

DETAILED PROJECT REPORT
KACHAI LEMON PICKLE MANUFACTURING UNIT.



INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY

Ministry of Food Processing Industries, Govt. of India

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Project At a Glance

1	Name of the Project	Kachai lemon pickle
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 (55, 65, 75,90 & 100% capacity utilization in the 2nd, 3 rd , 4 th , 5 th & 6 th years' onwards respectively
11	Raw materials	Kachai lemon
12	Major product outputs	Kachai lemon pickle
13	Total project cost (Lakhs)	43.58
	Land development, building & civil construction	5.18
	Machinery and equipment	18.63
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	15.97
14	Working capital Management (In Lakhs)	
	Second Year	47.90
	Third Year	56.60
	Fourth Year	77.19
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	9.80
	Promoter's contribution (min 20%)	12.20
	Term loan (45%)	21.56
16	Debt-equity ratio	1.76 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	73.30
	3rd year	110.48
	4th year	129.16
18	Average DSCR	2.16
	Benefit Cost Ratio	2.007
	Term Loan Payment	7 Years with 1 year grace period
	Pay Back Period for investment	2 Years

Note: All the data/contents of this DPR are taken from the available information on IIFPT site.

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

1.1 INTRODUCTION

Rough lemon (*Citrus jambhiri* Lush.) is the fruit and the tree of a citrus hybrid, like the rangpur a cross between mandarin orange and citron.

There are several cultivars of rough lemon that can serve as a citrus rootstock, including 'Florida', 'Schaub', and 'Vangassay' rough lemon.

Rough lemon is a cold-hardy citrus and can grow into a large tree.

Kachai Lemon (*Citrus jambheri* Lush.) of Manipur is an exotic horticultural fruit from Northeast India which has been accorded Geographical Indication (GI) registration tag. Popularly known as Kachai Champra (Lemon), it is widely grown in the Kachai village in Ukhrul District, Manipur.

Kachai Lemon (*Citrus jambheri* Lush.) of Manipur is an exotic horticultural fruit from Northeast India which has been accorded Geographical Indication (GI) registration tag. Popularly known as Kachai Champra (Lemon), it is widely grown in the Kachai village in Ukhrul District, Manipur. Unlike the other lemon varieties grown in other part of world, Kachai Lemon is considered to be unique as it contains 45-51 mg/100 ml ascorbic acid, the highest so far available in the realm of citrus while other lemon varieties have only 45-51 ascorbic acid mg/100 ml of juice. The juice content is 36-56 ml per fruit. The fruit bearing plans of Kachai Lemon look like flowering trees during harvesting time.

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ascorbic acid mg/100 ml of juice. The juice content is 36-56 ml per fruit. The fruit bearing plants of Kachai Lemon look like flowering trees during harvesting time.

An introduced species originally from sub-tropical Asia, widely cultivated in Australia and now naturalized in NEQ. Altitudinal range from near sea level to 800 m. usually grows in disturbed areas, around old camp sites, on farmland and in rain forest regrowth

1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF KACHAI LEMON

Citrus jambhiri Lush, commonly known as *Jambīra Nimbū* in *Sanskrit* is medium to large indigenous tree with spreading habit, less spiny than lemon and belonging to the family *Rutaceae*.

Lemons and limes are cultivated under all Mediterranean, sub-tropical and inter-tropical climates worldwide. With 15 Mt produced, limes and lemons represent the third largest citrus horticultural group (FAO, 2014). Nearly 1.6 Mt of lemons and limes are traded, ranking them 11th worldwide. Lemons and limes are sold both as fresh fruit and as processed products. After expanding up to 2007, the lemon market is currently stagnating and is in direct competition with the market for limes, whose consumption has increased dramatically since the 1980s (Duportal *et al.*, 2013). Only a few cultivars are cultivated worldwide for the production of fresh fruit and essential oils or for use as rootstock, even though significant diversity exists in this horticultural group.

Citrus fruits and their relatives originated in South-east Asia, New Caledonia and Australia (Swingle and Reece, 1967). The genus *Citrus* L., which includes limes and lemons, has been cultivated in tropical and temperate parts of

the world for >2000 years. In the classification of Swingle and Reece (1967) lemons and limes are classified as two separate species, *Citrus limon* (L.) Burm. F. and *C. aurantifolia* (Christm.) Swing. In the classification of Tanaka (1954), limes and lemons are classified as 37 species. These conflicting classifications result from the total sexual compatibility between *Citrus* species and the frequent occurrence of apomixis due to nucellar polyembryony (Scora, 1975; Barrett and Rhodes, 1976), which led many taxonomists to consider interspecific hybrids fixed by apomixis or vegetative propagation (cuttings or grafting) as new species.

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.

Kachai lemon (Manipur) awarded Geographical Indicator (GI) tag owing to its unique taste and flavor of the fruit. The fruit will be available from January to March every year.

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 KACHAI 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:-

Fruit medium in size, of highly variable form but usually oblate to elliptic-oblong; commonly with irregularly furrowed or lobed basal collar or neck; usually with broad apical nipple surrounded by a deep irregular areolar furrow. Rind medium-thick; surface typically deeply pitted, and rough or bumpy, sometimes ribbed; easily separable; color lemon-yellow to brownish-orange. Segments about 10; axis large and hollow. Flesh color light yellow to pale orange; medium juicy; flavor moderately acid. Seeds numerous, small, highly polyembryonic, and cotyledons faintly green. Tree vigorous and large, upright-spreading, with numerous small thorns; leaves medium-small, blunt-pointed, and light green. Flowers small and mandarin-like, purple-tinged, and produced more or less throughout year, but mainly in spring and late summer. New shoot growth faintly purple-tinted. Sensitivity to cold about like that of true lemons.

This species exhibits a remarkable range of variation in fruit characters, and in India, where it is native, four relatively distinct types are recognized, one of which is similar to the form obtained from Italy known as *C. volckameriana*. There is also a sweet-fleshed form. Presumably native to northeastern India, where it still grows wild, the rough lemon seems to have been taken to southeast Africa by the Portuguese toward the end of the fifteenth or early sixteenth century and thence to Europe.

Although used to some extent as a lemon substitute, for which it is not very suitable, the rough lemon is highly important as a rootstock in many parts of the world—notably India, South Africa, Australia, Argentina, Brazil, and Florida. In the last two mentioned countries, selections have recently been named—Estes and Milam—which exhibit resistance to the burrowing nematode. While resemblances to the lemon are fairly obvious, the differences are greater, and many of its characters are clearly those of the Rangpur or mandarin. "

Cultivation and Bearing:-

Citrus fruits in India are cultivated under varied agro-ecological conditions right from arid and semiarid areas of southwest region to humid tropical climate of northeast India. Citrus trees are evergreen, grown in truly subtropical climates of the world although in tropical regions of the world they tend to produce cyclic growth flushes and hence regulating cropping in tropical areas for forcing them into concentrated bloom needs judicious management of water deficit stress according to soil type and growing season. Citrus fruits grow best between a temperature range of 13°C to 37°C. Temperatures below – 4 °C are harmful for the young plants. Soil temperature around 25°C seems to be optimum for root growth. High humidity favours spread of many diseases. Frost is highly injurious. Hot wind during summer results in desiccation and drop of flowers and developing fruits. Barring these limitations citrus is grown in all subtropical and tropical areas of the world. The subtropical climate is best suited for citrus growth and development. Khasi and Darjeeling mandarins are grown in high altitudes upto 2000 m as it is adapted to a cooler climate.

Citrus plants are grown in a wide range of soils ranging from sandy loam or alluvial soils of north India to clay loam or deep clay loam or lateritic/acidic soils in the Deccan plateau and north-eastern hills. Citrus orchards flourish well in light soils with good drainage properties. Deep soils with pH range of 5.5 to 7.5 are considered ideal. However, they can also be grown in a pH range of 4.0 to 9.0. High calcium carbonate concentration in feeder root zone may adversely affect the growth.

Land needs to be thoroughly ploughed and levelled. In hilly areas, planting is done on terraces against the slopes and on such lands, high density planting is possible as more aerial space is available than in flat lands. Since citrus trees are highly sensitive to water logging and water stagnation during rainy season providing drainage channels of 3-4 feet depth along the slopes around the orchard is essential.

Citrus requires critical stage watering in the initial year. It further reduces fruit drop and increases the fruit size. Diseases like root rot and collar rot occur in flooded conditions. Light irrigation with high frequency is beneficial. Irrigation water containing more than 1000 ppm salts is injurious. Quantity of water and frequency of irrigation depends on the soil texture and growth stage. Micro irrigation systems not only saves water and nutrients but also ensure good retention of fruits during crucial stages of crop growth in March – April even in situations where water is not a limitation.

There are two main crops in mandarins and sweet oranges. One is called as Ambiabahar (mango flowering) the flowering of which occurs in the month of January (at the time of flowering of mango hence the name Ambia) the fruits of which are available in the months of October-December The other crop is Mrigbahar (Monsoon bloom) the flowering of which occurs in the month of June-July and the fruits are harvested during February-April. Mandarins and sweet oranges normally take 240- 280 days to arrive at maturity. Mature fruits at colour break stage are picked up in 2 - 3 intervals of 10-15 days. Limes and lemons take 150-160 days for maturity. There may be 2 or 3 crops in a year in limes and lemons

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:-

Value added products from Kachai lemon:

Kachai Lemon is a high yielding landrace with high economic value. It is consumed as fresh fruit and also used for making juice and pickles.

The best ways of consumption are as fresh fruit or fresh squeezed juice. Citrus fruits are well known for their vitamin C content and are also good sources of vitamin A, folic acid and dietary fibre. Fresh citrus fruits can be stored for several days at room temperature or for several weeks in the refrigerator. Fresh- squeezed juice should be stored in the refrigerator and is stable at refrigerator temperature for several weeks from a nutritional standpoint.

Different value added products can be prepared from Kachai Lemon. The major products are juice, squash, RTS beverage and pickle. ICAR Research Complex for NEH Region, Manipur Centre has standardized a commercially viable technology of converting Kachai Lemon juice into powder. In addition, ascorbic acid and pectin can be extracted from juice and peel respectively.

Pickling is one of the oldest and most successful methods of food preservation known to humans. It is difficult to suggest a date for production of the first pickled foods, but it is known that both vinegar and spices were being used during biblical times. Pickles of various kinds are known throughout India and many parts of the world. They are good appetizers and add to the palatability of a meal. Fermentation of plant and animal foods was known to the early Egyptians, and fish were preserved by brining in prehistoric times. By the third century BC, Chinese labourers were recorded to be consuming acid-fermented vegetables while working on the Great Wall. The Koreans created *kimchi* from acid-fermented Chinese cabbage, radish, and other ingredients centuries ago. Corn, cassava and sorghum were fermented and became staples of the African diet. In the west, acid fermentation of cabbage and cucumbers produced sauerkraut and pickles, which are still popular today. Early explorers carried kegs of sauerkraut and pickles that prevented scurvy on their voyages. Pickles from India or *achaar* are unique because these are mixed with spices that only India produces. Some common Indian spices include cumin, mustard seeds, fenugreek, turmeric, coriander, etc. Some of the typical Indian pickles made from mango (*aam ka achaar*), lime (*nimbu ka achaar*), turnip, cabbage, cauliflower, etc. have become popular in several countries.

There are mainly two methods of preserving fruits and vegetables namely

- (i) by killing all the microorganisms responsible for spoilage, by heat or other means and then checking the entry of fresh microorganisms into the preserved product, and
- (ii) by making the conditions most unfavorable for the growth and multiplication of microorganisms. The first method is generally employed in the preservation of fruits and vegetables for making fruit juices, fruit powders, etc. and the second method in the preparation of pickles. The process of preservation of food in common salt or vinegar is called as pickling. Spices and edible oils also may be added to the product. Salt, vinegar, lactic acid and oil are the important ingredients used in pickle production. These substances when used in sufficient quantities, act as preservatives either singly or in combination. The preservative action of these substances are given below:

Salt

Vegetables do not ferment when they are covered with strong brine or packed with a fairly large quantity of salt. Spoilage is prevented by adding sufficient common salt, bringing its final concentration in the material from 15 to 20 percent. At this high salt concentration, mould and even lactic acid-forming bacteria do not grow. This method of preservation is only applicable to vegetables which contain very little sugar because sufficient lactic acid cannot be formed by fermentation to act as preservative.

Vinegar

In vinegar pickles, vinegar acts as a preservative. In order to ensure satisfactory results, the final concentration of acid as acetic acid, in the finished product should not be less than 2 percent. To avoid dilution of the vinegar by the water liberated from the tissues, the vegetables are generally placed in strong vinegar of about 10 percent acidity for several days before final packing. This treatment also helps to expel the gases present in the intercellular spaces of the vegetable tissue.

Lactic acid

Bacteria prefer for their growth media with little or no acid. The lactic acid bacteria, however, can grow in acid media and can also produce acid through their action on the substrate. They can grow in the presence of 8 - 10 percent salt. The growth of undesirable organisms is inhibited by adding salt while allowing the lactic fermentation to proceed. In fermented pickles, microorganisms ferment sugars to lactic acid. When vegetables are placed in brine, the soluble material present in them diffuses into the salt water owing to osmosis and the liquid penetrates into the tissues. The soluble material, besides containing mineral matter, contains fermentable sugars. These sugars serve as food for lactic acid bacteria, which convert them into lactic and other volatile acids.

Oil

In oil-based pickles, fruits or vegetables are completely immersed in the edible oil. It acts as a barrier for air and creates an anaerobic condition which is utilized by the native bacteria for the production of lactic acid. Oil prevents growth of spoilage yeasts and moulds. Generally mustard oil is used.

Depending on the method of preparation, pickles can be classified into three types such as pickles in vinegar, pickles in citrus juice or brine and pickles in oil. Fruit pickles are generally preserved in sweetened and spiced vinegar, while vegetable pickles are preserved in salt.

Pickles in vinegar

These are most important pickles in the world.

Pickles in citrus juice or brine

Steeping of the vegetable in a salt solution of pre-determined concentration for a certain length of time is called brining. Vegetables which do not contain sufficient water are better fermented by covering them with a weak brine solution. Alternately, dry salt is also used for

vegetables which contain sufficient water content. It involves packing vegetables with a small quantity of dry salt (about 2-3 kg for every 100 kg) without adding water. Salt extracts the water from the vegetables owing to osmosis and forms the brine. The sugars present in the vegetables are extracted into the water and are fermented by the lactic-acid forming bacteria which are naturally present in great numbers on the surface of the fresh material. After certain time, enough lactic acid is formed to kill the bacteria and prevent any further change in the material, provided certain precautions are taken to prevent the growth of moulds. The lactic acid permeates to the fermented vegetables and gives characteristic flavour. It is the same acid which is present in sour milk and it is digested and utilized by the body as a source of energy. *Leuconostoc mesenteroides* was identified as one of the most important microorganisms for initiation of vegetable fermentation.

Pickles in oil

These are pickles containing some edible oil and are highly popular in India. Usually oil pickles are highly spiced. Cauliflower, lime, mango, turnip pickles, etc are prepared in this manner. The method of preparation of some of the oil pickles vary in different parts of the country. In north India, rapeseed or mustard oil is commonly used, but in south, gingelly (sesame) or groundnut oil is preferred.

Desired Quality of Ingredients Used in Pickling

Raw materials used in pickling should possess certain definite characteristics for achieving a wholesome pickle. The desired qualities of ingredients used in pickling are given as follows:

Salt

In general, pure common salt is generally preferred for pickling. It should not contain more than 1.0% percent of impurities, should not contain chemicals like tricalcium phosphate or magnesium phosphate which are generally added to salt as anticaking agents. Salt should be free from lime (calcium oxide), as it reduces the acidity of the vinegar in which brine vegetables are pickled and also causes lime deposits of the bottom of the container. Salt should be free from iron, which in contact with the tannin of the fruit, vegetable and spice

produces blackening of the pickle. It should not contain magnesium salts which impart a bitter taste to the pickle.

Vinegar

Vinegar of good quality should contain at least 4 percent acetic acid. Usually malt or cider vinegar is used. Vinegars of low acid content or imitation or synthetic vinegars are not suitable for pickling. Vinegar should not come in contact with iron as it leads to blackening of the pickle.

Oil

Good quality oil free from rancidity or oxidation is preferred. Vegetable oil is added to the pickle. It is often mixed with the spices to make a paste. Oil is also poured onto the top of pickles to form a barrier against oxygen. Top quality vegetable oil should be used.

Sugar

Sugar used in the preparation of sweet pickles should be of high quality.

Spices

Spices are added practically to all pickles, the quantity added depending upon the kind of fruit or vegetable taken and the kind of flavour desired. The spices generally used are bay leaves, cardamom, chillies, cinnamon, clove, coriander, ginger, mustard, black pepper, cumin, turmeric, garlic, mint, fennel, etc. These should be of good quality and should be stored in tin cans in a cool and dry place.

Spices used should be good quality, clean and free of mould and insects. They are either roasted or fried before adding to the pickle mixture. The amount and type of spices added depends on personal taste.

Water

Only potable water should be used for the preparation of brine. Hard water contains salts of calcium, sodium, magnesium, etc. which interfere with the normal salt-curing of the

vegetable. If hard water is to be used, a small quantity of vinegar should be added to brine to neutralize its alkalinity. Iron should not be present in the water in any appreciable quantity as it causes the blackening of the pickle.

Good quality lime are selected for making lime pickle and washed thoroughly before use. The cleaned lime fruits are sliced and cut into four pieces. About one-fourth of the cut lime fruit pieces are squeezed to extract juice. Later, the remaining lime pieces are mixed with selected spices, salt and extracted lime juice. Spices such as turmeric, red chilli powder, cardamom, cumin, aniseed, black pepper, etc. are used. The mixture is filled into clean glass or glazed jars kept usually in sunlight for about a week. During this period the useful biochemical changes takes places. At the end of one week, selected edible oil which is previously heated and cooled is mixed with the mixture and stored.

2. MODEL KACHAI LEMON PICKLE 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 major kachai lemon producing regions are North-east region of India, mainly Manipur and parts of Mizoram, Nagaland.

2.2 INSTALLED CAPACITY OF THE KACHAI LEMON PICKLE PROCESSING UNIT

The maximum installed capacity of the Kachai lemon pickle manufacturing unit in the present model project is proposed as 150 tonns/annum or 500 kg/day Kachai lemon pickle. 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 90 percent capacity & 6th year onwards 100 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 Kachai lemon pickle manufacturing project,

the unit requires 1039.5 kg/day, 1228.5 kg/day, 1417.5 kg/day, 1701 Kg/day & 1890 kg/day Kachai lemon at 55, 65, 75, 90 & 100 percent capacity utilization, respectively.

2.4 MANUFACTURING PROCESS OF THE KACHAI LEMON PICKLE

Method 1: Ingredients for making Kachai Lime pickle

Place of origin/usage: Manipur.

Nature of food: Vegetable based.

Time of consumption: Dietary supplement.

Usual composition/ingredients: Kachai Lime 1.5kg, salt 375g, coriander seeds 12g, cumin seeds 9g, fenugreek seeds 15g, red chilly powder 12g and turmeric powder 2 g.

Method of preparation: Fully ripe lime were selected and washed well and cut into 4 slits. Coriander, fenugreek and cumin seeds were roasted and powdered. Salt, red chilli powder, turmeric and roasted spice powder were added to the like pieces and pickle was placed in pet jar and allowed to cure for one week.

Procedure

1. Select ripe but not over-ripe limes with dark yellow skins and no sign of bruising or mould growth.
2. Wash the limes in clean water and dip in hot water (60-65°C) for about 5 minutes to soften the skin.
3. Cut each lime into four pieces and dip into a saturated salt solution for 20-30 minutes. Alternatively, pack the limes and salt in layers (1kg salt per 5kg limes) in a sealed jar, ensuring that the surface is covered with juice. Ferment the packed limes for 24 hours. It may be necessary to press the fruits down to hold them under the surface of the liquid.

4. Dry in the sun for 2-3 days. Sometimes salt crystals are sprinkled on the limes while they are drying. Drying is continued until the skin becomes brown and the pieces are soft and breakable.
5. Roast the fenugreek seeds until they splutter. Grind all the seeds together and add to the limes.
6. Fill into pots or glass jars and seal.
7. Store in a cool place away from direct sunlight. Store for one month to allow fermentation to take place.
8. Re-pack in sterilised glass jars or polythene bags, ensuring that no air bubbles are trapped in the pickle. Pour a thin layer of oil onto the surface of the pickle.
9. Store in a cool place away from sunlight.

Method 2: Ingredients for making Kachai Dry salted lime pickle

Place of origin/usage: Manipur.

Nature of food: Vegetable based.

Time of consumption: Dietary supplement.

Method of preparation: Limes are placed in a layer, approximately 2.5 cm deep, into the fermenting container (a barrel or keg). One kilogram of salt is added for every four kilograms of limes. The salt is sprinkled over the vegetables. Another layer of vegetables is added and more salt added. This is repeated until the container is three quarters full. A cloth is placed above the vegetables and a weight added to compress the vegetables and assist in the formation of brine. The formation of brine takes about 24 hours. The container is then placed in the sun for a week. As soon as the brine is formed, fermentation starts. As fermentation starts, bubbles of carbon dioxide appear. Fermentation takes between one and four weeks depending on the ambient temperature. Fermentation is complete when no more bubbles appear.

2.5 MARKET DEMAND AND SUPPLY FOR KACHAI LEMON PICKLE

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.

Pickles are fairly safe products for small-scale manufacturers to make. Some of the processed products are whole dried form, ground or powdered form, crushed, paste, sauce, chutney, oleoresin, essential oil, pickles, in oil or brine, etc.

When preserved properly they carry a low risk of food poisoning and have a long shelf life. Pickles can be made using relatively simple equipment that is readily available in most places. Pickles can be prepared from a variety of fruits and

vegetables depending on what is available. By varying the proportions of fruit and vegetables and the amount of spice added, a range of products can easily be made.

2.6 MARKETING STRATEGY FOR KACHAI LEMON PICKLE

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 kachai lemon products.

2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for Kachai lemon pickle 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 pickle processing 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. Kachai lemon cost considered @ Rs.20/-per kg.
 2. 1 kg Kachai lemon will produce 90% recovery.
 3. 1 Batch size is approximately 500 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 Kachai lemon	150	MT/annum

pickle Unit		
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	20	
Average sale prices per Kg	320	Rs/kg
Pulp extraction	90	
KACHAI LEMON PICKLE	1 Kg Kachai lemon pickle from 3.78 kg Kachai lemon fruit	

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	1	15000 Kg	10
2	Washing tank	1	500 liter	0.4
3	Blanching kettle	1	200 liter	0.6
4	Vegetable cutter	1	100 kg/Hr	0.25
5	Deseeding machine	1	Suitable	1.2

6	Juice extractor	1	Suitable	0.6
7	Brine dippink tank (SS 316 L)	1	500 liter	0.6
8	Gas operated kettle	1	80 litere/hr	0.75
9	Blending/mixing Tank	1	300 liter	1.4
10	Induction sealer	1	Suitable	0.3
11	Shrink tunnel	1	Suitable	0.35
12	Bottle filling Unit	1	400 PPH	1.5
13	Batch coding machine	1	Suitanle	0.12
14	Weighing balance	1	Suitable	0.06
15	Accessories	1	Suitable	0.5
			Total	18.63

2.8.2 OTHER COSTS:-

Utilities and Fittings:-

Utilities and Fittings	
1.Water	Rs. 0.8Lacs 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 43.58 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	5.07	5.99	8.17
Work in progress	15 days	10.13	11.98	16.33
Packing material	15 days	3.30	3.90	5.32
Finished goods' stock	15 days	14.74	17.41	23.75
Receivables	30 days	29.47	34.83	47.49
Working expenses	30 days	1.15	1.36	1.86
Total current assets		63.86	75.47	102.92
Trade creditors		0.00	0.00	0.00
Working capital gap		63.86	75.47	102.92
Margin money (25%)		15.97	18.87	25.73
Bank finance		47.90	56.60	77.19

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	18.63
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	15.97
Total project cost (i to vii)	43.58
Means Of finance	
i. Subsidy	9.80
ii. Promoters Contribution	12.20
iii. Term Loan (@10%)	21.57

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
Helper	1	5500	5500	66000
Semi-skilled	2	7600	15200	182400
Sales man	1	8000	8000	96000
			60700	728400

2.12 EXPENDITURE, REVENUE AND PROFITABILITY ANALYSIS

	Particulars	1st Year	2nd Year	3rd Year	4th Year	5th year	6th year
A	Total Installed Capacity (MT)	567 MT Kachai lemon/Annum	82.5	97.5	112.5	135	150
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	Expenditure (Rs. in Lakh)	0					
	Kachai lemon(Av. Price @ Rs. 20/Kg)	0.00	62.37	73.71	85.05	102.06	113.40
	Salt @ Rs. 3/kg	0.00	0.62	0.73	0.84	1.01	1.13
	Mustard oil @ Rs. 160/Kg	0.00	34.32	40.56	46.80	56.16	62.40
	Other materials	0.00	9.94	11.75	13.56	16.27	18.08
	Packaging materials	0.00	36.30	11.70	13.50	16.20	18.00
	Utilities (Electricity, Fuel)	0.00	0.96	1.13	1.31	1.57	1.75
	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	155.09	150.27	171.84	204.05	225.53
C	Total Sales Revenue (Rs. in Lakh)	0.00	264.00	312.00	360.00	432.00	480.00
	Sale of Kachai lemon pickle (Av. Sale Price @ Rs.320/kg)	0.00	264.00	312.00	360.00	432.00	480.00
D	PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows	-2.96	108.91	161.73	188.16	227.95	254.47
	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	1.86	1.68	1.51	1.36	1.22	1.10

	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%	2.24	2.17	2.08	1.98	1.88	1.76
	Interest on working capital @ 12%	0.00	5.75	6.79	9.26	9.26	9.26
E	Profit after depreciation and Interest (Rs. in Lakh)	-7.45	104.72	157.82	184.52	224.57	251.35
F	Tax (assumed 30%) (Rs. in Lakh)	0.00	31.41	47.35	55.36	67.37	75.41
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	-7.45	73.30	110.48	129.16	157.20	175.95
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	2.24	2.17	2.08	1.98	1.88	1.76
I	Coverage available (Rs. in Lakh)	2.24	2.17	2.08	1.98	1.88	1.76
J	Total Debt Outgo (Rs. in Lakh)	0.75	0.83	0.91	1.01	1.11	1.23
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)	-5.20	75.33	112.31	130.82	158.69	177.30
M	Payback Period	2.5 Years					
	(on Rs. 43.58 Lakhs initial investment)						

2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	2,156,977.26	299,214.12	224,325.63	74,888.49	2,082,088.77
2	2,082,088.77	299,214.12	216,537.23	82,676.89	1,999,411.88
3	1,999,411.88	299,214.12	207,938.84	91,275.29	1,908,136.59
4	1,908,136.59	299,214.12	198,446.21	100,767.92	1,807,368.67
5	1,807,368.67	299,214.12	187,966.34	111,247.78	1,696,120.89

6	1,696,120.89	299,214.12	176,396.57	122,817.55	1,573,303.34
7	1,573,303.34	299,214.12	163,623.55	135,590.57	1,437,712.77
8	1,437,712.77	299,214.12	149,522.13	149,691.99	1,288,020.78
9	1,288,020.78	299,214.12	133,954.16	165,259.96	1,122,760.82
10	1,122,760.82	299,214.12	116,767.12	182,447.00	940,313.82
11	940,313.82	299,214.12	97,792.64	201,421.49	738,892.33
12	738,892.33	299,214.12	76,844.80	222,369.32	516,523.01
13	516,523.01	299,214.12	53,718.39	245,495.73	271,027.28
14	271,027.28	299,214.12	28,186.84	271,027.28	(0.00)
		4,188,997.71	2,032,020.45	2,156,977.26	(2,156,977.26)

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	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	18.63	16.77	15.09	13.58	12.22	11.00	9.90	8.91
Depreciation	1.86	1.68	1.51	1.36	1.22	1.10	0.99	0.89
Depreciated value	16.77	15.09	13.58	12.22	11.00	9.90	8.91	8.02

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	24.61	22.37	20.34	18.51	16.86	15.36	14.01	12.78
Depreciation	2.24	2.02	1.83	1.65	1.50	1.35	1.23	1.11
Depreciated value	22.37	20.34	18.51	16.86	15.36	14.01	12.78	11.67

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)	43.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	155.09	150.27	171.84	204.05	225.53	225.53	225.53	
Total cost (Rs. in Lakh)	46.54	155.09	150.27	171.84	204.05	225.53	225.53	225.53	1404.38
Benefit (Rs. in Lakh)	0.00	264.00	312.00	360.00	432.00	480.00	480.00	480.00	
Total Depreciated value of all assets (Rs. in Lakh)								11.67	
Total benefits (Rs. in Lakh)	0.00	264.00	312.00	360.00	432.00	480.00	480.00	491.67	2819.67
Benefit-Cost Ratio (BCR): (Highly Profitable project)	2.008								
Net Present Worth (NPW):	1415.29								

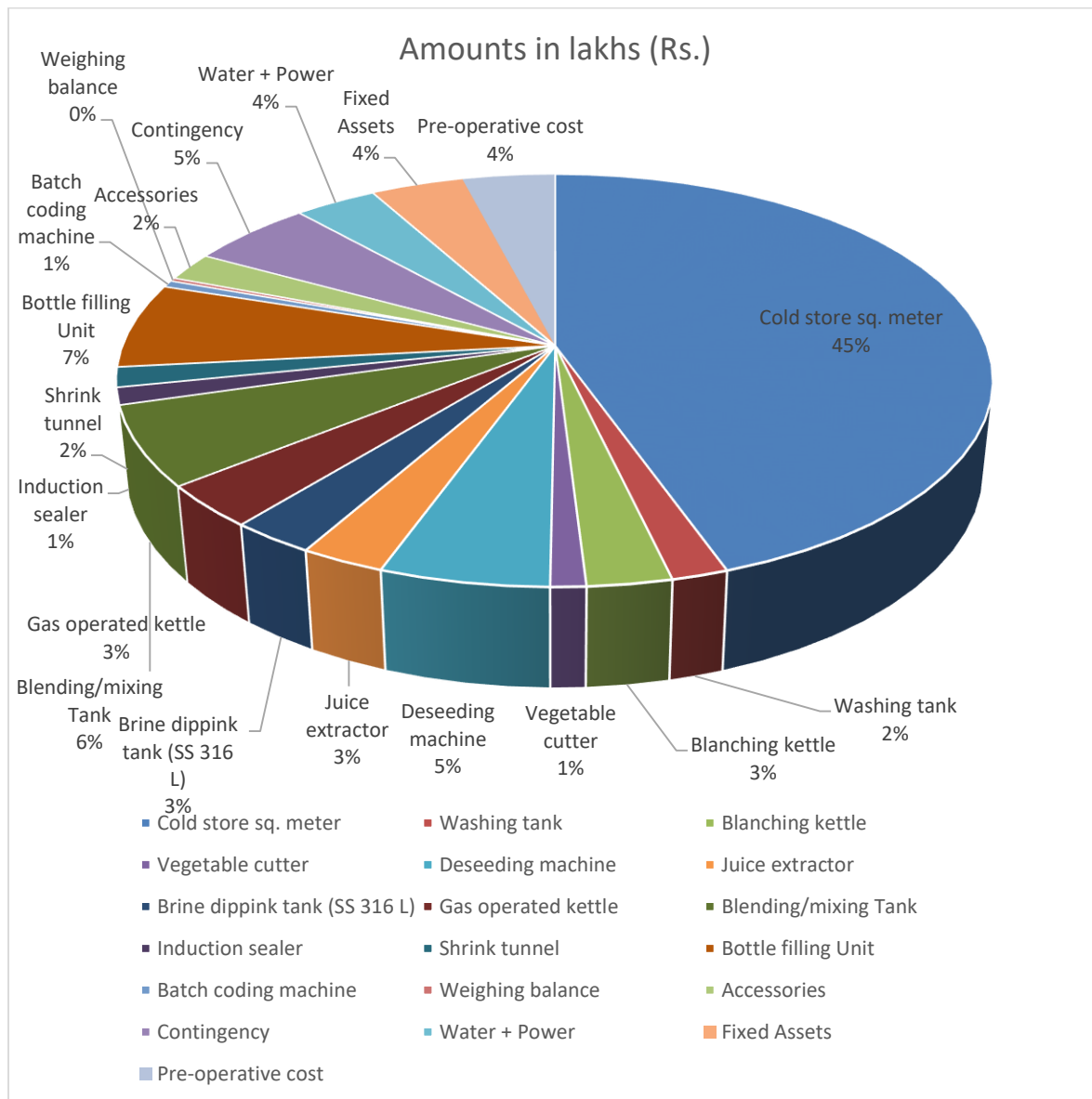
2.16 BREAK EVEN ANALYSIS

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.

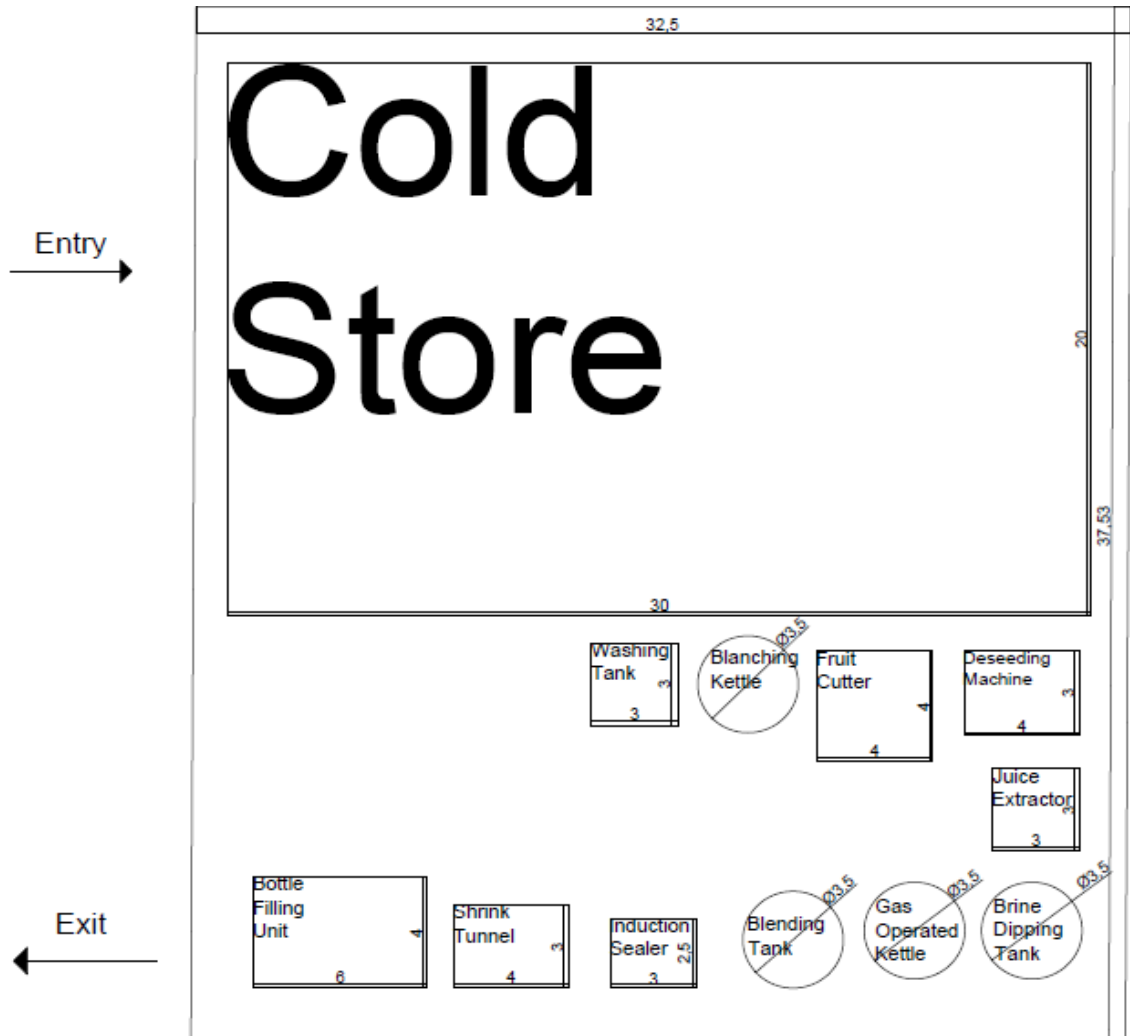
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
Production MT/Annum		82.5	97.5	112.5	135	150	150	150
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	7.284	7.284	7.284	7.284	7.284	7.284	7.284	7.284
Depreciation on building @ 5% per annum	0.26	0.25	0.23	0.22	0.21	0.20	0.19	0.18
Depreciation on machinery @ 10% per annum	1.86	1.68	1.51	1.36	1.22	1.10	0.99	0.89
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	2.24	2.17	2.08	1.98	1.88	1.76	1.64	1.50
Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total Fixed Cost (Rs. in Lakh)	12.07	11.77	11.49	11.22	10.95	10.70	10.44	10.18
Sales Revenue (Rs. in Lakh)	0	264	312	360	432	480	480	480
Variable Cost (Rs. in Lakh)								
Kachai Lemon (Av. Price @ Rs.20/Kg)	0.00	62.37	73.71	85.05	102.06	113.40	113.40	113.40
Salt @ 3 per kg	0.00	0.62	0.73	0.84	1.01	1.13	1.13	1.13
Mustard oil @ 160 per kg	0.00	34.32	40.56	46.80	56.16	62.40	62.40	62.40
Other ingredients	0.00	9.94	11.75	13.56	16.27	18.08	18.08	18.08
Packaging materials	0.00	36.30	42.90	49.50	59.40	66.00	66.00	66.00
Casual staff salaries	0.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78

Utilities (Electricity, Fuel)	0.00	0.96	1.13	1.31	1.57	1.75	1.75	1.75
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	5.75	6.79	9.26	9.26	9.26	9.26	9.26
Total Variable Cost (Rs. in Lakh)	0.50	158.74	186.16	215.01	254.42	280.69	280.69	280.69
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)	-	31.68	31.20	28.80	34.56	33.60	33.60	28.80

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



2.18 TYPICAL KACHAI LEMON PICKLE 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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