marmalade so that it does not keep cooking in the jar. The gel starts to form as the temperature of the marmalade reduces (about 55°C) and continues until it is cold.

CHAPTER 3

MODEL MANDARIN ORANGE MARMALADE PROCESSING UNIT UNDER PM-FME SCHEME

3.1 Introduction

The Central Sector scheme for Formalization of Micro Enterprises in Food Processing sector under Ministry of Food Processing Industries, Government of India is an important scheme that offers for formalization and mainstreaming the unorganized home based or micro food processing units. The scheme is useful for expansion of the existing units in terms of capacity and technology through installation of new machineries and additional civil infrastructures. Further, the scheme promotes establishment of new micro units on the principle of ODOP (One District One Product).

Establishment or expansion of Mandarin Orange Marmalade Processing Unit is an attractive option in potential Mandarin Orange growing states in India as Orange marmalade has a lot of market and export potential. A model generalized DPR is therefore, prepared for expansion of existing unformalized Mandarin Orange Marmalade Processing Unit. A detailed account of the model DPR prepared on the basis of certain generalized assumptions is discussed in the subsequent sections. An entrepreneur can use this model DPR template and modify according to his/her need in terms of capacity, location, raw materials availability etc.

3.2 Form of the Business Enterprise

The entrepreneur concerned must specify about the form of his/her business organization i.e. whether Sole Proprietorship, Cooperative, FPO/FPC, SHG Federation, Partnership Firm or Company and accordingly attach all the required documents. The documents may be registration certificate, share holding pattern, loan approval certificate etc as specified in the FME scheme guidelines.

3.3 Background of the Promoters/ Owners and Required Documents

The detailed bio-data of promoter/promoters inter-alia name, fathers name, age, qualification, business experience, training obtained, contact number, email, office address, permanent address, share holding pattern, definite sources of meeting the commitment of promoters contribution, details of others business along with certified balance sheet and profit loss

account for the last 3- 4 years, tax registration, PAN Number, income tax return etc for 3-4 years and other requirements as specified in the FME guidelines must be provided with the DPR.

3.4 Background of the Proposed Project

The entrepreneur must specify whether it is a new project or expansion of the existing project. If new project is proposed then the reason to go in to the project and if expansion of the existing project, the must specify what kind of expansion is proposed in terms of capacity, product, machines, civil infrastructure etc.

3.5 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 entrepreneur must mention whether project is proposed in self owned land or rented/allotted land in any industrial park or private location. Accordingly, he/she must provide ownership document, allotment letter/ lease deed.

Land clearance certificate must be from village authority/ municipality or any other concerned authority. The ideal locations for establishment of exclusive Mandarin Orange Marmalade Processing Units are in the production clusters of the major Mandarin Orange growing states such as Madhya Pradesh, Punjab, Maharashtra, Rajasthan, Assam, Karnataka, Arunachal Pradesh, Nagaland and Meghalaya where adequate quantities of Mandarin Oranges will be available for processing.

3.6 Installed Capacity

The maximum installed capacity of the Mandarin Orange Marmalade Processing Unit in the present model project is proposed as 120 tonnes/ annum. 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 60 percent capacity, 3rd year 70 percent capacity and 4th year 80 percent and 5th year onwards 90 percent capacity utilization is assumed in this model project.

3.7 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 deteriorated. In the current model Mandarin Orange Marmalade processing project, the unit requires 0.48 Tonnes/ day, 0.56 Tonnes/ day, 0.64 Tonnes/ day and 0.72 Tonnes/ day of Mandarin Oranges at 60, 70, 80 and 90 percent capacity utilization, respectively.

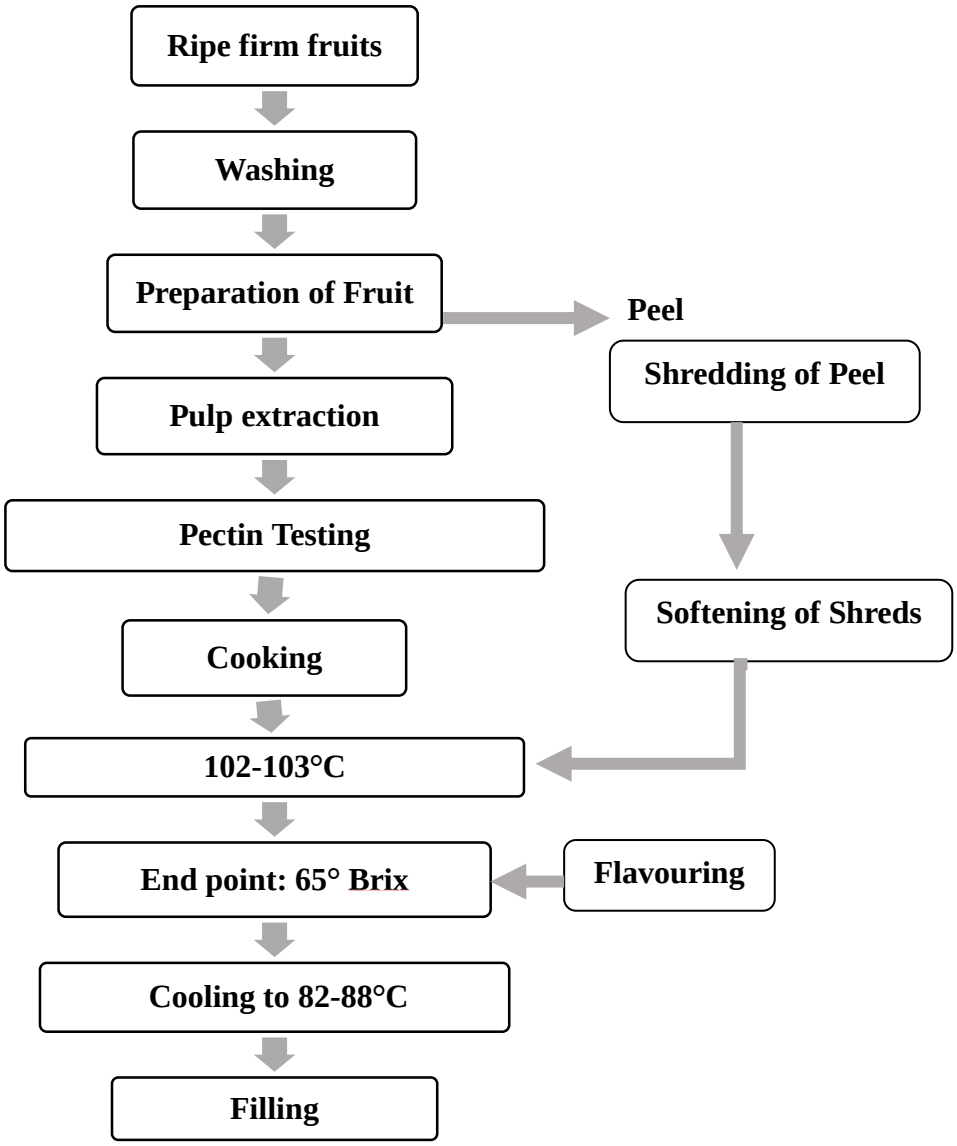
3.8 Product Profile of the Unit

In the present model Mandarin Orange Marmalade processing unit, the targeted product output is taken as Mandarin Orange Marmalade.

The food industry and consumers are showing increased interest in the use of unconventional ingredients in food products. Food residues such as peel, seeds, membranes, stems, and leaves have a high rate of waste worldwide. Also their high nutritional content suggests a potential for addition as an ingredient in food products. Jams are a product with high acceptance. Using the peel in the preparation of Mandarin Orange Marmalade improves the organoleptic preference of the product as well as reduces the problem of food waste.

Therefore, value addition of Mandarin Oranges into Marmalade has great potential in terms of maintaining the export quality standards, nutritive quality of the product, minimizing post-harvest losses, enhancing the non seasonal availability through increased shelf life and the ability increase the revenue potential for the Mandarin Orange cultivating farmers.

3.9 Manufacturing Process of Mandarin Orange Marmalade



3.10 Technology Accessibility

IIFPT and its liaison offices at Guwahati and Bhatinda have all the technical knowhow on Mandarin Orange Marmalade processing. These technologies are available through training, incubation and consultancy. The entrepreneur can first avail training or consultancy and then undergo business incubation before venturing into the business. Other than IIFPT, NIFTEM, CFTRI and other institutes also have the technical knowledge and training facilities.

3.11 Market Demand and Supply

The Fruit Jams, Squashes & Cocktail market is expected to register a CAGR of 3.5% till 2023. The global retail sales are set to reach 1.53 billion USD by 2023. Out of various fruit products produced in the country, jams & jellies constitute only 10 percent. This implies that the processed products of fruit & vegetable business will remain a growth industry for a long time. One of the main reasons for the expectation of growth is that the consumption of jam & jelly is gaining popularity day by day owing to the growing change in the food habits and increased consumption of bread and other convenient snack foods. Apart from Pickles & Chutneys, such preserved fruit products are consumed primarily by urban and tourist oriented markets in India.

The jam, jelly, and preserves market is driven by the convenience of food supplement items, preference for ready-to-eat products, and multiple distribution channels. With the increasing popularity of gourmet varieties the market is likely to have a positive outlook in the forecast period. Consumers consider gourmet jams and preserves as luxuries and niche dining and gifting are evolving with more spending power.

During the last decade, the jams segment dominated the market and accounted for more than 40% of the market share in terms of revenue. There is a huge versatility in jams, and many consumers and vendors are experimenting different flavors.

Innovative product development with new flavors and traditional fruits and organic products is driving the jam, jelly and preserve market growth. Increasing health consciousness and the inclusion of organic ingredients is driving the market. Hence there is a huge potential to manufacture such value added products.

3.12 Marketing Strategy

Generally, domestic households, restaurants, and other eateries are the major consumers of these items. The increasing urbanization offers huge market for Orange marmalades packaged attractively and merchandised in organized urban platforms such as departmental stores, malls, super markets. Direct marketing kiosks can also be utilised in urban market areas.

The producer may also enter into agreements for supplying to big players or retailers in their brand name as private labels. The producer may enter into agreements for supplying to larger

manufacturers who have their own brand or have a large market volume. It is safe and more sustainable to manufacture in bulk for established branded players.

The producer may also enter into agreements with local retail chains, quick service restaurants, etc, as well as e-commerce channels as the liking for such is on a rise and the local demand for products like orange marmalade will hence be boosted.

Export market is a major avenue for Orange Marmalades, provided good hygienic production and compliant attractive packaging. Further there are several e-commerce companies that sell good quality produce, which can be utilized.

3.13 Detailed Project Assumptions

This model DPR for Mandarin Orange Marmalade Processing 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 Table 4.

This DPR assumes expansion of existing unit by adding new Mandarin Orange processing line. Therefore, land and civil infrastructures are assumed as already available with the entrepreneur.

Table 4: Detailed Project Assumptions		
Parameter	Value	
Assumed Capacity of the Mandarin Orange Marmalade processing unit :	120 MT/ annum	
Utilization of capacity :	Year 1	Implementation
	Year 2	60%
	Year 3	70%
	Year 4	80%
	Year 5 onwards	90%
Working days per year :	300 days	
Working hours per day :	8-10 hours	
Interest on term loan : Interest on working capital loan :	12.00% 12.00%	
Repayment period :	Five years with one year grace period is considered.	
Average price of raw material :	Rs. 50/ kg	
Average sale price of product :	Rs. 220/ kg	

3.14 Fixed Capital Investment

3.14. A. Land & Building

This DPR is for FME scheme to upgrade/ formalize existing micro enterprises which already has land & built-up area. However, they can invest to expand the built-up area (Table 5) as required.

Table 5: Land and Civil Infrastructures	
i. Land 1000 Sq ft	Assumed land already developed and has 6000 sq ft built in area. So additional 1000 sq ft can be built in @ Rs. 200/sq ft Rs. 2,00,000
ii. Built-up processing area 6000 sq ft	
iii. Storage area 1000 sq ft	
Total	Rs. 2,00,000

3.14. B. Machinery & Equipment: Rs. 20.00 Lakhs

Table 6: Machineries & Equipments						
S.No	**Description**	**Power required**	**Area reqd (Sq.ft)**	**Unit Price, (Rs.)**	**Qty**	**Amount (Rs. in Lakhs)**
1.	Weighing scale	0.5 HP	50	100000	1	1.00
2.	Washer	5 HP	100	200000	1	2.00
3.	Pulper	5 HP	100	300000	1	3.00
4.	Shredder	2 HP	100	200000	1	2.00
5.	Kettle	5 HP	100	100000	4	4.00
6.	Bottle Filler	10 HP	50	300000	1	3.00
7.	Capping & labelling m/c	5 HP	300	200000	1	2.00
8.	Boiler	5 HP	100	300000	1	3.00
	Total					**20.00**

3.14. C. Utilities and Fittings

Table 7: Utilities and Fittings	
Power	Rs. 1.20 Lakhs
Water	Rs. 0.80 Lakhs
Total	Rs. 2.00 Lakhs

3.14. D. Other Fixed Assets

Table 8: Other Fixed Assets	
Furniture and fixtures	Rs. 2.00 lakhs
Utensils, trays, thermometer, refractometer, etc	
Total	Rs. 2.00 Lakhs

3.14. E. Pre-operative Expenses

Table 9: Pre-operative Expenses	
Legal expenses, start-up expenses, establishment cost, consultancy fee, trial runs, & others	Rs. 25,000.00
Total Pre-operative Expenses	Rs. 25,000.00

3.14. F. Total Fixed Capital Investment

Total Fixed Capital Investment = (Land & Building + Machinery & Equipment+ Utilities and Fittings + Other Fixed Assets + Pre-operative Expenses)

= Rs. (2.00+20.00+2.00+2.00+0.25) = **Rs. 26.25 Lakhs**

3.15. Working Capital Requirement

Table 10: Working Capital Requirement (Rs. in lakhs)				
Particulars	**Period**	**year 2 (70% - 70 MT)**	**year 3 (80% - 80 MT)**	**year 4 (90% - 90 MT)**
Raw material stock	7 days	1.79	2.09	2.39
Packing material	15 days	1.50	1.75	2.00
Work in progress	15 days	5.49	6.56	7.45
Finished goods' stock	15 days	5.27	6.51	7.41
Receivables	30 days	12.10	15.22	17.42
Total current assets		26.15	32.13	36.67
Trade creditors		0.00	0.00	0.00
Working capital gap		26.15	32.13	36.67
Margin money (25%)		6.54	8.03	9.17
Bank finance		19.61	24.10	27.50

3.16. Total Project Cost and Means of Finance

Table 11: Total Project Cost and Means of Finance (Rs. In lakhs)	
Particulars	**Amount**
i. Land and building	2.00
ii. Machinery and equipments	20.00
iii. Utilities & Fittings	2.00
iv. Miscellaneous Fixed assets	2.00
v. Pre-operative expenses	0.25
vi. Contingencies	2.00
vii. Working capital margin	6.54
Total project cost (i to vii) (Rounded off)	**34.80**
Means of finance	
i. Subsidy	10.00
ii. Promoter's contribution	8.80
iii. Term loan	16.00

3.17. Manpower Requirement

Table 12: Manpower Requirement			
Particulars	**No. of persons**	**Monthly Wage (Rs.)**	**Total Monthly Salary (Rs.)**
i. Manager (can be the owner)	1	20000	20000
ii. Skilled worker	2	10000	20000
iii. Semi skilled	3	7500	22500
iv. Helper	3	5000	15000
v. Salesman	1	7500	7500
Total	10		85000

Note: Only the manager and two skilled workers are permanent staffs (Salary Rs. 40000/ month). Others are causal staffs.

3.18. Expenditure, Revenue and Profitability Analysis

Table 13: Expenditure, Revenue and Profitability Analysis									
	Particulars	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**	**8th year**
A	**Total Installed Capacity**	120 MT/Year Processed Mandarin Oranges							
	Capacity utilization (%)	Under const. (0%)	72 MT (60%)	84 MT (70%)	96 MT (80%)	108 MT (90%)	108 MT (90%)	108 MT (90%)	108 MT (90%)
B	**Expenditure (Rs. in Lakh)**								
	Raw materials*	0.00	85.97	100.30	114.62	128.95	128.95	128.95	128.95
	Packaging materials @ Rs. 50/ kg	0.00	36.00	42.00	48.00	54.00	54.00	54.00	54.00
	Utilities (Electricity, Fuel)	0.00	4.40	4.87	5.34	5.82	5.82	5.82	5.82
	Salaries (1st yr only manager's salary)	2.40	7.14	7.91	8.67	9.44	9.44	9.44	9.44
	Repair & maintenance	0.00	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	Insurance	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	Miscellaneous expenses	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Total Expenditure	3.20	135.00	156.57	178.12	199.70	199.70	199.70	199.70
C	**Total Sales Revenue (Rs. in Lakh)**								
	Sale of Orange Marmalade @ Rs. 220/ kg	0.00	145.20	182.60	209.00	235.40	237.60	237.60	237.60
D	**PBDIT** (Total Sales Revenue-Total Expenditure) (Rs. in Lakh)	-3.20	10.20	26.03	30.88	35.70	37.90	37.90	37.90
	Depreciation on civil works @ 5% per annum	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07

	Depreciation on machinery @ 10% p.a	2.02	1.82	1.64	1.47	1.32	1.19	1.07	0.97
	Depreciation on other fixed assets@ 15% p.a	0.91	0.77	0.65	0.56	0.47	0.40	0.34	0.29
	Interest on term loan @ 12% p.a	1.91	1.91	1.64	1.27	0.88	0.61	0.00	0.00
	Interest on working capital @ 10% p.a	0.00	2.35	2.89	3.30	3.71	3.73	3.73	3.73
E	**Profit after Depreciation and Interest** (Rs. in Lakh)	-8.14	3.25	19.12	24.19	29.24	31.89	32.69	32.84
F	Tax (assumed 15%) (Rs. in Lakh)	0.00	1.80	3.20	4.01	4.95	5.20	5.33	5.40
G	**Profit after depreciation, Interest & Tax** (Rs. in Lakh)	-8.14	1.45	15.92	20.18	24.29	26.69	27.36	27.44
H	Surplus available for repayment (PBDIT-Interest on Working Capital -Tax) (Rs. in Lakh)	-3.20	6.05	19.94	23.57	27.04	28.97	28.84	28.77
I	Coverage available (Rs. in Lakh)	-3.20	6.05	19.94	23.57	27.04	28.97	28.84	28.77
J	Total Debt Outgo (Rs. in Lakh)	1.91	5.11	4.84	4.47	4.08	3.81	0.00	0.00
K	**Debt Service Coverage Ratio (DSCR)**	-1.68	1.18	4.12	5.27	6.63	7.60		
	Average DSCR	3.86							
L	**Cash accruals (PBDIT- Interest-Tax)** (Rs. in Lakh)	-5.11	6.49	21.19	25.60	29.87	32.09	32.57	32.50
M	**Payback Period** (on Rs. 32.50 Lakhs initial investment)	4 years							

* Raw materials: For every kg of product: Mandarin Orange Juice extract: 1 kg; Sugar: 0.55 kg; Pectin: 5 g; Other additives: 5g.
Raw material cost: Oranges: Rs 50/kg (Juice yield: 60% with 10% TSS); Sugar: Rs.40/ kg; Pectin: Rs.800/ kg; Other additives: Rs 100/kg.

3.19. Repayment Schedule

Table 14: Repayment Schedule (Rs. in Lakh)									
Year	**Outstanding loan at start of yr.**	**Disbursement**	**Total outstanding Loan**	**Surplus for repayment**	**Interest payment**	**Repayment of principal**	**Total outgo**	**o/s Loan at the end of the yr.**	**Balance left**
1	0	16.00	16.00	-3.20	1.91	0	1.91	16.00	-5.11
2	16.00		16.00	6.05	1.91	3.20	5.11	12.80	0.94
3	12.80		12.80	19.94	1.64	3.20	4.84	9.60	15.10
4	9.60		9.60	23.57	1.27	3.20	4.47	6.40	19.10
5	6.40		6.40	27.04	0.88	3.20	4.08	3.20	22.96
6	3.20		3.20	28.97	0.61	3.20	3.81	0.00	25.16

3.20. Assets' Depreciation

Table 15: Assets' Depreciation (Written Down Value Method) (Rs. in Lakh)								
Particulars	**1st Year**	**2nd Year**	**3rd Year**	**4th Year**	**5th Year**	**6th Year**	**7th Year**	**8th Year**
Civil works	2.02	1.92	1.82	1.73	1.64	1.56	1.48	1.41
Depreciation	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07
Depreciated value	1.92	1.82	1.73	1.64	1.56	1.48	1.41	1.34
Plant & Machinery	20.19	18.17	16.35	14.71	13.24	11.92	10.73	9.66
Depreciation	2.02	1.82	1.64	1.47	1.32	1.19	1.07	0.97
Depreciated value	18.17	16.35	14.71	13.24	11.92	10.73	9.66	8.69
Other Fixed Assets	6.04	5.13	4.36	3.71	3.15	2.68	2.28	1.94
Depreciation	0.91	0.77	0.65	0.56	0.47	0.40	0.34	0.29
Depreciated value	5.13	4.36	3.71	3.15	2.68	2.28	1.94	1.65
All Assets	28.25	25.22	22.53	20.15	18.03	16.16	14.49	13.01
Depreciation	3.03	2.69	2.38	2.12	1.87	1.67	1.48	1.33
Depreciated value	25.22	22.53	20.15	18.03	16.16	14.49	13.01	11.68

3.21. Financial Assessment of the Project

Table 16: Benefit Cost Ratio (BCR) and Net Present Worth (NPW)										
S. No	**Particulars**	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**	**8th year**	
i	Capital cost (Rs. in Lakh)	28.25	0	0	0	0	0	0	0	
ii	Recurring cost (Rs. in Lakh)	3.20	135.00	156.57	178.12	199.70	199.70	199.70	199.70	
iii	Total cost (Rs. in Lakh)	31.45	135.00	156.57	178.12	199.70	199.70	199.70	199.70	1299.94
iv	Benefit (Rs. in Lakh)	0.00	145.20	182.60	209.00	235.40	237.60	237.60	237.60	
v	Total Depreciated value of all assets (Rs. in Lakh)								11.68	
vi	Total benefits (Rs. in Lakh)	0.00	145.20	182.60	209.00	235.40	237.60	237.60	249.28	1496.68
	Benefit-Cost Ratio (BCR): 1.15 (Profitable Project) **Net Present Worth (NPW): 196.74**									

3.22. Break Even Analysis of the Project

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.

Table 17: Break-Even Analysis

S.No	Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
	Capacity utilization	Under const (0%)	72 MT (60%)	84 MT (70%)	96 MT (80%)	108 MT (90%)	108 MT (90%)	108 MT (90%)	108 MT (90%)
A	**Fixed Cost (Rs. in Lakh)**								
	Permanent staff salaries	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
	Depreciation on building @ 5% p.a	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.07
	Depreciation on machinery @ 10% p.a	2.02	1.82	1.64	1.47	1.32	1.19	1.07	0.97
	Depreciation on other fixed assets @ 15% p.a	0.91	0.77	0.65	0.56	0.47	0.40	0.34	0.29
	Interest on term loan 12% p.a	1.91	1.91	1.64	1.27	0.88	0.61	0.00	0.00
	Insurance	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
	Total Fixed Cost (Rs. in Lakh)	7.79	7.45	6.87	6.24	5.6	5.13	4.33	4.18
B	**Sales Revenue (Rs. in Lakh)**	0.00	145.20	182.60	209.00	235.40	237.60	237.60	237.60
C	**Variable Cost (Rs. in Lakh)**								
	Raw materials*	0.00	85.97	100.30	114.62	128.95	128.95	128.95	128.95
	Packaging materials @ Rs.50/ Unit	0.00	36.00	42.00	48.00	54.00	54.00	54.00	54.00
	Casual staff salaries	0.00	4.59	4.59	4.59	4.59	4.59	4.59	4.59
	Utilities (Electricity, Fuel)	0.00	4.40	4.87	5.34	5.82	5.82	5.82	5.82

	Repair & maintenance	0.00	0.69	0.69	0.69	0.69	0.69	0.69	0.69
	Miscellaneous expenses	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Interest on working capital	0.00	2.35	2.89	3.30	3.71	3.73	3.73	3.73
	Total Variable Cost (Rs. in Lakh)	0.50	134.50	155.84	177.04	198.26	198.28	198.28	198.28
D	**Break Even Point (BEP) as % of sale**	0.00	69.63%	25.67%	19.52%	15.08%	13.05%	11.01%	10.63%
	Break Even Point (BEP) in terms of sales value (Rs. in lakhs)		101.10	46.88	40.81	35.49	31.00	26.17	25.26

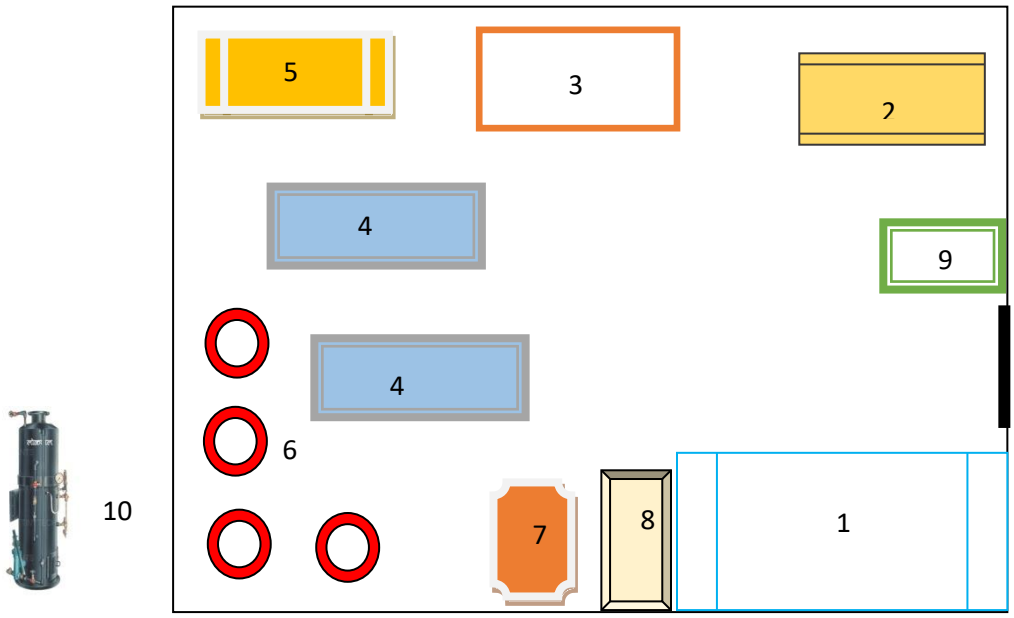
* Raw materials:

For every kg of product: Mandarin Orange Juice extract: 1 kg; Sugar: 0.55 kg; Pectin: 5 g; Other additives: 5g.

Raw material cost:

Oranges: Rs 50/kg (Juice yield: 60% with 10% TSS); Sugar: Rs.40/ kg; Pectin: Rs.800/ kg; Other additives: Rs 100/kg.

3.23 Plant Layout



1 Storage	6 Exhausting & Capping Line
2 Washer	7 Pasteurizer
3 Pulper	8 Bulk filling area
4 Work table	9 Weighing scale
5 Shredder	10 Boiler

3.24. Machinery Suppliers

The entrepreneur must provide tentative supplier list and quotations with respect to his project. However, there are many machinery suppliers available within India for Mandarin Orange processing machineries and equipments. Some of the suppliers are:

1. Eastend Engineering Company

   173/1 Gopal Lal Thakur Road, Calcutta 700 035 India

   Tel: +91 33 2553 6397

2. Gardners Corporation

   158 Golf Links New Delhi 110003 India

   Tel: +91 11 2334 4287/2336 3640; Fax: +91 11 2371 7179

3. Narangs Corporation

   P-25 Connaught Place New Delhi 110001 India

Tel: +91 11 2336 3547 Fax: +91 11 2374 6705

4. Bajaj Machine Private Limited
   7/20 7/27, Jai Lakshmi Industrial Estate, Side-IV Sahibabad Industrial Area
   Ghaziabad - 201301 U.P India
   Tel: +91 120 22775119/22775137; Fax: +91 120 22775137
   Website: www.indiamart.com/bajajmachine
5. Geeta Food Engineering
   Plot No C-7/1 TTC Area Pawana MIDC, Thane Belapur Road
   Behind Davita Chemicals Ltd, Navi Mumbai 400 705 India
   Tel: +91 22 2782 6626/2766 2098; Fax: +91 22 2782 6337
6. Sri Rajalakshmi Commercial Kitchen Equipment
   No.57, (old No. 30/1) Silver Jubilee Park Road,
   Bangalore - 560 002 India
   Tel: +91 (0)812 2222 1054/223 9738; Fax: +91 (0)812 2222 2047
7. Raylons Metal Works
   Kondivita Lane, J. B. Nagar Post Office Post Box No. 17426
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CHAPTER 4

LIMITATIONS OF THE MODEL DPR AND GUIDELINES FOR ENTREPRENEURS

4.1. Limitations of the Model DPR

i. This model 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 is a model DPR 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.

iv. This particular DPR is made on three components of means of finance i.e. grant, owner's contribution and loan/debt as followed in many central sector schemes.

4.2. 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 base/contract sourcing, entrepreneurs own SWOT analysis, detailed market research, comprehensive 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.

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