PM Formalization of

Micro Food Processing Enterprises Scheme

DPR OF

JARDALU MANGO LEATHER PROCESSING

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Contents

Project At a Glance		
1	Name of the Project	Jardalu mango RTS
2	Name of the entrepreneur/FPO/SHG/Cooperative	
3	Nature of proposed project	Proprietorship/Company/ Partnership
4	Registered office	
5	Project site/location	
6	Names of Partner (if partnership)	
7	No of share-holders (if company/FPC)	
8	Technical advisor	
9	Marketing advisor/partners	
10	Proposed project capacity	75 MT/annum (55, 65, 75, 90 & 100% capacity utilization in the 2^{nd}, 3^{rd},4^{th}, 5^{th} & 6^{th} years' onwards respectively
11	Raw materials	Jardalu mango Fruit
12	Major product outputs	Jardalu mango RTS
13	Total project cost (Lakhs)	31.76
	Land development, building & civil construction	5.18
	Machinery and equipments	17.16
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	5.62
14	Working capital Management (In Lakhs)	
	Second Year	16.86
	Third Year	19.92
	Fourth Year	27.17
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	10.00
	Promoter's contribution (min 20%)	7.93
	Term loan (45%)	13.81
16	Debt-equity ratio	1.38 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	43.00
	3rd year	52.52
	4th year	62.03
18	Average DSCR	2.16
	Benefit Cost Ratio	2.10
	Term Loan Payment	7 Years with 1 year grace period

Pay Back Period for investment	2 Years

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

1.1 INTRODUCTION

The Jardalu variety of mango of Bhagalapur is the second most globally famous thing of Bihar after the "tussar silk". A piece of Jardalu mango generally weighs between 220 gm-250 gm and has a special aroma with brilliant yellow colour. Jardalu mango famous for its exclusive aroma, sweetness and other nutritional properties, the Jardalu mango is considered as a safe fruit for even those who have been diagnosed with diabetes or have a poor digestive system. It is rich with fibre and enzymes that are highly beneficial to the abdominal muscles and digestive system. Jardalu is a very short time variety of mangoes and sensitive to deterioration and even when stored under refrigerated conditions; therefore, need to get processed during glut period. Jardalu mangoes fetched to Geographical Identification (GI) tag in 2018 due to its exclusive aroma with brilliant yellow colour, sweetness and other nutritional properties. They are also sent as gift to dignitaries, including the Prime Minister, President, Vice President Lok Sabha Speakers, and chief ministers by the Bihar Government every year. The Jardalu mangoes are procured directly from the mango orchards and put inside the safe gift packets every year, since 2007.

Jardalu mango has been described as a unique product from Bhagalpur in the Geographical Indications Journal's issue dated November 28, 2017. The journal is now available in the public domain, as per rule 41(1) of Geographical Indications of Goods (Registration and Protection) Rules, 2002. This mango variety is known for its light yellow skin and special aroma. It has been mentioned in the journal that the Jardalu mango was first planted in Bhagalpur region by Maharaja Rahmat Ali Khan Bahadur of Kharagpur. The journal has quoted growers association as saying that

a more than 200-year-old Jardalu tree in Tagepur village under Jagdishpur block of the district acted as mother plant. The application for GI tag was moved by Jardalu Aam Utpadak Sangh (Jardalu mango producers' union), Madhuban, Maheshi village under Sultanganj block of Bhagalpur district.

1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF JARDALU MANGO

Mango (*Mangifera indica*), member of the cashew family (Anacardiaceae) and one of the most important and widely cultivated fruits of the tropical world. The mango tree is considered indigenous to southern Asia, especially Myanmar and Assam state of India, and numerous cultivars have been developed. Mangoes are a rich source of vitamins A, C, and D.

The mango is inextricably connected with the folklore and religious ceremonies of India. Buddha himself was presented with a mango grove that he might find repose in its grateful shade. The name *mango*, by which the fruit is known in English- and Spanish-speaking countries, is most likely derived from the Malayam *manna*, which the Portuguese adopted as *manga* when they came to Kerala in 1498 for the spice trade. Probably because of the difficulty in transporting seeds (they retain their viability a short time only), the tree was not introduced into the Western Hemisphere until about 1700, when it was planted in Brazil; it reached the West Indies about 1740.

In 2018, global production of mangoes (report includes mangosteens and guavas) was 55.4 million tonnes, led by India with 39% (22 million tonnes) of the world total. China and Thailand were the next largest producers.

India ranks first among world's mango producing countries accounting for about 50% of the world's mango production. Other major mango producing countries include China, Thailand, Mexico, Pakistan, Philippines, Indonesia, Brazil, Nigeria and Egypt. India's share is around 52% of world production i.e., 12 million tonnes as against world's production of 23 million tonnes.

An increasing trend has been observed in world mango production averaging 22 million metric tonnes per year. Worldwide production is mostly concentrated in Asia, accounting for 75% followed by South and Northern America with about 10% share.

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The main mango producing states in India are Uttar Pradesh (23.86%), Andhra Pradesh (22.14%), Karnataka (11.71%), Bihar (8.79%), Gujarat (6.00%) and Tamil Nadu (5.09%). Total export of mangoes from India is 59.22 thousand tons, valuing Rs. 162.92 crores during 2010-11. India exports mango to over 40 countries worldwide. The major importing countries of India's Mangoes were UAE (61.79%), Bangladesh (11.41%), UK (8.92%), Saudi Arabia(3.79%), Kuwait (2.32%), and Bahrain (2.19%) respectively.

Production:

- Bihar ranks third in mango cultivation and covers and covers about 50% of the total fruit area in the state.
- Jardalu variety of mango, which is successfully grown in Bhagalpur district of Bihar with an area of 1600 ha. and production of 7500 tonnes. Source: National horticulture mission**.**

1.3 VARIETIES

Over **500 varieties** of mangoes are known, many of which ripen in summer, while some give a double crop. The fruit takes four to five months from flowering to ripen. The ripe fruit varies according to cultivar in size, shape, color, sweetness, and eating quality.

Some of the varieties of mangoes growing worldwide are described below.

1. **Alphonso** : This is the leading commercial variety of Maharashtra state and one of the choicest varieties of the country. This variety is known by different names in different regions, viz. Badami, Gundu, Khader, Appas, Happus and Kagdi Happus. The fruit of this variety is medium in size, ovate oblique in shape and orange yellow in colour. The fruit

quality is excellent and keeping quality is good. It has been found good for canning purpose. It is mainly exported as fresh fruit to other countries. It is a mid season variety.

2. **Bangalora** : It is a commercial variety of south India. The common synonyms of this variety are Totapuri, Kallamai, Thevadiyamuthi, Collector, Sundersha, Burmodilla, Killi Mukku and Gilli Mukku. The fruit size is medium to large, its shape is oblong with necked base and colour is golden yellow. Fruit quality is poor but keeping quality is very good. It is widely used for processing. It is a mid-season variety.
3. **Banganapalli** : It is a commercial variety of Andhra Pradesh and Tamil Nadu. It is also known as Chapta, Safeda, Baneshan and Chapai. Fruit is large in size and obliquely oval in shape. The colour of the fruit is golden yellow. Fruit quality and keeping quality are good. It is a mid-season variety and is good for canning. 4. Bombai : It is a commercial variety from Bihar state. It is also known as Malda in West Bengal and Bihar. Fruit size is medium, shape ovate oblique and colour is yellow. Fruit quality and keeping quality are medium. It is an early season variety.
4. **Bombay Green** : It is commonly grown in north India due to its early fruiting quality. It is also called Malda in northern India. Fruit size is medium, shape ovate oblong and fruit colour is spinach green. Fruit quality is good and keeping quality is medium. It is a very early season variety.
5. **Dashehari** : This variety derives its name from the village Dashehari near Lucknow. It is a leading commercial variety of north India and one of the best varieties of our country. The fruit size is small to medium, shape is oblong oblique and fruit colour is yellow. Fruit quality is excellent and keeping quality is good. It is a mid season variety and is mainly used for table purpose.
6. **Fajri** : This variety is commonly grown in the states of Uttar Pradesh, Bihar and West Bengal. Fruit is very large, obliquely oval in shape. Fruit colour is light chrome. Fruit quality and keeping quality are medium. This is a late season variety.
7. **Fernandin** : This is one of the oldest varieties of Bombay. Some people think that this variety originated in Goa. Fruit size is medium to large, fruit shape is oval to obliquely oval and fruit colour is yellow with a blush of red on shoulders. Fruit quality and keeping quality are medium. It is a late season variety mostly used for table purpose.

8. **Himsagar** : This variety is indigenous to Bengal. This is one of the choicest varieties of Bengal and has gained extensive popularity. Fruit is of medium size, ovate to ovate oblique in shape. Fruit colour is yellow. Fruit quality and keeping quality are good. It is an early season variety.
9. **Kesar** : This is a leading variety of Gujarat with a red blush on the shoulders. Fruit size is medium, shape oblong and keeping quality is good. It is an early season variety.
10. **Kishen Bhog** : This variety is indigenous to Murshidabad in West Bengal. Fruit size is medium, fruit shape oval oblique and fruit colour is yellow. Fruit quality and keeping quality are good. It is a mid season variety.
11. **Langra** : This variety is indigenous to Varanasi area of Uttar Pradesh. It is extensively grown in northern India. Fruit is of medium size, ovate shape and lettuce green colour. Fruit quality is good but keeping quality is medium. It is a mid season variety.
12. **Mankurad** : This variety is of commercial importance in Goa and in the neighboring Ratnagiri district of Maharashtra. The variety develops black spots on the skin in rainy season. Fruit is medium in size, ovate in shape and yellow in colour. Fruit quality is very good but keeping quality is poor. It is a mid season variety.
13. **Mulgoa** : This is a commercial variety of south India. It is quite popular among the lovers of mango owing to high quality of its fruit. Fruit is large in size, roundish oblique in shape and yellow in colour. Fruit quality and keeping quality are good. It is a late season variety.
14. **Neelum** : This is a commercial variety indigenous to Tamil Nadu. It is an ideal variety for transporting to distant places owing to its high keeping quality. Fruit is medium in size, ovate oblique in shape and saffron yellow in colour. Fruit quality is good and keeping quality is very good. It is a late season variety.
15. **Samarbehisht Chausa** : This variety originated as a chance seedling in the orchard of a Talukdar of Sandila district Hardoi, U.P. It is commonly grown in northern part of India due to its characteristic flavour and taste. Fruit is large in size, ovate to oval oblique in shape and light yellow in colour. Fruit quality is good and keeping quality is medium. It is a late season variety.
16. **Suvernarekha** : This is a commercial variety of Visakhapatnam district of Andhra Pradesh. Other synonyms of this variety are Sundari, Lal Sundari and Chinna

Suvernarekha. Fruit is medium in size and ovate oblong in shape. Colour of the fruit is light cadmium with a blush of jasper red. Fruit quality is medium and keeping quality is good. It is an early season variety.

17. **Vanraj** : It is a highly prized variety of Vadodra district of Gujarat and fetches good returns. Fruit is medium in size, ovate oblong in shape and colour is deep chrome with a blush of jasper red on the shoulders. Fruit quality and keeping quality are good. It is a mid season variety.
18. **Zardalu** : This variety is indigenous to Murshidabad in West Bengal. It derives its name from Zardalu, a dry fruit popular in North West Frontier Province and Sindh in Pakistan owing to similarity in shape. Fruit size is medium, oblong to obliquely oblong and golden yellow in colour. Fruit quality is very good. Keeping quality is medium. It is a mid season variety.

Hybrids

1. **Amrapali** : This hybrid is from a cross of Dashehari and Neelum. It is dwarf, regular bearing and late maturing variety. The variety is suitable for high density planting as about 1600 plants may be planted in a hectare. It yields on an average of 16 tonnes/hectare.
2. **Mallika**: It is from a cross of Neelum and Dashehari. Its fruit is large in size, oblong elliptical in shape and cadmium yellow in colour. Fruit and keeping quality are good. It is a mid season variety.
3. **Arka Aruna** : It is a hybrid between Banganapalli and Alphonso. It is dwarf, regular bearing and precocious. Fruits are large having attractive skin colour with red blush and free from spongy tissue. Suitable for homesteads as well as high density planting.
4. **Arka Puneet** : It is a hybrid between Alphonso and Banganapalli. It is a regular and prolific bearer. Fruits are medium sized having attractive skin colour with red blush, excellent keeping quality and free from spongy tissue.
5. **Arka Anmol** : This hybrid is from a cross of Alphonso and Janardhan Pasand. It is regular bearer and good yielder. Fruits are medium sized having uniform yellow peel colour, excellent keeping quality and free from spongy tissue.

6. **Arka Neelkiran** : It is a hybrid between Alphonso and Neelum. It is regular bearing late season variety with medium sized fruits having attractive red blush and free from spongy tissue.
7. **Ratna** : This hybrid is from a cross of Neelum and Alphonso. Tree moderately vigorous, precocious, fruits are medium sized, attractive in colour and free from spongy tissue.
8. **Sindhu** : It is from a cross of Ratna and Alphonso. It is regular bearer, fruits medium sized, free from spongy tissue with high pulp to stone ratio and very thin and small stone.
9. **Ambika**: This hybrid is a cross between Amrapali and Janardhan Pasand. It is a regular and prolific bearer. Fruits are medium sized having attractive skin colour with red blush, and late in ripening.
10. **Au Rumani**: It is from a cross of Rumani and Mulgoa. It is precocious, heavy and regular bearer with large fruits having yellow cadmium skin colour.
11. **Manjeera** : This hybrid is from a cross of Rumani and Neelum. It is dwarf, regular and prolific bearer with firm and fibreless flesh.
12. **PKM 1** : It is from a cross of Chinnasuvernarekha and Neelum. It is regular bearer, heavy yielder and bears fruits in clusters.

1.4 HEALTH BENEFITS AND NUTRITIONAL INFORMATION

Mango is a low-calorie fruit that is high in fibre, and is a great source of vitamins A and C. It also contains folate, B6, iron and a little calcium, zinc and vitamin E. Mangoes are a good source of antioxidants, containing certain phytochemicals such as gallotannins and mangiferin which have been studied for their health benefits.

Just 80g of mango (2 x 2 inch slices) counts as one of your five-a-day. This one portion will provide 53 calories, 11g of naturally-occurring sugar and just over 2g of fibre.

Nutritional value of mango:

Mango is low in calories but full of nutrients. One cup (165 grams) of sliced mango provides:

- **Calories:** 99

- **Protein:** 1.4 grams
- **Carbs:** 24.7 grams
- **Fat:** 0.6 grams
- **Dietary fiber:** 2.6 grams
- **Vitamin C:** 67% of the Reference Daily Intake (RDI)
- **Copper:** 20% of the RDI
- **Folate:** 18% of the RDI
- **Vitamin B6:** 11.6% of the RDI
- **Vitamin A:** 10% of the RDI
- **Vitamin E:** 9.7% of the RDI
- **Vitamin B5:** 6.5% of the RDI
- **Vitamin K:** 6% of the RDI
- **Niacin:** 7% of the RDI
- **Potassium:** 6% of the RDI
- **Riboflavin:** 5% of the RDI
- **Manganese:** 4.5% of the RDI
- **Thiamine:** 4% of the RDI
- **Magnesium:** 4% of the RDI

It also contains small amounts of phosphorus, pantothenic acid, calcium, selenium and iron

Health benefits:

Consuming mangoes can help strengthen and protect the body in numerous ways. Here's an overview of mango and the health benefits it offers:

1. Promotes Eye health - Rich in beta-carotene that helps in the production of Vitamin A
2. Prevent Cancer - Antioxidants -quercetin, isoquercitrin Protects against Carcinogens
3. Cholesterol level - High vitamin C, fiber and pectin Helps Maintain the Fat level
4. Cleansing Skin - It cleanses your skin from deep inside your body.
5. Immune System - Vitamin C, carotenoids Responsible for Boosting immune
6. Prevents Anemia- Iron content in mango is a natural remedy for anemic people.

1.5 CULTIVATION, BEARING & POST HARVEST MANAGEMENT:-

Mango *(Mangifira indica)*, seedling trees are big in size and can grow over 20 metre high with a same spread. Grafted trees can attain a height of 8-10 metres with a dome shaped top. Mango is evergreen with spreading branches. On road sides seedling trees have erect branches.

The leaves are alternate, leathery and lanceolate in shape, with short petiole. Inflorescences in mango appear mostly terminally and rarely axillary. Flowers are small both male and hermaphrodite flowers are borne on the same inflorescence, which may be of 10-40 cm long. The stamens (4-5) of different lengths are present in a flower only one or two are fertile and rest are reduced to staminodes. Ovary is one celled, oblique and compressed. The fruit is a drupe with leathery epicarp, fleshy mesocarp (edible) and a seed with hard covering (stone) endocarp.

A particle may have few to more than 1000 flowers. The ratio of male to hermaphrodite flowers varies from 4:1 to 1:1. The ratio can vary with season, from area to

area and within cultivars. In northern India Dusehari, Amrapali and Langra cultivars may have 80, 85 and 65 percent perfect flowers, respectively. Some of the sucking mango selections have only 25 to 30 percent perfect flowers.

Cultivation and Bearing:-

Mangoes have been cultivated in South Asia for thousands of years and reached Southeast Asia between the fifth and fourth centuries BCE. By the 10th century CE, cultivation had begun in East Africa. The 14th-century Moroccan traveler Ibn Battuta reported it at Mogadishu. Cultivation came later to Brazil, Bermuda, the West Indies, and Mexico, where an appropriate climate allows its growth. The mango is now cultivated in most frost-free tropical and warmer subtropical climates; almost half of the world's mangoes are cultivated in India alone, with the second-largest source being China. Mangoes are also grown in Andalusia, Spain (mainly in Málaga province), as its coastal subtropical climate is one of the few places in mainland Europe that permits the growth of tropical plants and fruit trees. The Canary Islands are another notable Spanish producer of the fruit. Other cultivators include North America (in South Florida and the California Coachella Valley), South and Central America, the Caribbean, Hawai'i, south, west, and central Africa, Australia, China, South Korea, Pakistan, Bangladesh, and Southeast Asia. Though India is the largest producer of mangoes, it accounts for less than 1% of the international mango trade; India consumes most of its own production.

Mango *(Mangiferaindica L.)* Family *Anacardiaceae* is the most popular fruit and is considered to be the "King of Fruits". The mango growing states in India are Andhra Pradesh, Assam, Bihar, Dadara Nagar & Haveli, Gujarat, Goa, Haryana, Kerala, Karnataka, Madhya Pradesh, Maharastra, Manipur, Orrisa, Punjab, Tamil nadu, Tripura, Uttar pradesh, West Bengal. Mango occupies over 50% of the total area under fruits in India.It has both Medicinal and Industrial importance and almost all parts of the tree are used for various uses Ripe mango fruits are rich in vitamin A and Vitamin C. In Goa, the area under mango is 4414 with annual production estimated at about 19280 tonnes.

Mango thrives well up to 600 m above mean sea level provided locality is frost free and there is no high humidity or rains during flowering. The favourable temperature is 240 C to 270 C, however, it can tolerate temperature as high as 480 C provided that trees are getting regular irrigation.

Mango has been found to grow on a wide range of soils. However, deep and well-drained loam to sandy loam soils are most suitable for cultivation.Heavy black cotton, saline and alkaline soils should be avoided. The deal range of soil pH for mango cultivation is 5.5 to 7.5.

Mango fruits mature in 3-4 months from flowering, Fruit colour changes from dark green to light green on maturity. Harvesting should be started after few fruits drop, during morning hours. Individual fruits are clipped with 1.5 cm stalk using mango harvester. Harvested fruits are kept on gunny bags under shade. Under sized, bruized and infested fruits are sorted out and healthy fruits are graded into 2 – 3 grades depending upon colour, shape and size and packed in wooden or corrugated boxes.

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.
- 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 Mangos. 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:-

Mangoes are processed at two stages of maturity. Green fruit is used to make chutney, pickles, curries and dehydrated products. The green fruit should be freshly picked from the tree. Fruit that is bruised, damaged, or that has prematurely fallen to the ground should not be used. Ripe mangoes are processed as canned and frozen slices, purée, juices, nectar and various dried products. Mangoes are processed into many other products for home use and by cottage industry. Processing mango provides an economical way to store and transport mango from regions of production to distant markets. Processing allows small

and medium sized businesses to create jobs in growing, processing, marketing and to contribute to the economic growth of a region.

Several options have become available for large scale processing of mango products.

1. Mango pulp
2. Juice
3. Nectar
4. Fruit sauces
5. Fruit cocktails
6. Dried mango slices
7. Mango wine
8. Glazings
9. Flavoured yoghurt
10. Ice cream

Mango leather and mango bar are delicious and nutritious products. The manufacturing process is simple. And the commercial manufacturing is a highly profitable business. Fruits are highly perishable items. Additionally, fruits are only available on the seasonal basis. Therefore, different types of value-added processed fruit products are commercially very successful. It can be predicted that few entrepreneurs may enter in this venture along with other mango base product. Mango leather is a traditional item. However, commercially produced mango leathers are better in terms of color, taste, and quality. Furthermore, fruit toffee is a highly nutritious food compared to other toffee

and chocolates. Pulpy fruits like banana, mango, guava, apple, pineapple etc. are the best fruits for making mango leathers.

Mango leather is manufactured by hydrating mango puree into a leather like sheet. Moisture is removed from the wet purees. Mango leather is a confectionary dietary product which is often eaten as snack or dessert. It is chewy and flavorful, naturally low in fat and high in fiber and carbohydrates. Mango fruit leather is becoming popular for their taste, chewy nature and nutritive value now a days.

2. MODEL JARDALU MANGO LEATHERPROCESSING 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 Jardalu mango leather processing unit are in the production clusters of Jardalu mango growing states/Areas such as Bihar, Eastern part of Uttar Pradesh and some parts of West Bengal where adequate quantities of surplus raw materials can be available for processing.

2.2 INSTALLED CAPACITY OF THE JARDALU MANGO LEATHER PROCESSING UNIT

The maximum installed capacity of the Jardalu mango leather manufacturing unit in the present model project is proposed as 75 tonns/annum or 250 kg/day Jardalu mango leather. 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 Jardalu mango leather manufacturing project, the unit

requires 691.42 kg/day, 817.14 kg/day, 942.85 kg/day, 1131.42 kg/day and 1257.14 kg/day Jardalu mango fruit at 55, 65, 75, 90 and 100 percent capacity utilization, respectively. The Mature Jardalu mango must be plucked from plant; and then stored below 6°C temperature.

2.4 MANUFACTURING PROCESS OF THE JARDALU MANGO LEATHER

The typical Procedure for manufacturing of Jardalu mango leather is as below:

Jardalu mango fruits

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

↓

Sorting

↓

*Washing and cleaning (Soaked in water containing chlorine solution (10-20ppm) for 2-5 minutes)

↓

Pulp extraction

↓

Strain

↓

Weighing and mixing (Sugar + lemon juice + SMP + Corn flour + Preservative)

↓

Thermal treatment (70-80ºC for 10 minutes)

↓

Drying

↓

After drying first layer, spread second layer on it and repeat the process

↓

(until thickness of sheet is 1.0-1.25 cm)

↓

Cut dried sheets into pieces of suitable sizes

↓

Wrap in waxed paper

↓

*Packaging and Storage

*Established Critical Control point

1. Preliminary Washing:

Washing water can be chlorinated by adding 1teaspoon of chlorine to 4.5 liters of water in order to reduce microbial load and impurities from the fruit. A second washing with clean water is made to eliminate residual chlorine.

2. Sorting and grading:

After removing A grade mango (As Jardalu had good market value), B and C grade fruits can be taken for processing. All fruit should be ripe and free from bruising. Any

rotten or bruised fruit should be thrown away as this will spoil the colour and flavour of the leather.

3. Peeling:

After washing drain the water from mango surface. Peeling can be done by two ways: manually and by machines. Manual peeling can cause a reduction of up to 5.6% in the recovery of slices compared with machine peeling.

4. Cutting:

Preparation of the mango: Pulp is separated from the seed manually or by using a food mill. If electricity is available, a liquidizer or blender can be used to increase the production output. The liquidized mangoes are strained or sieved to remove fibers, seeds and other unwanted materials and make a smooth puree.

5. For further processing:

Puree can be semi-processed and stored in sealed drums for further processing later in the season. Sulphur dioxide (SO2) (600ppm) is added to the drums to prevent the growth of microorganisms. The semi-processed mango pulp can be stored for several months.

6. Weighing and Mixing:

Weigh the pulp and mix with the sugar, lemon juice and Sodium of potassium metabisulphite in the ratios of Sugar - 10-15% of the pulp weight according to the consumer taste, Lemon juice or citric acid - 2 spoons per kg pulp, Sodium of potassium metabisulphite - 2g per kg pulp Other ingredients could be added as per the demand of the market as skim milk powder, corn flour, roasted defatted soy flour. Chopped nuts, coconut or spices to vary the taste and flavour. Chemical preservatives may be added to the mango puree to maintain a bright colour in the leather.

7. Thermal treatment:

A heat treatment is applied to the pulp to prevent chemical and microbial spoilage. In this treatment the pulp reaches 70-80°C and is held for 10 min. with continuous stirring to inactivate the enzymes and reduce the level of microbiological contamination.

8. Drying:

The leathers should not be dried in direct sunlight as this will cause the colour to fade and reduce the levels of vitamins A and C. Indirect solar dryers or mechanical dryers should be used. Remove the foam from the top of the mixture. Grease the surface of trays with glycerine to prevent the leather from sticking. Pour the fruit puree mix in a thin layer (3-6mm thick) on plastic trays or wooden. The leather is dried until it has a final moisture content of 15-25%. After drying, the leather pieces should be dusted lightly with starch to prevent them sticking together. The product will have a soft, leather-like consistency. Place three sheets of leather on top of each other and cut into small 4x4cm squares.

9. Packaging and Storage:

In the current growing market of fruit leathers, commercial packaging is necessary. Packaging materials for fruit leather are required to prolong the shelf-life of the product and, normally, relate to the stability of water activity, microbiological stability, sensory properties, and physicochemical characteristics. Wrap each square in cellophane. It may be necessary to dust the squares with corn flour to prevent excess stickiness. Pack in plastic bags, label and store in a cool dry place.

2.5 MARKET DEMAND AND SUPPLY FOR JARDALU MANGO LEATHER

Jardalu mango Fruits and peel were processed into various value-added products like Jardalu mango jam, Jardalu mango jelly, Jardalu mango marmalade, Jardalu mango sherbets, Jardalu mango puree, Jardalu mango Nectar, Jardalu

mango Juice, Jardalu mango Juice concentrates, Jardalu mango wine, Jardalu mango canned slice, Jardalu mango frozen slices and Jardalu mango dried slices. Due to sensitivity to chilling injury and limited shelf life of Jardalu mango fruit, it becomes important to process it in the form of value-added products to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of value-added product has turn out to be the business activity of great significance and countries with rich fruit resources with short harvesting season are emphasizing more for establishes storage to keep up quality of fruits, enhance shelf life and preserve fruit product for availability in off-season. In recent past the consumption of fruit-based products has increased at a fast rate.

The most commonly used products in the global market are processed mango products. These products include dried mango, mango puree, mango pulp, mango leather, concentrate, and IQF mango.

Factors such as increasing consumption of mango products, increasing preference for highly versatile and sweet products, and rising awareness about nutritive products are driving the growth of the processed mango product market.

However, availability of mangoes only during certain seasons, fluctuations in mango prices, and stringent regulations of food processing across the globe are the major restraints for the processed mango products market.

Rise in preference for organic mango products, and increasing consumptions across the globe can increase the export value of mango products especially in the U.S. AND IN Europe.

2.6 MARKETING STRATEGY FOR JARDALU MANGO LEATHER

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 Jardalu mango fruit-based products.

2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for Jardalu mango leather 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 fruit leather 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. Jardalu mango cost considered @ Rs.15/-per kg.
    2. 1 kg Jardalu mango will produce 50% 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 Jardalu mango leather Unit	75	MT/annum
Utilization of capacity	1st Year Implementation, 55% in second, 65% in third, 75% in fourth year, 90% in fifth & onwards	
Working days per year	300	days
Working hours per day	10	hours
Interest on term and working capital loan	12%	
Repayment period	Seven year with one year grace period is considered.	
Average prices of raw material	15	
Average sale prices per Kg	300	Rs/kg
Pulp extraction	50	
Jardalu mango leather	1 kg Jardalu mango leather from 5.02 Kg jardalu mango	

2.8 FIXED CAPITAL INVESTMENT

2.8.1 MACHINERY AND EQUIPMENT

Sr No.	Equipment	Quantity	Area (in Feet)	Capacity	Price (Rs. In Lacs)
1	Cold store	1	12*10*13	10000 kg	8
2	Fruit washer	1	6*4	Suitable	1.5
3	Mango Peeler	1	3*5	Suitable	1.25
4	Pulper	1	5*5	500 kg/hr	1.8
5	Gas operated heating kettle	2	4 ft dia.	200 kg/hr	1.6
6	Tray dryer	1	7*7	120 kg/batch	2.2
7	Cont. sealing machine	1	4*5	Suitable	0.25
8	Weighing balance	1		Suitable	0.06
9	Accessories	1		Suitable	0.5
				Total	17.16

2.8.2 OTHER COSTS:-

Utilities and Fittings:-

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

Other Fixed Assests:

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

Pre-operative expenses

Pre-operative Expenses

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

Contingency cost to be added as approx.1.2 Lac.

So total startup cost at own land & Premise may be somewhat similar to 31.76 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	7 days	1.93	2.28	3.11
Work in progress	15 days	3.86	4.57	6.23
Packing material	15 days	0.45	0.53	0.73
Finished goods' stock	15 days	5.08	6.01	8.19
Receivables	30 days	10.16	12.01	16.38
Working expenses	30 days	0.99	1.17	1.59
Total current assets		22.48	26.56	36.22
Trade creditors		0.00	0.00	0.00
Working capital gap		22.48	26.56	36.22
Margin money (25%)		5.62	6.64	9.06
Bank finance		16.86	19.92	27.17

2.10 TOTAL PROJECT COST AND MEANS OF FINANCES

Particulars	Amount in Lakhs
i. Land and building (20 x 32 x 12 ft - LxBxH)	5.18
ii. Plant and machinery	17.16
iii. Utilities & Fittings	0.8
iv. Other Fixed assets	0.9
v. Pre-operative expenses	0.90
vi. Contingencies	1.20

vii. Working capital margin	5.62
Total project cost (i to vii)	31.76
Means Of finance	
i. Subsidy	10.00
ii. Promoters Contribution	7.94
iii. Term Loan (@10%)	13.82

2.11 MANPOWER REQUIREMENTS

Total Monthly Salary (Rs.)	No	Wages	Total Monthly	Total Annually
Supervisor (can be the owner)	1	15000	15000	180000
Technician	1	12000	12000	144000
Semi skilled	2	7600	15200	182400
Sales man	1	8000	8000	96000
			50200	602400

2.12 EXPENDITURE, REVENUE AND PROFITABILITY ANALYSIS

	Particulars	1st Year	2nd Year	3rd Year	4 th Year	5th year	6th year
A	Total Installed Capacity (MT)	378 MT Mango/Annum	41.25	48.75	56.25	67.5	75
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	**Expenditure (Rs. in Lakh)**	0					
	Mango Av. Price @ Rs. 15/Kg)	0.00	31.11	36.77	42.43	50.91	56.57
	Sugar @ Rs. 35/kg	0.00	4.95	5.85	6.75	8.10	9.00
	Lemon juice @ Rs. 45/kg	0.00	0.86	1.01	1.17	1.40	1.56
	SMP @ Rs. 280/Kg	0.00	5.78	6.83	7.88	9.45	10.50
	Other materials	0.00	0.54	0.64	0.74	0.89	0.99
	Packaging materials	0.00	4.95	5.85	6.75	8.10	9.00
	Utilities (Electricity, Fuel)	0.00	1.53	1.81	2.08	2.50	2.78
	Salaries (1st yr only manager's salary)	1.80	6.02	6.02	6.02	6.02	6.02
	Repair & maintenance	0.00	0.70	0.80	0.90	0.90	0.90
	Insurance	0.30	0.30	0.30	0.30	0.30	0.30
	Miscellaneous expenses	0.50	2.30	2.30	2.30	2.30	2.30
	Total Expenditure	**2.60**	**59.04**	**68.18**	**77.32**	**90.88**	**99.92**
C	**Total Sales Revenue (Rs. in Lakh)**	**0.00**	**123.75**	**146.25**	**168.75**	**202.50**	**225.00**
	Sale of Jardalu mango leather(Av. Sale Price @ Rs.180/kg)	0.00	123.75	146.25	168.75	202.50	225.00
D	**PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows**	**-2.60**	**64.71**	**78.07**	**91.43**	**111.62**	**125.08**
	Depreciation on civil works @ 5% per annum	0.26	0.25	0.23	0.22	0.21	0.20
	Depreciation on machinery @ 10% per annum	1.72	1.54	1.39	1.25	1.13	1.01
	Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05
	Interest on term loan @ 12%	1.44	1.39	1.33	1.27	1.20	1.13
	Interest on working capital @ 12%	0.00	2.02	2.39	3.26	3.26	3.26
E	Profit after depreciation and Interest (Rs. in Lakh)	**-6.13**	**61.43**	**75.02**	**88.61**	**109.01**	**122.68**
F	Tax (assumed 30%) (Rs. in Lakh)	**0.00**	**18.43**	**22.51**	**26.58**	**32.70**	**36.80**
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	**-6.13**	**43.00**	**52.52**	**62.03**	**76.31**	**85.88**
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	1.44	1.39	1.33	1.27	1.20	1.13
I	Coverage available (Rs. in Lakh)	1.44	1.39	1.33	1.27	1.20	1.13
J	Total Debt Outgo (Rs. in Lakh)	0.48	0.53	0.58	0.65	0.71	0.79
K	Debt Service Coverage Ratio (DSCR)	3.00	2.62	2.28	1.97	1.69	1.44
	Average DSCR	2.16					
L	Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)	-4.04	44.89	54.23	63.57	77.71	87.14

M	Payback Period	2.5 Years					
	(on Rs. 31.76 Lakhs initial investment)						

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	1,381,523.23	191,643.77	143,678.42	47,965.36	1,333,557.88
2	1,333,557.88	191,643.77	138,690.02	52,953.75	1,280,604.12
3	1,280,604.12	191,643.77	133,182.83	58,460.95	1,222,143.18
4	1,222,143.18	191,643.77	127,102.89	64,540.88	1,157,602.29
5	1,157,602.29	191,643.77	120,390.64	71,253.14	1,086,349.16
6	1,086,349.16	191,643.77	112,980.31	78,663.46	1,007,685.70
7	1,007,685.70	191,643.77	104,799.31	86,844.46	920,841.23
8	920,841.23	191,643.77	95,767.49	95,876.29	824,964.95
9	824,964.95	191,643.77	85,796.35	105,847.42	719,117.53
10	719,117.53	191,643.77	74,788.22	116,855.55	602,261.98
11	602,261.98	191,643.77	62,635.25	129,008.53	473,253.45
12	473,253.45	191,643.77	49,218.36	142,425.42	330,828.03
13	330,828.03	191,643.77	34,406.12	157,237.66	173,590.37
14	173,590.37	191,643.77	18,053.40	173,590.37	-
		2,683,012.84	1,301,489.60	1,381,523.23	(1,381,523.23)

2.14 ASSET'S DEPRECIATION

Assets' Depreciation (Down Value Method)							Amounts in Lakhs	
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Civil works	5.18	4.92	4.67	4.44	4.22	4.01	3.81	3.62
Depreciation	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciated value	4.92	4.67	4.44	4.22	4.01	3.81	3.62	3.44
Plant & Machinery	17.16	15.44	13.90	12.51	11.26	10.13	9.12	8.21
Depreciation	1.72	1.54	1.39	1.25	1.13	1.01	0.91	0.82
Depreciated value	15.44	13.90	12.51	11.26	10.13	9.12	8.21	7.39

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	23.14	21.05	19.15	17.44	15.90	14.50	13.23	12.08
Depreciation	2.10	1.89	1.71	1.55	1.40	1.27	1.15	1.04
Depreciated value	21.05	19.15	17.44	15.90	14.50	13.23	12.08	11.04

2.15 FINANCIAL ASSESSMENT OF THE PROJECT

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

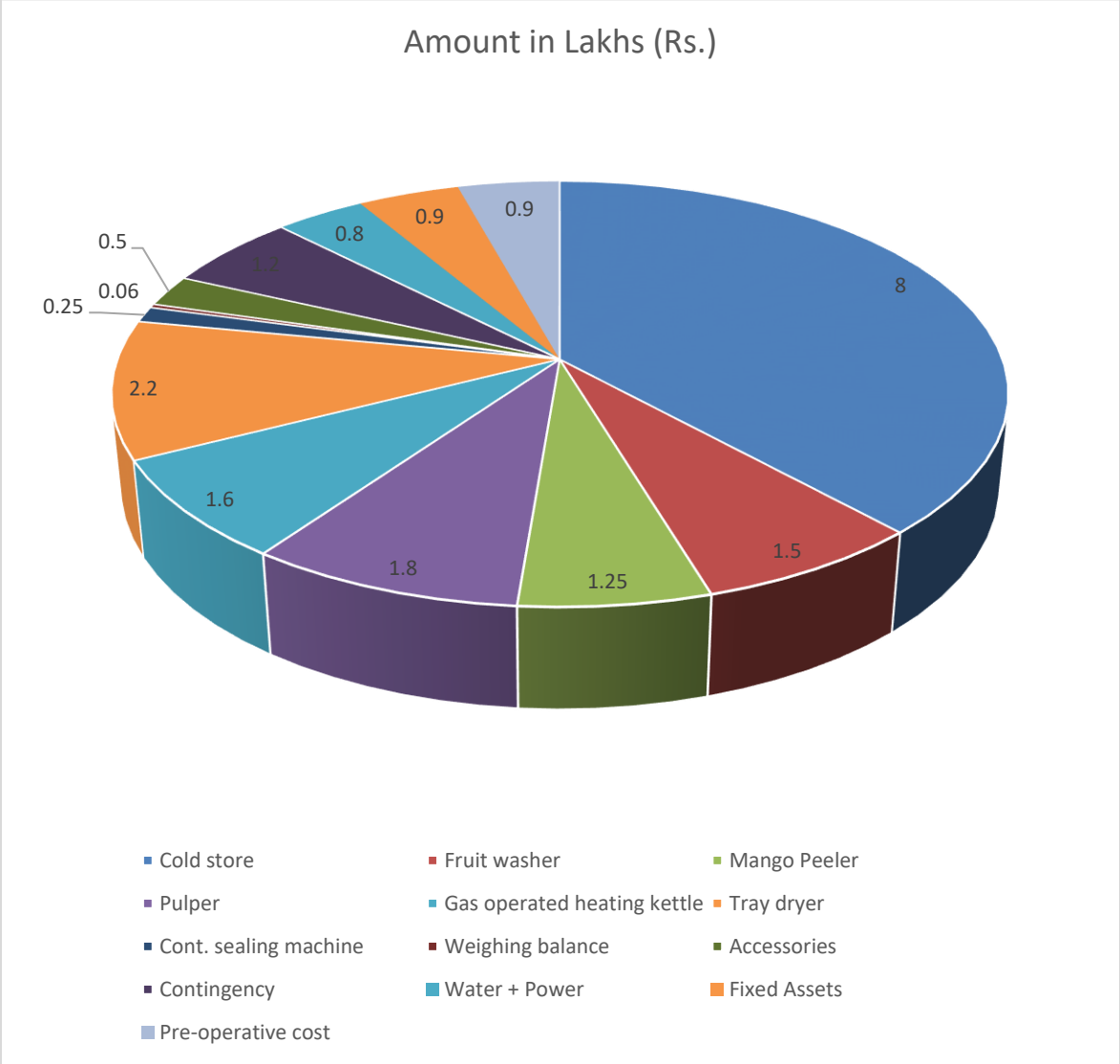
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year	
Capital cost (Rs. in Lakh)	31.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.60	59.04	68.18	77.32	90.88	99.92	99.92	99.92	
Total cost (Rs. in Lakh)	34.36	59.04	68.18	77.32	90.88	99.92	99.92	99.92	629.56
Benefit (Rs. in Lakh)	0.00	123.75	146.25	168.75	202.50	225.00	225.00	225.00	
Total Depreciated value of all assets (Rs. in Lakh)								11.04	
Total benefits (Rs. in Lakh)	0.00	123.75	146.25	168.75	202.50	225.00	225.00	236.04	1327.29
Benefit-Cost Ratio (BCR): (Highly Profitable project)	**2.108**								
Net Present Worth (NPW):	697.73								

2.16 BREAK EVEN ANALYSIS

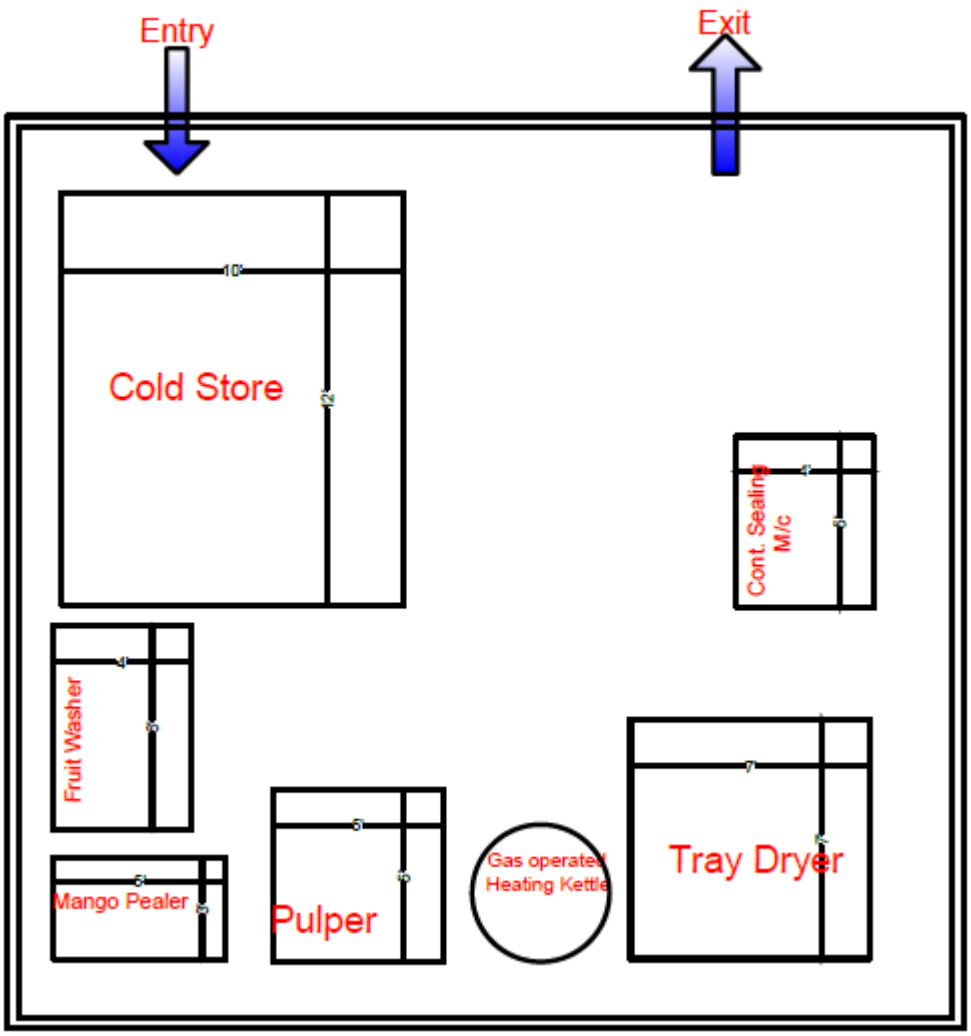
Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
Production MT/Annum		41.25	48.75	56.25	67.5	75	75	75
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	6.024	6.024	6.024	6.024	6.024	6.024	6.024	6.024
Depreciation on building @ 5% per annum	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciation on machinery @ 10% per annum	1.72	1.54	1.39	1.25	1.13	1.01	0.91	0.82
Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04
Interest on term loan	1.44	1.39	1.33	1.27	1.20	1.13	1.05	0.96
Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Fixed Cost (Rs. in Lakh)	**9.85**	**9.60**	**9.36**	**9.14**	**8.92**	**8.72**	**8.51**	**8.32**
Sales Revenue (Rs. in Lakh)	**0**	**123.75**	**146.25**	**168.75**	**202.5**	**225**	**225**	**225**
Variable Cost (Rs. in Lakh)								
Mango (Av. Price @ Rs.15/Kg)	0.00	31.11	36.77	42.43	50.91	56.57	56.57	56.57
Sugar @ 35 per kg	0.00	4.95	5.85	6.75	8.10	9.00	9.00	9.00
Lemon juice@ 45 per kg	0.00	0.86	1.01	1.17	1.40	1.56	1.56	1.56
SMP @ 280 per kg	0.00	5.78	6.83	7.88	9.45	10.50	10.50	10.50
Other ingredients	0.00	0.54	0.64	0.74	0.89	0.99	0.99	0.99
Packaging materials	0.00	4.95	5.85	6.75	8.10	9.00	9.00	9.00
Casual staff salaries	0.00	4.52	4.52	4.52	4.52	4.52	4.52	4.52
Utilities (Electricity, Fuel)	0.00	1.53	1.81	2.08	2.50	2.78	2.78	2.78
Repair & maintenance	0.00	0.70	0.80	0.90	0.90	0.90	0.90	0.90
Miscellaneous expenses	0.50	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Interest on working capital @ 12%	0.00	2.02	2.39	3.26	3.26	3.26	3.26	3.26
Total Variable Cost (Rs. in Lakh)	**0.50**	**58.97**	**68.47**	**78.48**	**92.04**	**101.08**	**101.08**	**101.08**
Break Even Point (BEP)								
as % of sale	-	12.00	10.00	8.00	8.00	7.00	7.00	6.00
Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	14.85	14.63	13.50	16.20	15.75	15.75	13.50

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



2.18 TYPICAL JARDALU MANGO LEATHER MANUFACTURING UNIT LAYOUT



2.19 MACHINERY SUPPLIERS

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

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

3. LIMITATIONS OF MODEL DPR & GUIDELINES FOR ENTREPRENEURS

3.1 LIMITATIONS OF THE DPR

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

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

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

3.2 GUIDELINES FOR THE ENTREPRENEURS

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

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

production/availability of the raw materials/crops in the targeted area/clusters and many more relevant aspects for acceptance and approval of the competent authority.

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

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

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

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

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

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

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

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

Contact Us

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