MINISTRY OF FOOD PROCESSING INDUSTRIES
GOVERNMENT OF INDIA

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NIFTEM
THANJAVUR

PM Formalisation of
Micro Food Processing Enterprises Scheme

DETAILED PROJECT REPORT
FOR
LEMON JUICE

AATMANIRBHAR BHARAT

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Project At a Glance		
1	Name of the Project	Citrus lemon juice
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 shareholders (if company/FPC)	
8	Technical advisor	
9	Marketing advisor/partners	
10	Proposed project capacity	150 MT/annum (70, 80 & 90% capacity utilization in the 2nd, 3rd and 4th years' onwards respectively
11	Raw materials	Citrus lemon Fruit
12	Major product outputs	Fortified Citrus lemon juice
13	Total project cost (Lakhs)	34.04
	Land development, building & civil construction	4.44
	Machinery and equipment	23.55
	Utilities (Power & water facilities)	3
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.00
	Working capital margin	0.25
14	Working capital Management (In Lakhs)	
	Second Year	17.44
	Third Year	19.93
	Fourth Year	25.62
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	11.23
	Promoter's contribution (min 20%)	6.80
	Term loan (45%)	15.99
16	Debt-equity ratio	2.35 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	137.00
	3rd year	158.68
	4th year	180.33
18	Average DSCR	19.14
	Benefit Cost Ratio	5.16
	Term Loan Payment	7 Years with 1 year grace period
	Pay Back Period for investment	2 Years

1 General Overview of Citrus lemon Production, Clusters, Post-Harvest Management and Value Addition in India

1.1 Introduction

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

1.2 Origin, Distribution and Production of Citrus lemon

Lemon (Citrus limon) is the medicinally important plant and belongs to the family Rutaceae. Lemon is the third most important citrus fruit following orange and mandarin. The origin of the lemon is unknown, though lemons are thought to have first grown in Assam (a region in northeast India), northern Burma or China. A genomic study of the lemon indicated it was a hybrid between bitter orange (sour orange) and citron. Citrus fruits are native to south-eastern Asia and are among the oldest fruit crops to be domesticated by humans. They are widely grown

in all suitable subtropical and tropical climates and are consumed worldwide. Citrus lemon spread all across Middle East, Europe, Africa and as far as Americas. Lemons entered Europe near southern Italy no later than the second century AD, during the time of Ancient Rome. However, they were not widely cultivated. They were later introduced to Persia and then to Iraq and Egypt around 700 AD. The lemon was first recorded in literature in a 10th-century Arabic treatise on farming, and was also used as an ornamental plant in early Islamic gardens. It was distributed widely throughout the Arab world and the Mediterranean region between 1000 and 1150. The first substantial cultivation of lemons in Europe began in Genoa in the middle of the 15th century. The lemon was later introduced to the Americas in 1493. It was mainly used as an ornamental plant and for medicine. In the 19th century, lemons were increasingly planted in Florida and California. . Total Lemon production in India is about 3147.85 MT. Top lemon producing states are Gujarat, Andhra Pradesh, Madhya Pradesh, Karnataka, Orissa and Maharashtra. Gujarat contributes 20 % share of total lemon production in India followed by Andhra Pradesh accounting for 18%, Madhya Pradesh and Karnataka accounting for 10% of Total lemon production in India.

Citrus lemon is the most important fruit in all over world. It is well known for nutritional and medicinal property. All citrus lemon is used as a traditional medicine. Citrus lemon fruit is used for culinary and non-culinary purposes throughout the world, primarily for its juice, which has both culinary and cleaning uses. The pulp and rind are also used in cooking and baking. The juice of the lemon is about 5% to 6% citric acid, with a pH of around 2.2, giving it a sour taste and which is also rich in vitamin C and contains smaller amounts of Vitamin B, particularly thiamine, riboflavin, and niacin.

1.3 Varieties

There are different varieties of Citrus lemon found across world.

The ‘Bonnie Brae’ is oblong, smooth, thin-skinned and seedless. These are mostly grown in San Diego County, USA.

The 'Eureka' grows year-round and abundantly. This is the common supermarket lemon, also known as 'Four Seasons' because of its ability to produce fruit and flowers together throughout the year. This variety is also available as a plant to domestic customers. There is also a pink-fleshed Eureka lemon, with a green and yellow variegated outer skin. They are commercially popular because of their reliable flavor and continuous growing season.

The Lisbon lemon is very similar to the Eureka and is the other common supermarket lemon. It is smoother than the Eureka, has thinner skin, and has fewer or no seeds. It generally produces more juice than the Eureka.

The ‘Meyer’ lemon is not ‘true’ lemon, but hybrid which is originated from China. It is a cross between a lemon and a sweet orange such as a mandarin. It looks like lime when young, rounder than true lemons and with a lime green skin. As the lemon ripens, it takes on the typical yellow shade, with a strong fragrance and thin skin. These lemons have a more subtle flavor than the Eureka or Lisbon lemons, which are widely available in grocery stores. Instead, they have a sweeter taste, with a dark yellow flesh and usually around 10 seeds.

Primofiori Lemon is grown extensively in the Mediterranean region and is the most largely commercially produced lemon in Spain. The trees have a vigorous growth habit, with large leaves and dense foliage. The fruit it produces is pale yellow in color,

with a thin and smooth skin. Lemons can be round or oval, and are smaller in size than most other lemon varieties, though they tend to be much juicier.

Verna This lemon tree is native to Spain, where it is the second most important lemon tree after the Primofiori. It is widely known as both Verna and Berna. The fruits of this tree are less appealing for consumption than other lemons, as they tend to have a thick rind and do not contain much juice. This lemon is ornamentally attractive.

The 'Sorrento' is native to Italy. This fruit's zest is high in lemon oils. It is the variety traditionally used in the making of *limoncello* (Italian lemon liquor).

The 'Yen Ben' is an Australasian cultivar.

1.4 Health benefits and Nutritional Information

Lemon is a great source of vitamin C and fibre, lemons contain many plant compounds, minerals, and essential oils. Lemons contain very little fat and protein. They consist mainly of carbs (10%) and water (88–89%). The carbohydrates in lemons are primarily composed of fibres and simple sugars, such as glucose, fructose, and sucrose. The main fibre in lemons is pectin. Soluble fibres like pectin can lower blood sugar levels by slowing down the digestion of sugar and starch. Dietary fibres are an important part of a healthy diet and linked to numerous health benefits. It also rich in following vitamins and minerals.

- **Vitamin C.** An essential vitamin and antioxidant, vitamin C is important for immune function and skin health.
- **Potassium.** A diet high in potassium can lower blood pressure levels and have positive effects on heart health.

- **Vitamin B6.** A group of related vitamins, B6 is involved in converting food into energy.

The carbohydrates in lemons are primarily composed of fibers and simple sugars, such as glucose, fructose, and sucrose. The plant compounds in lemons and other citrus fruit may have beneficial effects on cancer, cardiovascular disease, and inflammation.

These are the main plant compounds in lemons:

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

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

Diosmin. An antioxidant used in some drugs that affect the circulatory system, it improves muscle tone and reduces chronic inflammation in your blood vessels.

Eriocitrin. This antioxidant is found in lemon peel and juice.

D-limonene. Found primarily in the peel, d-limonene is the main component of lemon essential oils and responsible lemons' distinct aroma. In isolation, it can relieve heartburn and stomach reflux.

Nutritional value per 100 g

Nutritional Parameters	Values	% of Daily value
Calories	29 Kcal	-
Total Fat	0.3 g	-
Saturated Fat	0 g	-

Trans Fat	0 g	-
Polyunsaturated Fat	0.1 g	-
Mono saturated Fat	0 g	-
Cholesterol	0 mg	-
Sodium	2 mg	-
Potassium	138 mg	4 % of DV
Total Carbohydrates	9.3 g	3% of DV
Dietary Fiber	2.8 g	11 % of DV
Sugars	2.5 g	-
Protein	1.1 g	-
Vitamin A	-	0.4 % of DV
Vitamin C	-	88 % of DV
Calcium	-	2 % of DV
Iron	-	3.3 % of DV

Source: USDA Nutrient Database

Constituents and Health Benefits of Citrus lemon

Lemon also have many potential health benefits. Eating lemons may lower your risk of heart disease, cancer, and kidney stones. A medium lemon provides only about 20 calories.

Health benefits:

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

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

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

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

5 Anemia prevention: Anemia is often caused by iron deficiency and most common in pre-menopausal women. Lemons contain small amounts of iron, but they are a great source of vitamin C and citric acid, which can increase the absorption of iron from other foods. It may help prevent anemia.

6. Prevention of kidney stones: The citric acid in lemons may reduce your risk of kidney stones by diluting urine and increasing its citrate content.

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

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

9. Weight loss: Lemon detox diet resulted in greater improvements in insulin resistance, body fat, BMI, body weight, and waist-hip ratio than those on the other diets.

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

1.5 Cultivation, Bearing & Post Harvest management:-

Citrus Lemon is a small evergreen tree in the family Rutaceae grown for its edible fruit which, among other things, are used in a variety of foods and drinks. The tree has a spreading, upright growth habit, few large branches and stiff thorns. The tree possesses large, oblong or oval, light green leaves and produces purple-white flowers in clusters. The lemon fruit is an ellipsoid berry surrounded by a green rind, which ripens to yellow, protecting soft yellow segmented pulp. Lemon trees can reach 3–6 m (10–20 ft.) in height and can live for many years, reaching full fruit bearing capacity in approximately 40 years. Lemon may also be referred to as bush lemon or Persian apple and likely originated from the eastern Himalaya of India.

Cultivation and Bearing:-

Lemon is a subtropical plant and the trees grow best in regions with a pronounced change in season. They will grow best at temperatures between 26–28°C (79–82°F) and are very sensitive to

cold. Trees and fruit will be damaged or killed by freezing conditions without protection. The trees will tolerate drought conditions but perform poorly in water-logged soil. Trees will grow best when planted in a well-draining sandy loam with a pH between 6.0 and 7.5. Soil must be deep enough to permit adequate root development. Lemon trees will grow best when positioned in full sunlight. Lemon trees for commercial planting are usually propagated by grafting or budding the desired variety on seedlings of other *Citrus* species, such as the sweet orange, grapefruit, mandarin orange, sour orange, or tangelo.

Newly planted trees require proper irrigation to ensure they become established. During the first year, water should be applied at the base of the trunk so that the root ball is kept moist to allow the roots to establish in the soil. Newly planted trees should be provided with water every 3–7 days. The soil should be moist, but not wet. Trees planted in sandy soils will require water more frequently. Young trees will also require a light application of fertilizer every month in the first year. Lemon trees will need up around the trunk during the winter and removed in the spring. Young trees can also be protected from frosts by covering them with tarps or blankets as required.

Post-harvest management:-

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

- 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;

1.6 Processing & Value Addition:-

Lemon constitutes an important fresh fruit group even though it is not eaten fresh as mandarins and oranges.

Sensitivity of lemon fruits to chilling injury makes it hard to store in the commercial cold stores. So, due to sensitivity to chilling injury and limited shelf life of lemon fruit, it becomes important to process it in the form of juice to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of juices 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 juices for availability in off-season. Fruit juices are preserved by various methods such as freezing, irradiation, heat processing and addition of chemical preservatives.

Food fortification is the process of adding micronutrients (essential trace elements and vitamins) to food. It can be carried out by food manufacturers, or by governments as a public health policy which aims to reduce the number of people with dietary deficiencies within a population. Food fortification has a long history of use in industrialized countries for the Successful control of deficiencies of vitamins A and D,

several B vitamins (thiamine, riboflavin and niacin), calcium, iodine and iron. In the less industrialized countries, fortification has become an increasingly attractive option in recent years, so much so that planned programmers have moved forward to the implementation phase more rapidly than previously thought possible. Interest in micronutrient malnutrition has increased greatly over the last few years. One of the main reasons for the increased interest is the realization that micronutrient malnutrition contributes substantially to the global burden of disease. In 2000, the *World Health Report*1 identified calcium, iodine, iron, and vitamin A and zinc deficiencies as being among the world's most serious health risk factors.

Concern for the prevention of osteoporosis has led to an increase in food fortification with calcium in World. Increased awareness of the importance of calcium (Ca) for bone health throughout life has led to an increase in the number and types of Ca supplements and to Ca fortification of foods. Different calcium sources for fortification have advantages in terms of cost, calcium content, convenience, and their taste compatibility with foods. Calcium is a key mineral in the human body, necessary for normal growth and development of the skeleton as well as for teeth, nerve, muscle and enzyme functions. As the body's calcium absorption capabilities reduce with age, it is vital for the ageing to have a sufficient calcium intake. There are several options to avoid calcium deficiency by increasing the daily calcium intake.

Health benefits of Calcium:

- Essential for development, growth and maintenance of bone
- Regulate muscle contraction
- Key role in blood clotting
- Lowers blood pressure
- Improved cholesterol values
- Lower risk of colorectal adenomas, a type of non-cancerous tumor

Prevention of vitamin D deficiency and insufficiency remains an international health care priority. Rates of vitamin D deficiency and insufficiency are highest among elderly and institutionalized adults In addition, darker-pigmented persons and Asians have a higher prevalence of vitamin D insufficiency because their skin is unable to produce vitamin D3 efficiently. Vitamin D insufficiency results in secondary hyperparathyroidism and causes rickets in children and osteomalacia and osteoporosis in adults. Increasing evidence indicates that vitamin D insufficiency is associated with an increased risk of colon cancer, breast cancer, prostate cancer, and other cancers. Vitamin D is difficult to obtain from the diet because it is not naturally present in many foods. Fortification of food with Vitamin D is increasing rapidly worldwide. Marketing demand of Calcium and vitamin D fortified fruit juices is growing.

Health benefits of Vitamin D:

- Help strengthen muscles
- Help strengthen bones
- Support immune system and fight inflammation
- Help strengthen oral health
- Help prevent type 1 and typ3 diabetes
- Help treat hypertension
- Reduce risk of certain cancer

2. Model Fortified Citrus lemon juice Processing under FME Scheme

2.1 Location of the Proposed Project and Land

The entrepreneur must provide description of the proposed location, site of the project, distance from the targeted local and distant markets; and the reasons/advantages thereof i.e. in terms of raw materials availability, market accessibility, logistics support, basic infrastructure availability etc.

The ideal locations for establishment of exclusive Fortified Citrus lemon juice processing unit are in the production clusters of Citrus lemon growing states such as Gujarat. Andhra Pradesh, Madhya Pradesh, Karnataka, Orissa, Maharashtra and Uttar Pradesh where adequate quantities of surplus raw materials can be available for processing.

2.2 Installed Capacity of the Fortified Citrus lemon juice Processing Unit

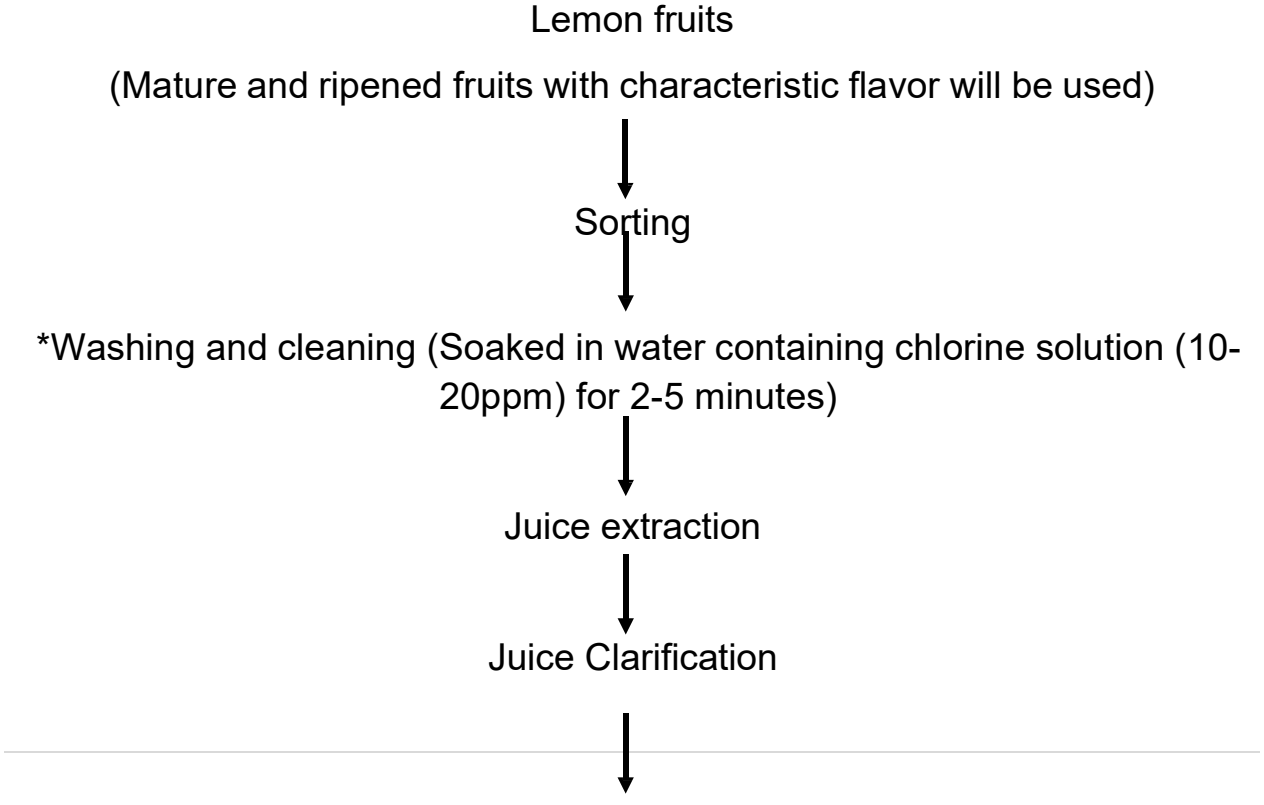
The maximum installed capacity of the Fortified Citrus lemon juice manufacturing unit in the present model project is proposed as 150 tonns/annum or 500 kg/day Fortified Citrus lemon juice. The unit is assumed to operate 300 days/annum @ 8-10 hrs/day. The 1st year is assumed to be construction/expansion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

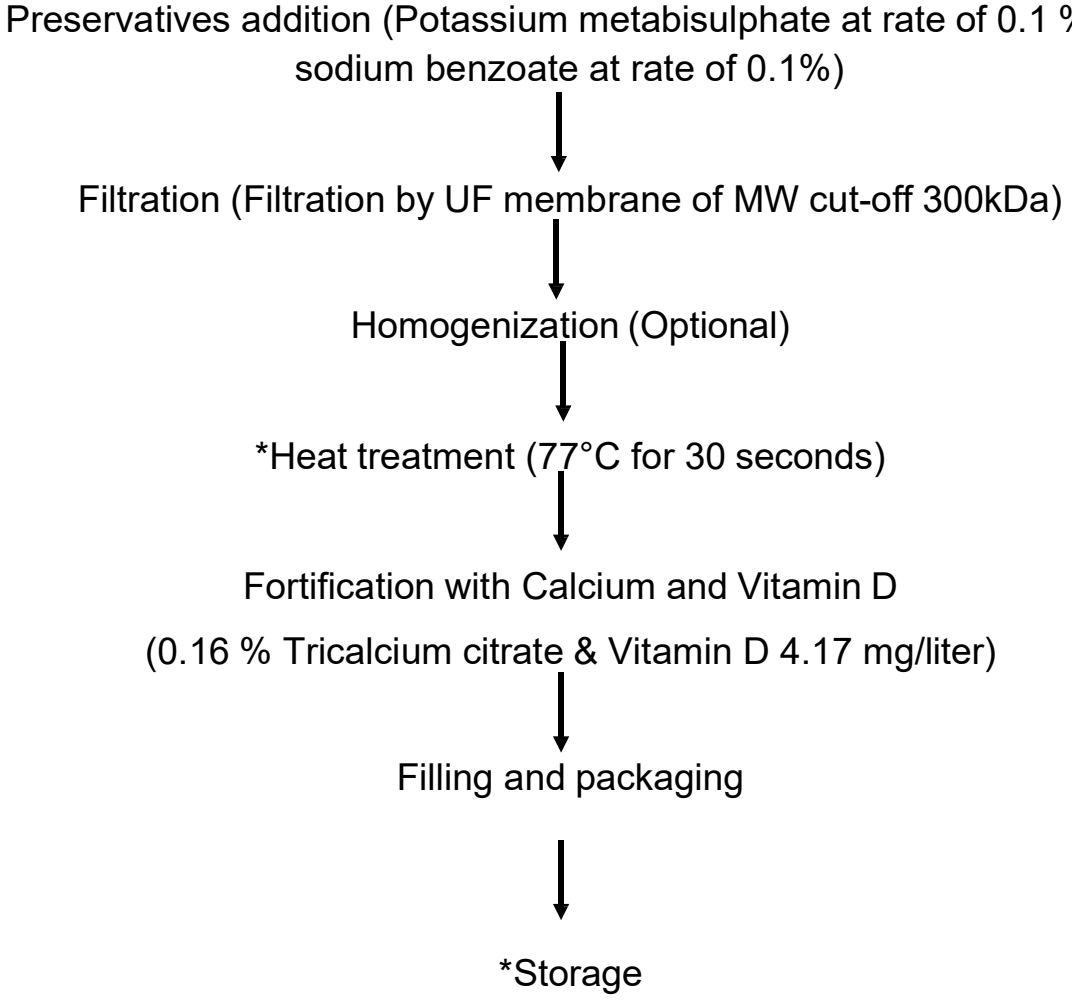
2.3 Raw Material Requirements for the Unit

A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material inventory. The processor must have linkage with producer organizations preferably FPCs through legal contract to get adequate quantity and quality of raw materials which otherwise get spoiled. In the fortified citrus lemon juice manufacturing project, the unit requires 350 kg/day, 400 kg/day and 450 kg/day raw lemon fruit at 70, 80 and 90 percent capacity utilization, respectively. The Mature lemon must be plucked from plant; and then stored below 6°C temperature.

2.4 Manufacturing process of the Fortified Citrus lemon juice

The typical Procedure for manufacturing of Fortified lemon juice is as below:





*Established Critical Control point

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

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

Juice extractor: Juice is extracted by automatic juice extractors. These extractors produces juice free of peel extractives.

Filtration: Juice is screened as soon as possible to remove insoluble solids, which contain leachable substances that may impair flavor, color and cloud stability of juice. For better juice yields, screening in paddle finishers or screw presses id done to remove coarse pulp. UF unit for clarification of lemon juice is also used. Membrane with a molecular weight cut-off of 300kDa was best suited for clarification of lemon juice.

Preservatives addition: Preservatives are added to prevent or reduce the microbial spoilage. Sulfur dioxide acts as an antimicrobial agent and also stabilize ascorbic acid and it is added in fruit juices in the form of sulfites and metabisulpfites of sodium and potassium. Potassium metabisulphate at rate of 0.1 % is added or sodium benzoate at rate of 0.1% is also added.

Pasteurization: Heat the juice to a temperature for sufficient time and to assure practical sterility as well as cloud stability by inactivating natural juice enzymes. Temperature of 77°C for 30 seconds is used. The juice is cooled immediately after pasteurization by passing through the heat exchanger.

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

2.5 Market Demand and Supply for Fortified Citrus lemon Juice

Lemon constitutes an important fresh fruit group even though it is not eaten fresh as mandarins and oranges. They usually have high acid content although acid less cultivars also exist. It is used primarily for drinks and fresh juice or lemonade, cooking and flavoring, especially in the making of lemon pies, lemon cakes, candies, jams and marmalades, and also for medicinal purposes due to its high content of vitamins.

Lemon Fruits and peel were processed into various value added products like lemon Squash, lemon salt pickle, lemon sweet pickle, lemon sweet pickle without oil, lemon candied peel, lemon candied peel with chocolate, lemon candied fruit slices, lemon candied fruit slices with chocolate and lemon jelly. Lemon peel also processes into essential oil products. Due to sensitivity to chilling injury and limited shelf life of lemon fruit, it becomes important to process it in the form of juice to reduce the surplus in the market in its peak season of production. Preservation of fruit in the form of juices 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 juices for availability in off-season.

2.6 Marketing Strategy for Citrus Lemon Products

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 Citrus lemon based products.

2.7 Detailed project Assumptions

This model DPR for Fortified citrus lemon juice unit is basically prepared as a template based on certain assumptions that may vary with capacity, location, raw materials availability etc. An entrepreneur can use this model DPR format and modify as per requirement and suitability. The assumptions made in preparation of this particular DPR are given in This DPR assumes expansion of existing fruit processing unit by adding new juice manufacturing line. Therefore, land and civil

infrastructures are assumed as already available with the entrepreneurs.

- Herewith in this DPR, we have considered the assumptions as listed below in the tables of different costs, which may vary as per region, seasons and machinery designs and supplier.
    1. Citrus lemon cost considered @ Rs.7/-per kg.
    2. 1 kg Citrus lemon will produce 22% recovery.
    3. 1 Batch size is approximately 100 kg.
    4. No. of hours per day are approximately 10 hours.
    5. Batch yield is 95%

Detailed Project Assumptions		
Parameter	Assumption	
Capacity of the Fortified Citrus Lemon Juice Unit	150	MT/annum
Utilization of capacity	1st Year Implementation, 70% in second, 80% in third and 90% in fourth year onwards	
Working days per year	300	days
Working hours per day	10	hours
Interest on term and working capital loan	12	
Repayment period	Seven year with one year grace period is considered.	
Average prices of raw material	Rs. 7 per Kg	
Average sale prices of Fortified Citrus lemon juice/kg	200	Rs/kg
Pulp extraction	22	
Pulp processing	4.54 Kg Citrus lemon Fruit /Kg Fortified Citrus lemon juice	

2.8 Fixed Capital Investment

2.8.1 Machinery and Equipment

Sr No.	Equipment	Capacity	Quantity	Price (Rs. In Lacs)
1	Cold store sq. meter	1500 kgs	1	4.5
2	Lemon Washing Tank with conveyor	100 kg/hr	1	2.7
3	Fruit juice Extractor	continuous	1	2.2
4	Filter press	100 kg/hr	1	0.8
5	Inline Homogenizer	100 kg/batch	1	1.8
6	Gas fired Kettle-200 Ltr	100 kg/hr	1	1.8
7	Juice storage tank (Insulated)	continuous	1	1.5
8	Bottling line	0 to 30 Kg/hr	1	1.45
9	Weighing balance	suitable	1	0.2
10	Accessories	suitable	1	0.9
12	Contingency	Standard	1	0.9
13	Water + Power			3
14	Fixed Assets			0.9
15	Pre-operative cost			0.9
				23..55

2.8.2 Other costs:-

Utilities and Fittings:-

Utilities and Fittings		
1.	Water	Rs. 3 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 Lac.

So total startup cost at own land & Premise may be somewhat similar to 34.04 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 (70%-70 MT)	Year 3(80%-80MT)	Year 4 (90%-90 MT)
Raw material stock	7 days	1.25	1.42	1.83
Work in progress	15 days	5.79	6.62	8.51
Packing material	15 days	1.35	1.54	1.98
Finished goods' stock	15 days	4.58	5.23	6.73
Receivables	30 days	9.16	10.47	13.46
Working expenses	30 days	1.12	1.28	1.65
Total current assets		23.25	26.57	34.16
Trade creditors		0.00	0.00	0.00
Working capital gap		23.25	26.57	34.16
Margin money (25%)		5.81	6.64	8.54
Bank finance		17.44	19.93	25.62

2.10 Total project Cost and Means of Finances

Particulars	Amount in Lakhs
i. Land and building (20 x 32 x 12 ft - LxBxH)	4.44
ii. Plant and machinery	23.55
iii. Utilities & Fittings	3
iv. Other Fixed assets	0.9
v. Pre-operative expenses	0.90
vi. Contingencies	1.00
vii. Working capital margin	0.25
Total project cost (i to vii)	34.04
Net Sale per Day in Lacs	0.20
Net Profit Per Annum @300 working days	203.83
Payback Period	Less than 1 year

2.11 Manpower Requirements

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

2.12 Expenditure, Revenue and Profitability Analysis

	Particulars	1st Year	2nd Year	3rd Year	4 th Year	5th year	6th year
A	Total Installed Capacity (MT)	45 MT Lemon/Annum	105	120	135	135	135
	Capacity utilization (%)	Under Const.	70%	80%	90%	90%	90%
B	**Expenditure (Rs. in Lakh)**	0					
	Raw Lemon(Av. Price @ Rs. 7/Kg)	0.00	7.34	8.39	9.44	9.44	9.44
	Other ingredients	0.00	0.10	0.11	0.13	0.13	0.13
	Packaging materials (Rs 18 per Kg)	0.00	18.90	21.60	24.30	24.30	24.30
	Utilities (Electricity, Fuel)	0.00	1.65	1.88	2.12	2.12	2.12
	Salaries (1st yr only manager's salary)	2.16	7.28	7.28	7.28	7.28	7.28
	Repair & maintenance	0.00	0.70	0.80	0.90	0.90	0.90
	Insurance	0.30	0.30	0.30	0.30	0.30	0.30
	Miscellaneous expenses	0.50	2.30	2.30	2.30	2.30	2.30
	Total Expenditure	**2.96**	**38.57**	**42.67**	**46.77**	**46.77**	**46.77**
C	**Total Sales Revenue (Rs. in Lakh)**	**0.00**	**210.00**	**240.00**	**270.00**	**270.00**	**270.00**
	Sale of Fortified Citrus lemon juice (Av. Sale Price @ Rs. 200/kg)	0.00	210.00	240.00	270.00	270.00	270.00
D	**PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows**	**-2.96**	**171.43**	**197.33**	**223.23**	**223.23**	**223.23**
	Depreciation on civil works @ 5% per annum	0.22	0.21	0.20	0.19	0.18	0.17
	Depreciation on machinery @ 10% per annum	2.36	2.12	1.91	1.72	1.55	1.39
	Depreciation on other fixed assets @ 15% per annum	0.59	0.50	0.42	0.36	0.31	0.26
	Interest on term loan @ 12%	1.92	1.92	1.90	1.66	1.42	1.18
	Interest on working capital @ 12%	0.00	2.09	2.39	3.07	3.07	3.07
E	Profit after depreciation and Interest (Rs. in Lakh)	**-8.04**	**166.68**	**192.90**	**219.31**	**219.78**	**220.23**
F	Tax (assumed 30%) (Rs. in Lakh)	**0.00**	**50.00**	**57.87**	**65.79**	**65.93**	**66.07**
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	**-8.04**	**116.68**	**135.03**	**153.51**	**153.85**	**154.16**
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	-3.70	65.00	74.30	83.30	83.00	82.80
I	Coverage available (Rs. in Lakh)	-3.70	65.00	74.30	83.30	83.00	82.80
J	Total Debt Outgo (Rs. in Lakh)	1.92	3.72	3.70	3.46	3.22	2.98
K	Debt Service Coverage Ratio (DSCR)	-1.93	17.47	20.08	24.08	25.78	27.79
	Average DSCR	18.88					
L	Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)	-4.88	119.50	137.56	155.78	155.88	155.98
M	Payback Period						
	(on Rs. 30 Lakhs initial investment)	2 Years					

2.13 Repayment Schedule

	Amount in Lakhs								
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	14	14	-3.7	1.92	0	1.92	14	-1.78
2	14		14	65	1.92	1.8	3.72	12	61.28
3	12		12	74.3	1.90	1.8	3.70	10	70.60
4	10		10	83.3	1.66	1.8	3.46	8	79.84
5	8		8	83	1.42	1.8	3.22	6	79.78
6	6		6	82.8	1.18	1.8	2.98	4	79.82
7	4		4	82.77	0.94	1.8	2.74	2	80.03
8	2		2	82.76	0.70	1.8	2.50	0	80.26

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	4.44	4.218	4.0071	3.806745	3.616408	3.435587	3.263808	3.100618
Depreciation	0.222	0.2109	0.200355	0.190337	0.18082	0.171779	0.16319	0.155031
Depreciated value	4.218	4.0071	3.806745	3.616408	3.435587	3.263808	3.100618	2.945587
Plant & Machinery	23.55	21.195	19.0755	17.16795	15.45116	13.90604	12.51544	11.26389
Depreciation	2.355	2.1195	1.90755	1.716795	1.545116	1.390604	1.251544	1.126389
Depreciated value	21.195	19.0755	17.16795	15.45116	13.90604	12.51544	11.26389	10.1375
Other Fixed Assets	3.9	3.315	2.81775	2.395088	2.035824	1.730451	1.470883	1.250251
Depreciation	0.585	0.49725	0.422663	0.359263	0.305374	0.259568	0.220632	0.187538
Depreciated value	3.315	2.81775	2.395088	2.035824	1.730451	1.470883	1.250251	1.062713
All Assets	31.89	28.728	25.90035	23.36978	21.10339	19.07208	17.25013	15.61476
Depreciation	3.162	2.82765	2.530568	2.266395	2.03131	1.821951	1.635366	1.468958
Depreciated value	28.728	25.90035	23.36978	21.10339	19.07208	17.25013	15.61476	14.1458

2.15 Financial Assessment of the project

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

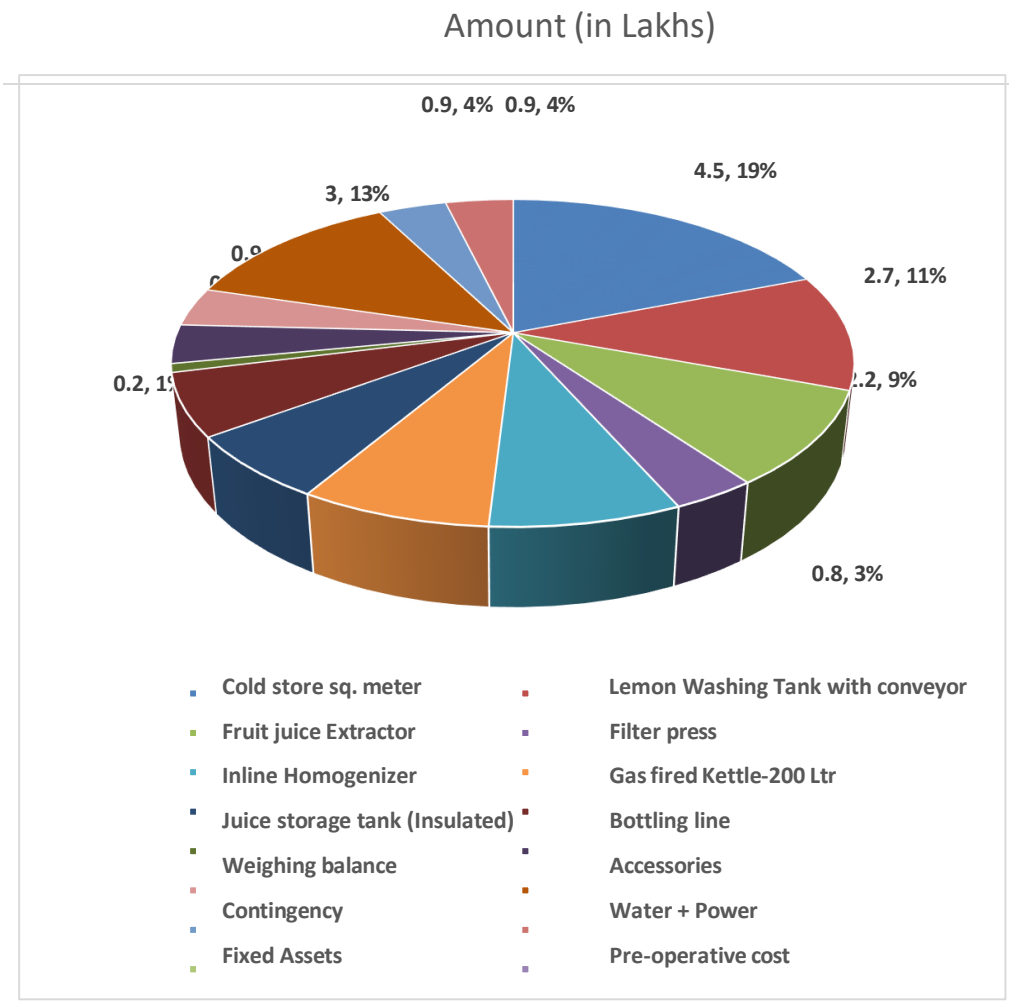
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year	
Capital cost (Rs. in Lakh)	34.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	38.57	42.67	46.77	46.77	46.77	46.77	46.77	
Total cost (Rs. in Lakh)	37.00	38.57	42.67	46.77	46.77	46.77	46.77	46.77	352.08
Benefit (Rs. in Lakh)	0.00	210.00	240.00	270.00	270.00	270.00	270.00	270.00	
Total Depreciated value of all assets (Rs. in Lakh)								14.1458	
Total benefits (Rs. in Lakh)	0.00	210.00	240.00	270.00	270.00	270.00	270.00	284.15	1814.15
Benefit-Cost Ratio (BCR): (Highly Profitable project)	5.15								
Net Present Worth (NPW): 828.34									

2.16 Break even analysis

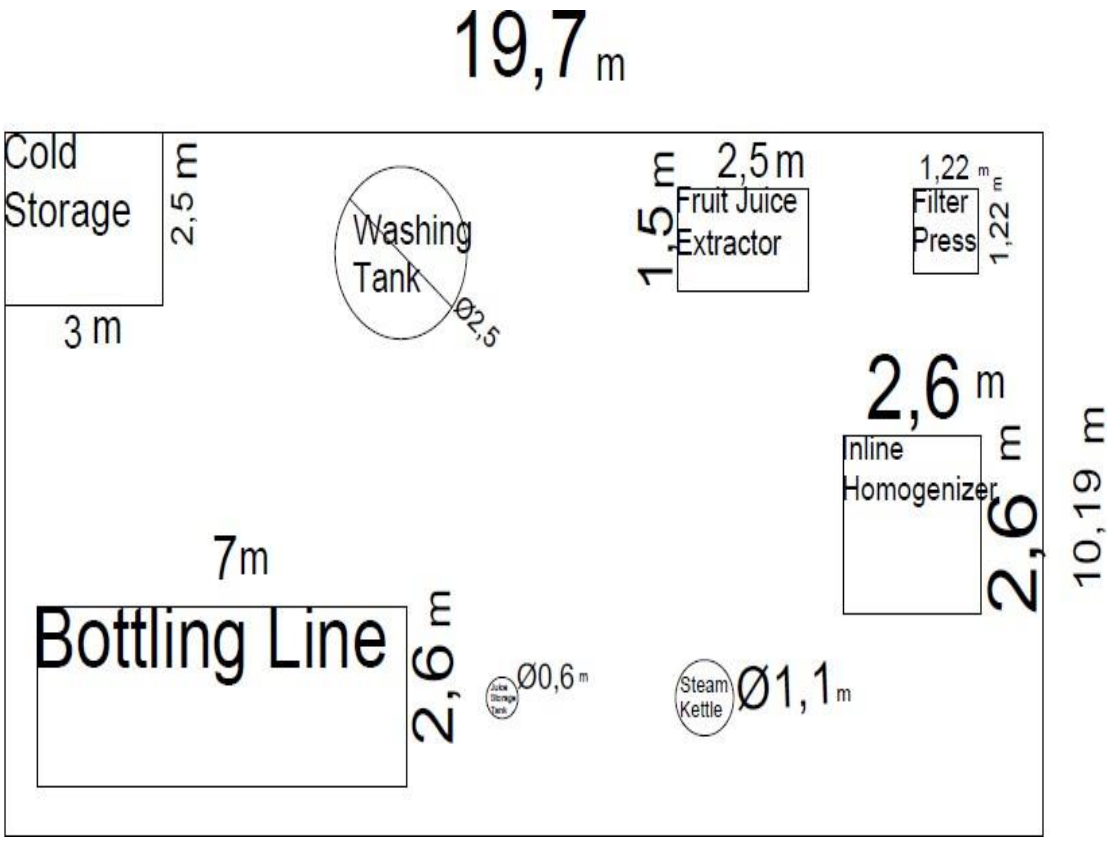
Break even analysis indicates costs-volume profit relations in the short run. This is the level at which, the firm is in no loss no profit situation.

Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Capacity utilization (%)	Under Const.	70%	80%	90%	90%	90%	90%	90%
Production MT/Annum		105	120	135	135	135	135	135
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	7.28	7.28	7.284	7.284	7.284	7.284	7.284	7.284
Depreciation on building @ 5% per annum	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.15
Depreciation on machinery @ 10% per annum	2.35	1.69	1.52	1.37	1.23	1.11	1.00	0.90
Depreciation on other fixed assets @ 15% per annum	0.58	0.39	0.33	0.28	0.24	0.20	0.17	0.14
Interest on term loan	1.92	1.92	1.90	1.66	1.42	1.18	0.94	0.70
Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Fixed Cost (Rs. in Lakh)	12.66	11.80	11.54	11.09	10.66	10.25	9.86	9.48
Sales Revenue (Rs. in Lakh)	0	210	240	270	270	270	270	270
Variable Cost (Rs. in Lakh)								
Raw lemon (Av. Price @ Rs. 7/Kg)	0	7.34	8.39	9.44	9.44	9.44	9.44	9.44
Other ingredients	0	0.10	0.11	0.12	0.12	0.12	0.12	0.12
Packaging materials	0	18.9	21.6	24.3	24.3	24.3	24.3	24.3
Casual staff salaries	0	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Utilities (Electricity, Fuel)	0	1.64	1.88	2.12	2.12	2.12	2.12	2.12
Repair & maintenance	0	0.7	0.8	0.9	0.9	0.9	0.9	0.9
Miscellaneous expenses	0.5	2	2	2	2	2	2	2
Interest on working capital @ 12%	0	2.09	2.39	3.07	3.07	3.07	3.07	3.07
Total Variable Cost (Rs. in Lakh)	0.5	38.57	42.96	47.75	47.75	47.75	47.75	47.75
Break Even Point (BEP)								
as % of sale	-	12	10	8	8	7	7	6
Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	25.2	24	21.6	21.6	18.9	18.9	16.2

2.17 Pie chart for better understanding of expenses of each head:



2.18 Typical Fortified Citrus lemon juice Manufacturing Unit Layout



2.19 Machinery Suppliers

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

1. Bajaj Process pack Limited, Noida, India 0
2. Shriyan Enterprises. Mumbai, India

3. Limitations of Model DPR & Guidelines for Entrepreneurs

3.1 Limitations of the DPR

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

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

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

3.2 Guidelines for the Entrepreneurs

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

ii. This model DPR must be made more comprehensive by the entrepreneur by including information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of entrepreneur's business, project location, raw material costing base/contract sourcing, detailed market research, comprehensive dehydrated product mix based on demand, rationale of the project for specific location, community advantage/benefit from the project, employment generation, production/availability of the raw materials/crops in the targeted area/clusters and many more relevant aspects for acceptance and approval of the competent authority.

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

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

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

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

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

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

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

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

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