

# **DETAILED PROJECT REPORT**

## **KING CHILLY PICKLE MANUFACTURING UNIT.**



**INDIAN INSTITUTE OF FOOD PROCESSING TECHNOLOGY**

**Ministry of Food Processing Industries, Govt. of India**

**Thanjavur**

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### The Project at a Glance

1	Name of the Project	King chilly 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 share holders (if company/FPC)	
8	Technical advisor	
9	Marketing advisor/partners	
10	Proposed project capacity	150 MT/annum (55, 65, 75,90 and 100% capacity utilization in the 2nd, 3rd, 4th year, 5th year and 6th year onwards respectively
11	Raw materials	King chilly
12	Major product outputs	King chilly pickle
13	Total project cost (Lakhs)	36.84
	Land development, building & civil construction	4
	Machinery and equipments	12.73
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	16.31
14	Working capital Management (In Lakhs)	
	Second Year	48.92
	Third Year	57.82
	Fourth Year	78.84
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	9.945949781
	Promoter's contribution (min 20%)	9.577581271
	Term loan (45%)	17.31331999
16	Debt-equity ratio	2.35 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	214.77
	3rd year	277.49
	4th year	321.72
18	Average DSCR	2.16
	Benefit Cost Ratio	3.052660138

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 KING CHILLY PRODUCTION, CLUSTERS, POST-HARVEST MANAGEMENT AND VALUE ADDITION IN INDIA**

### **1.1 INTRODUCTION**

King chilly (U-Morok) is native to the north eastern region of India and subsequently the geographical indication (GI) of goods tag for this chilly has been obtained by the Nagaland State Government. King Chilly also known as ghost pepper, ghost chilly, naga jolokia and bhoot jolokia is among one of the hottest chilly in the world. It is grown in districts of Kohima, Mon and Peren of Nagaland, and also been cultivated in parts of Manipur (Tamenlong, Ukhrul, Churachanpur etc) and Assam (Golaghat & Tepur districts). Harvesting period - May-July (plain area like Assam) and September-October (Hilly area like Nagaland and Manipur)

King chilly entered in "Guinness book of world records" (measuring 855,000 scoville units) beating the "Mexican red savana habaneros" (5, 77,000 scoville units). It is consumed in fresh or dried form and used for its distinct flavor and aroma in the various culinary preparations. Due to its distinct taste and pungency people of North East India commonly use this chilly for making pickles and adding hotness to non-vegetarian food stuffs. It is used as spice, food, medicine

Chilles have anticancer, anti-diabetic, anti-obesity effect. It improves heart health by preventing/delaying oxidation of bad cholesterol, reduce rhinitis and bronchitis through thinning of mucus, and also reduce chronic pain. In recent years this crop is gaining importance because its high content of capsaicin (3-5%) as compared to any other Indian chilly. The secondary metabolite group, capsaicinoids, are produced solely in the fruit of members of the genus Capsicum.

Capsaicin and hydroxycapsaicin, the major constituents of capsaicinoids, are highly desirable and essential for spice, food, medicinal, and industrial purposes. Capsaicin is also the active principle which accounts for the pharmaceutical properties of chilles. Bhut Jolokia is characterized by very high capsaicinoid content, ranging from 2.45%. As a result, it is an ideal chilly variety of India for extraction of capsaicin.

King chilles have a soft texture and with high water content (85%) hence its quality deteriorated overtime. 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.

## 1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF KING CHILLY

King Chilly (*U-Morok*) is a crop which has been cultivated in Manipur since time immemorial. King Chilly also known as ghost pepper, ghost chilly, naga jolokia and bhoot jolokia is among one of the hottest chilly in the world.

The Scoville Heat Unit (SHUs) is reported to be 20, 41,427. It is consumed in fresh or dried form and used for its distinct flavor and aroma in the various culinary preparations. Due to its distinct taste and pungency people of North East India commonly use this chilly for making pickles and adding hotness to non-vegetarian food stuffs. In recent years this crop is gaining importance because its high content of capsaicin (3-5%) as compared to any other Indian chilly. King Chilly is used as spice, food, medicine. It can be used as relief for asthma patients at low quantities. Regular consumption in small quantities has been known to treat gastro-intestinal abnormalities.

Capsaicin, the active principle which accounts for the pharmaceutical properties of chilles is useful as a counter-irritant, anti-arthritis, analgesic, anti-oxidant and anti-cancer agent. Capsaicin has also received increased attention for its anti-obesity effect.

King Chilly (*C. chinense*, Jacq) also called “Bhut Jolokia” placed among hottest chillies (Wikipedia, April 2013), is an indigenous cultivar growing in Nagaland, Manipur and other part of northeast India. The king chilly focused and declared it is as hottest chilly of the World when reported by Defense Research Laboratory, Tezpur, Assam, India. And has recorded that it is hottest chilly with 1001304 SHU (Verma et al., 2013). The capsaicin content of king chilly fruits has been found to be very high in comparison to the fruits of the other chilly species (Baruah et al., 2014; Sanatombi and Sharma, 2008). The high foothill conditions with high nitrogen available of the region are suitable for the cultivation and production of an extensive range of capsicum crops including king chilly (Rongsennungla et al., 2012; Sharma, 2014). Monsoon season with high humidity is ideal for the cultivation of the crop (Anon., 2008). Due to high pungency and aroma of the king chilly it has an enormous scope both in international domestic market. It has been reported that production of king Chilly is increased every year in north-eastern India (Meetei et al., 2016). Green king chilly has the huge demand due to its aroma (Elias and Hossain, 1984). Also in season the price of green King Chilly (bhut jolokia) is reasonable having 300-400 per kg but in off season the market price rises up (Malangmeih and Rahaman, 2016; Meetei et al., 2016). Huge quantity of green chilly has been found to be wasted in the field due to the lack of proper processing and preservation technology. After harvesting of king chilly the increase the shelf-life of green king chilly is very challenging due to its perish-ability; it is subject to quick worsening the shelf life during storage, transportation, and marketing. (Chitravathi et al., 2015; Edusei et al., 2012). Freshness is a prime requirement of green peppers consumed in India. However, freshness loss and reduced shelf-life occur because most supermarkets and retailers handle peppers improperly without optimal packaging and storage and quality can be improved and shelf-life extended for fresh king chilly by modified atmosphere packaging MAP (Azlin et al., 2014; Krishna et al., 2007; Naik et al., 2001).

### 1.3 VARIETIES

There are different varieties of chillies growing worldwide. Varieties of chillies growing in India are described below.



### **1. Bhut Jolokia, North East India**

Also known as 'ghost pepper', Bhut Jolokia is certified as the hottest chilly in the world in the Guinness Book in 2007. It is an interspecific hybrid (of *Capsicum Chinese* and *Capsicum frutescens*) chilly pepper cultivated in North Eastern states of Arunachal Pradesh, Assam, Nagaland and Manipur. Bhut jolokia is used as a food and a spice, popularly in combination with pork or dried or fermented fish.

### **2. Kashmiri Chilles, Kashmir**

As the name suggests, this chilly is found in Kashmir and is the most sought after red chilly in India for its color. An Indian kitchen is incomplete without Kashmiri mirch powder as this adds the color to the mouth-watering dishes every household cooks. This chilly is less hotter or pungent, as compared to the other variants found in India.

### **3. Guntur Chilly, Andhra Pradesh**

Andhra Pradesh is known for its spicy dishes and the credit goes to Guntur chilles, from Guntur district of the state. Guntur is the main producer and exporter of most varieties of chilies and chilly powder from India to countries like Sri Lanka, Bangladesh, Middle East, South Korea, UK, USA and Latin America. Guntur Sannam, one of the types of Guntur chilly, is also cultivated in Madhya Pradesh.

### **4. Jwala Chilly, Gujarat**

This chilly, also known as finger hot pepper, is primarily grown in Kheda, Mehsana and southern parts of Gujarat. Although its green initially, once it matures it turns red in color. They can even be grown at home. This chilly is easily available in market throughout the year and very pungent in flavor.

### **5. Kanthari Chilly, Kerala**

This chilly is grown in Kerala and some parts of Tamil Nadu. It is also known as bird eye chilly of Kerala and becomes white when matures. It adds heat and lends good flavor to dishes.

## 6. Byadagi Chilly, Karnataka

It is a famous variety of chilly, mainly grown in Karnataka. It is named after the town of Byadagi, which is located in the Haveri district of Karnataka. Known for its color and pungency, byadagi chilly is similar to paprika.

## 7. Ramnad Mundu/Gundu, Tamil Nadu

Almost spherical in shape, this chilly has a very shiny skin and is king chilly red in color, grown in the Ramnad district of Tamil Nadu. This chilly is particularly used to add flavor to the Chettinad cuisine.

## 8. Dhani, Manipur

This chilly is grown in Manipur and is easily available in Kolkata. Known for its strong pungent smell and heat, it is blood red in color.

## 1.4 HEALTH BENEFITS AND NUTRITIONAL INFORMATION

### Nutritional value per 100g:

Energy	: 24.44 KJ
Carbohydrate:	: 2.36 g
Protein:	: 1.59 g
Total dietary fiber	: 4.83 g
Iron	: 1.98 mg
Zinc:	: 0.151 mg
Phosphorous	: 40.08 mg
Copper	: 0.19 mg
Manganese	: 0.19 mg
Calcium	: 8.79 mg
Magnesium	: 17.59 mg
Capsaicin	: 0.46 g
Dihydro-capsaicin	: 0.09 g
Total Capsaicinoid	: 0.55 g



## CONSTITUENTS AND HEALTH BENEFITS OF KING CHILLY

The documented health benefits from chilies continues to grow at a break-neck speed, similar to the increasing popularity of consuming hot foods in various forms. The heat and health benefits comes from a chemical called capsaicin.

Historically, spicy additions to food helped prevent spoilage in warm climates before the invention of refrigeration. Capsaicin's anti-microbial properties inhibit as much as 75% of bacteria growth. People from cultures who lived and survived due to the use of various spices passed down to the next of kin spicy recipes and taste buds desiring extra zing in food.

Adding chilies, hot sauces and hot powders to food continues to protect us from food poisoning even though we now refrigerate food. To maximize these health benefits, eating the hottest pepper would magnify these effects.

### Health benefits:

- Improves breathing by opening clogged nasal passages
- Helps in curing rheumatic diseases
- Improves blood circulation and lowers blood pressure
- Helps in weight loss by speeding up metabolism

## 1.5 CULTIVATION, BEARING & POST HARVEST MANAGEMENT:-

King chilly is the fruit of plant belonging to *Capsicum* species. Family: *Solanaceae*  
Genus: *Capsicum* Species: *C. frutescens Jacquin*, these chilies are one of the hottest chilies on earth and the extreme variations among different cultivars include several colors, sizes and textures of fruits. Particularly the color ranges from light green, yellowish green to dark green in young fruits and gradually changes into light red, bright red and even chocolate while the texture varies from crumpled to semi smooth as well as gloomy with fleshy tissue. The fruit is sub-conical to conical in shape and about 2.40-2.85 cm wide at the shoulders and 6.10-9.20cm in length; Fruit surface: Rough, wrinkle with spikes and may weigh 14-18 g.

## **Cultivation and Bearing:-**

This chilly is grown mainly in the state of Nagaland, Assam and Manipur and to some extent in Mizoram, Arunachal Pradesh and Meghalaya which starts during February - March mainly in the hilly area and September-October in plains area (Baruah et al., 2014). King chilly is highly perishable non-climatic crop can be grown all the types of soil, but a deep loose soil is preferred. Good quality king chilly can be produced under clay loam soil (Borgohain and Devi, 2007). The soil should be rich in organic matter with of pH 5.5-6.0.

King Chilly grows in monsoon climatic condition with generally high humidity. The rainfall range for cultivation is wide, ranging from 1200 to 4050 mm per annum and the climate is moderate with temperatures ranging between a maximum of 36 °C in summer and a minimum of 12 °C in winter (Anon, 2008). The cultivation practices should be well prepared of land preparation, proper showing and transplanting, management of manuring and fertilizers and taken care of control the insect, pests and diseases for better cultivation and higher yield. The picking of either mature green or red fruits depends upon the market demands. The number of picking varies from 15- 45 days depending upon the growth and development of fruit (Meetei et al., 2016; Sharma, 2014). Best practice for production of King chilly with proper soil treatment & mixture, treat the seed with bio-fertilizer like azotobacter and phosphotika and sow seeds in line at about 5 cm apart to avoid overcrowding of the seedlings. Mulching should be provided and irrigate the nurseries every alternate day in the evening. When the seedlings become mature, it is ready for transplanting to the, main field. Seedling root dip should be done for about 30 minutes in 1 kg Azotobacter and 1 kg Phosphotika in about 100 lts. Naga King Chilly is a rainfed crop but watering should be done mixed with bio-agents at regular intervals.

Also greenhouse production technology of King Chilly standardized technology of King Chilly. Greenhouse King Chilly grows rapidly under optimum environmental conditions, and fruit production begins 50-60 days after transplanting. For good fruit production, a temperature range of 25- 28 o C during the day is desirable. Fertilizer management

practices will, therefore, have to be planned to ensure that plant requirements are satisfied to achieve good yields of high-quality fruit. Harvest fruits when it has reached a uniform diameter throughout its length and may be harvested in green stage or as per choice in red ripe stage (50-65 days after flowering) (Katwale and Saraf, 1990).

As soon as possible after harvest, fruit should be placed under conditions that will prolong its storage life. Packaging of fruits in shrink wrap film before packing in cartons prevents moisture loss and maintains fruit quality. The best storage temperature is 10 °C, 3 % O<sub>2</sub>, 5 % CO<sub>2</sub> with a relative humidity of 80-90 % (Chitravathi et al., 2015). Production of King Chilies increases in Nagaland throughout the year.

Naga King Chilly takes about 5 months to reach the harvesting stage from the time of transplanting. It is harvested at three different stages - green, yellow and ripened stages. For long distance market and vegetable purpose, harvesting is done at the green stage. For drying, pickling and seed purpose, it is harvested at yellowing to red stage. 50 plants yield about 6 kg fresh fruit per week for three months, which comes to approximately 1.5 kg per plant in three months. The average fresh fruit yield of this chilly is around 80-100q /ha under rain fed condition while dry weight ranges from 10-12 q/ha.

### **Post-harvest management:-**

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

- Harvesting is done when the pods are well ripened and partially withered in the plant itself. The harvested pods are kept in heaps either indoor or in shade away from direct sun light for 2 or 3 days so as to develop uniform red color and then dried in the sun by spreading them on clean dry polythene sheets, cemented / concrete drying yards etc.
- Pods are spread out in thin layers for uniform drying with frequent stirring to prevent mold growth and discoloration.

- The dried pods are heaped and covered by clean gunny bags / polythene sheets. The moisture content of dry pods are kept at 8- 10 %.
- Improved drying system could be used to ensure cleanliness and uniform color of the product.
- After removing the extraneous matters like plant parts, etc well dried pods should be packed in clean, dry gunny bags and stored ensuring protection from dampness.
- Dunnage should be provided to stack the packed bags to prevent moisture ingress from the floor.
- Care should be taken to stack the bags at 50 –60 cm away from the wall. Storing chillies for longer period may lead to deterioration.
- However, if cold storage facilities are used, the product may be stored for 8-10 months. Insects, rodents and other animals should be effectively prevented from getting access to the premises where chilly is stored.

## **1.6 PROCESSING & VALUE ADDITION:-**

Pickles are usually made from a mixture of vegetables and fruit. They are eaten as a savory, spicy accompaniment to a meal. Pickles are preserved by a combination of increased acidity (reduced pH), added salt, reduced moisture and added spices. Pickles can be prepared using one of two main methods: lactic acid fermentation of vegetables, either with or without the addition of salt the preservation of vegetables in acetic acid (vinegar). The products made by these two methods are very different -each one has its own distinctive taste and texture. Vegetables such as cucumber, cabbage, olive and onion are fermented by lactic acid bacteria which can grow in low concentrations of salt.

The bacteria ferment sugars in the food to form lactic acid, which then prevents the growth of food poisoning bacteria and molds. The amount of salt added controls the type and rate of the fermentation. If 2-5% salt is used, the fermentation is carried out by a series of bacteria that produce lactic acid. The pickle is preserved by the high level of acidity. If higher levels of salt are used (up to 16%) the product is preserved

by the high salt concentration rather than by fermentation and is known as a salt-stock pickle. Fruit and vegetables can be semi-processed and stored for many months by preserving in a high salt solution. They can be further processed into pickle later in the season. Sometimes sugar is added to increase the rate of fermentation or to make the product sweeter. Pickles prepared by fermentation are not heated, therefore strict attention must be paid to cleanliness and hygiene. The concentration of salt, pH of the mixture and temperature of fermentation must all be controlled to ensure a good fermentation and to prevent the growth of undesirable bacteria. Vegetables pickled in acetic acid (vinegar) have salt and sugar added. They are not fermented and therefore have a different texture and flavor.

The preservation of fruits and vegetables in the form of pickles, chutneys and sauces began as a household art, but at present major part of the world's supply of these are produced in commercial plants. The basic raw materials, quality control, brining, physico-chemical aspects, texture, color, flavor, composition, packaging, processing, storage, new and automation / mechanization determines the type and variety of pickles. Fruits and vegetables preserved in common salt, vinegar, oil or citrus fruit juice are called pickles. Mango, lime, carrot, bitter gourd, beans, chilies, garlic, ginger, brinjal and onion are mainly processed for pickles.

### **Different types of pickles:**

Commercially available pickles are of two types.

- 1) Fermented pickles and
- 2) Unfermented pickles.

Fermented pickles are classified as:

- a) Brine pickle
- b) Oil pickle

- c) Vinegar pickle
- d) Sweet pickle

**1. Brine pickle:** Salt cured pieces are freshened and preserved in fresh brine and vinegar. For brine pickles minimum prescribed salt of 8 to 12 per cent is permitted. Sometimes even 16 per cent salt is also added. Additions of spices help to improve the flavor of brine pickles.

**2. Oil pickles:** The salt stock is washed to reduce the salt to 5-6 per cent and covered with oil. Cured Mango, lime, gooseberry, chilies and mixed vegetables are pickled with 5 to 6 per cent salts. The contents are left for four to eight days with occasional mixing. Edible oil is poured over the pickle to form a thick layer. Oil layer creates an anaerobic condition.

**3. Vinegar pickle:** The brine is drained from the salt cured product, excess salt is removed and the material is kept in plain vinegar with 2 to 3 per cent salt for several weeks. Vinegar is added to 1/3 of total product.

**4. Sweet pickle:** Salt cured pieces are freshened and pickles are prepared with addition of sugar or jaggery and selective spices. Salt concentration of 5 - 8 per cent and sugar 40 - 60 per cent are added.

**5. Unfermented pickles:** In some pickles such as lime, lemon, immature mango, pickles are prepared without undergoing fermentation.

### Various types of pickles:

Product	Salt	Sugar	Vinegar	Process
Fermented sweet pickle	5% then 3% 0 then 5%	1-2% then 3%	0 then 5%	Ferment for 1-2 weeks then repacked in vinegar+ salt+ sugar (optional pasteurization)



Fermented sour pickle	5% then 3%	0 then 0	0 then 5%	Ferment for 1-2 weeks then repack in vinegar + salt (optional pasteurization)
Unfermented pickle	3%	1%	5%	Pack straight away and pasteurize
Salt-stock pickle	15%	0	0	Store until required. Wash out salt and repack as unfermented pickle.

## **2. MODEL KING CHILLY 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 king chilly pickle processing unit are in the production clusters of king chilly growing states/areas such as of Kohima, Mon and Peren of Nagaland, and also been grown in parts of Manipur (Tamenlong, Ukhrul, Churachanpur etc) and Assam (Golaghat & Tepur districts) where adequate quantities of surplus raw materials can be available for processing.

### **2.2 INSTALLED CAPACITY OF THE KING CHILLY PICKLE PROCESSING UNIT**

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

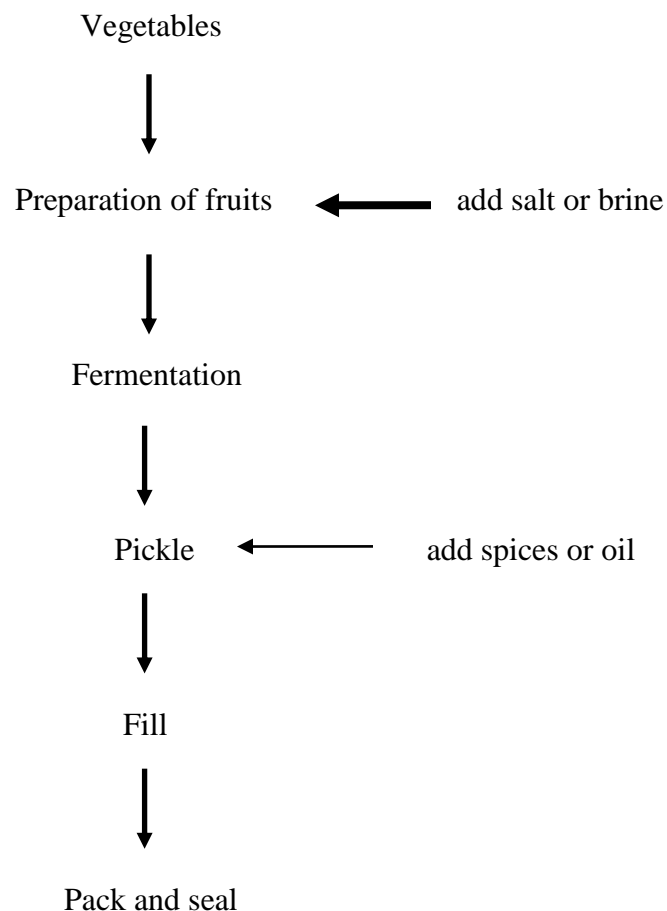
### **2.3 RAW MATERIAL REQUIREMENTS FOR THE UNIT**

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 King chilly pickle manufacturing project, the unit requires 350 kg/day, 400 kg/day and 450 kg/day King chilly vegetable at 70, 80 and 90 percent capacity utilization, respectively.

## 2.4 MANUFACTURING PROCESS OF THE KING CHILLY PICKLE

The typical Procedure for manufacturing of pickles is as below:



**1. Preparation of the fruit:** Fruit should be washed in clean water, peeled and the stones removed. Stainless steel knives should be used to cut the fruit into uniform-sized pieces. Most fruits are cut into small strips. Fruit should be as fresh as possible and slightly under-

ripe. Damaged, bruised or infected fruits should not be used. Accurate scales are needed to make sure that the correct amounts of ingredients are used each time. Two sets of scales are needed - one with a large capacity for sugar and fruit and a smaller set for the spices. For fermented pickles, the peeled fruit and vegetable pieces should be held in a 2-3% salt solution to prevent browning of the surfaces. For non-fermented pickles, vinegar, spices and sugar are added before the mixture is heated. Oil is sometimes added to the mixture

**2. Fermentation:** Prepared vegetables are placed in the fermentation container and salt or brine is added. The vegetable pieces are weighted down so that they are submerged in the brine. The vegetables and salt are placed in alternate layers until the container is three quarters full. As a guide, 3kg salt is required for every 100kg vegetables. A container with a lid should be used for fermentation. This is to maintain the temperature at the optimum level and to prevent contamination from dust and insects. If brine is being used, a 15-20% brine solution is prepared by dissolving salt in water. This is measured using a salometer or brine hydrometer. A starter culture of juice from a previous fermentation may be added to speed up the fermentation. The temperature and time of fermentation must be carefully controlled. The optimum temperature is 21°C. Fermentation begins as soon as a brine is formed. It can be seen by bubbles of carbon dioxide gas that are given off by the bacteria. Fermentation takes between one and four weeks depending upon the temperature, pH and strength of the salt solution. It is completed when no more bubbles appear.

**3. Measurement of salt concentration:** The concentration of salt in pickling brines can be measured using a brine hydrometer. A sample of brine at 20°C is filled into a large clear glass or plastic cylinder and the hydrometer placed in the liquid. When the hydrometer has stopped moving, the scale is read at the surface of the liquid.

**4. Filling:** Heated pickles are hot-filled (above 80°C) into clean sterile glass jars. The jars should be warm to prevent them cracking. If polythene pouches are used, the pickle should be cooled to room temperature before filling. Fermented pickles are filled into clean, sterile jars or containers. Since these pickles are not further processed, it is important to ensure good hygiene during filling. It is important to ensure that there are no air bubbles trapped in the

pickle during filling. A layer of good quality vegetable oil should be poured on the top of fermented pickles. This acts as a seal and helps to prolong the shelf life.

**5. Add Salt or Brine:** For pickling, any type of common salt is suitable as long as it is pure. Salt that contains chemicals to reduce caking should be avoided as the chemicals will make the brine cloudy. Salt with lime impurities can reduce the acidity and shelf life of the product. Salt with iron impurities can cause blackening of the vegetables. Salt with magnesium gives a bitter taste to the pickles. Salt containing carbonates can result in pickles with a soft texture. (Ref. Lal et al, 1986) Salt provides a suitable environment for lactic acid bacteria to grow. The lactic acid that they produce gives the pickle the characteristic flavor and preserves the vegetables. Salt can either be added to the vegetables as dry salt or made into a brine that the vegetables are soaked in.

**a) Dry salted pickles:** The salt extracts juice from the vegetables and creates a brine. For every 100kg of vegetables 3kg of salt is needed. Alternate layers of vegetables (about 2.5cm deep) and salt are placed in the fermentation container until it is about three quarters full. The contents are covered with a cloth that is weighted down to help with the formation of brine. As soon as the brine is formed, fermentation starts and bubbles of carbon dioxide gas appear.

**b) Brine pickles:** Brine is used for vegetables that are naturally low in water. A 15-20% salt solution is prepared by dissolving salt in water. Vegetables are submerged in the brine using weights to hold them under the solution and the container is sealed. The strong brine draws sugar and water out of the vegetables, which decreases the salt concentration of the brine. It is important that the salt concentration does not fall below 12% as fermentation will not be able to take place. Extra salt is added periodically to maintain the strength of brine.

### **Added Spices and oils**

**a) Spices:** 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.

**b) Starter culture:** Starter cultures are used to speed up the fermentation and to ensure consistency between different batches of pickle. Because they are acidic, the starter cultures

inhibit the growth of undesirable organisms. It is possible to use fermented pickle juice that has been saved from a previous fermentation as the starter culture. It is important to ensure that the acidity of the starter juice is not too acidic as this will inhibit the activity of the *Leuconostoc* bacteria. Starter cultures of *Lactobacillus* species can be purchased from ingredient suppliers, but they may not be readily available in all countries.

**c) Oil:** 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.

**6. Packaging:** Clean glass jars with lids are the preferred type of packaging for pickles. Small quantities of pickles can be packaged in polythene pouches that are sealed with a heat sealer. These pickles tend to have a shorter shelf life.

**General:** All equipment must be thoroughly cleaned each day to prevent contamination by insects and micro-organisms.

## 2.5 MARKET DEMAND AND SUPPLY FOR KING CHILLY PICKLE

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 KING CHILLY PICKLE

The increasing urbanization and income offers huge scope for marketing of vegetable based products. Urban organized platforms such as departmental stores, malls, super markets can be attractive platforms to sell well packaged and branded king chilly vegetable based products.

## 2.7 DETAILED PROJECT ASSUMPTIONS

This model DPR for king chilly 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 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. King chilly cost considered @ Rs.130/-per kg.
  2. 1 kg King chilly will produce 90% recovery.
  3. 1 Batch size is approximately 100 kg.
  4. No. of hours per day are approximately 8-10 hours.
  5. Batch yield is 95%

Detailed Project Assumptions		
Parameter	Assumption	
Capacity of the King chilly pickle 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	130	
Average sale prices per Kg	560	Rs/kg
Pulp extraction	90	
<b>KING CHILLY PICKLE</b>	1 Kg King chilly pickle from 1.2 kg King chilly vegetable	

## 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	1500 Kg	4
2	Vegetable washing trough	1	500 liter	0.65
3	Brine dipping tank (SS 316 L)	1	500 liter	0.65
4	Vegetable cutter	1	80 kg/Hr	0.25
5	Dryer	1	120 kg /batch	2.2
6	Gas operated kettle	1	80 liter/hr	0.75
7	Blending/mixing Tank	1	300 liter	1.4
8	Bottle filling Unit	1	400 PPH	1.5

9	Induction sealer	1	Suitable	0.3
10	Shrink tunnel	1	Suitable	0.35
11	Batch coding machine	1	Suitable	0.12
12	Weighing balance	1	Suitable	0.06
13	Accessories	1	Suitable	0.5
	<b>TOTAL</b>			<b>12.73</b>

## 2.8.2 OTHER COSTS:-

### Utilities and Fittings:-

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

### Other Fixed Assets:

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
<b>Total preoperative expenses</b>	<b>0.9 LAC</b>

Contingency cost to be added as approx.1.2 Lac.

So total startup cost at own land & Premise may be somewhat similar to 36.84 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	5.27	6.23	8.50
Work in progress	15 days	10.55	12.47	17.00
Packing material	15 days	3.30	3.90	5.32
Finished goods' stock	15 days	15.06	17.80	24.27
Receivables	30 days	30.12	35.60	48.55
Working expenses	30 days	0.92	1.09	1.48
Total current assets		65.23	77.09	105.12
Trade creditors		0.00	0.00	0.00
Working capital gap		65.23	77.09	105.12
Margin money (25%)		16.31	19.27	26.28
Bank finance		48.92	57.82	78.84

## 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
ii. Plant and machinery	12.73
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	16.31
Total project cost (i to vii)	36.84
Means Of finance	
i. Subsidy	9.95
ii. Promoters Contribution	9.58
iii. Term Loan (@10%)	17.31

## 2.11 MANPOWER REQUIREMENTS

Total Monthly Salary (Rs.)	No	Wages	Total Monthly	Total Annually
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)	200 MT King chilly/Annum	82.5	97.5	112.5	135	150
	Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%
B	<b>Expenditure (Rs. in Lakh)</b>	0					
	King chilly (Av. Price @ Rs. 130/Kg )	0.00	68.41	80.85	93.28	111.94	124.38
	Salt @ Rs. 3/kg	0.00	0.16	0.19	0.22	0.26	0.29
	Mustard oil @ Rs. 150/Kg	0.00	27.71	32.75	37.79	45.35	50.39
	Other materials (Rs. 125/kg)	0.00	7.63	9.02	10.40	12.48	13.87
	Packaging materials (Rs 44 per Kg)	0.00	36.30	11.70	13.50	16.20	18.00
	Utilities (Electricity, Fuel)	0.00	1.22	1.44	1.66	1.99	2.21
	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
	<b>Total Expenditure</b>	<b>2.96</b>	<b>152.01</b>	<b>146.62</b>	<b>167.64</b>	<b>199.01</b>	<b>219.92</b>
C	<b>Total Sales Revenue (Rs. in Lakh)</b>	<b>0.00</b>	<b>462.00</b>	<b>546.00</b>	<b>630.00</b>	<b>630.00</b>	<b>630.00</b>
	Sale of King chilly pickle (Av. Sale Price @ Rs.560/kg)	0.00	462.00	546.00	630.00	630.00	630.00
D	<b>PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows</b>	<b>-2.96</b>	<b>309.99</b>	<b>399.38</b>	<b>462.36</b>	<b>430.99</b>	<b>410.08</b>
	Depreciation on civil works @ 5% per annum	0.20	0.19	0.18	0.17	0.16	0.15
	Depreciation on machinery @ 10% per annum	1.27	1.15	1.03	0.93	0.84	0.75
	Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05



	Interest on term loan @ 12%	1.80	1.74	1.67	1.59	1.51	1.42
	Interest on working capital @ 12%	0.00	5.87	5.87	5.87	5.87	5.87
E	Profit after depreciation and Interest (Rs. in Lakh)	<b>-6.35</b>	<b>306.82</b>	<b>396.41</b>	<b>459.60</b>	<b>428.42</b>	<b>407.71</b>
F	Tax (assumed 30%) (Rs. in Lakh)	<b>0.00</b>	<b>92.04</b>	<b>118.92</b>	<b>137.88</b>	<b>128.53</b>	<b>122.31</b>
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	<b>-6.35</b>	<b>214.77</b>	<b>277.49</b>	<b>321.72</b>	<b>299.90</b>	<b>285.39</b>
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	1.80	1.74	1.67	1.59	1.51	1.42
I	Coverage available (Rs. in Lakh)	1.80	1.74	1.67	1.59	1.51	1.42
J	Total Debt Outgo (Rs. in Lakh)	0.60	0.66	0.73	0.81	0.89	0.99
K	Debt Service Coverage Ratio (DSCR)	3.00	2.62	2.28	1.97	1.69	1.44
	Average DSCR	2.16					
L	Cash accruals (PBDIT- Interest-Tax) (Rs. in Lakh)	-4.76	216.21	278.79	322.89	300.96	286.35
M	Payback Period	2.5 Years					
	(on Rs. 36.84 Lakhs initial investments)						

## 2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	1,731,332.00	240,168.96	180,058.53	60,110.43	1,671,221.57
2	1,671,221.57	240,168.96	173,807.04	66,361.92	1,604,859.65
3	1,604,859.65	240,168.96	166,905.40	73,263.56	1,531,596.09
4	1,531,596.09	240,168.96	159,285.99	80,882.97	1,450,713.13
5	1,450,713.13	240,168.96	150,874.17	89,294.79	1,361,418.33
6	1,361,418.33	240,168.96	141,587.51	98,581.45	1,262,836.88

7	1,262,836.88	240,168.96	131,335.04	108,833.92	1,154,002.95
8	1,154,002.95	240,168.96	120,016.31	120,152.65	1,033,850.30
9	1,033,850.30	240,168.96	107,520.43	132,648.53	901,201.77
10	901,201.77	240,168.96	93,724.98	146,443.98	754,757.80
11	754,757.80	240,168.96	78,494.81	161,674.15	593,083.65
12	593,083.65	240,168.96	61,680.70	178,488.26	414,595.39
13	414,595.39	240,168.96	43,117.92	197,051.04	217,544.35
14	217,544.35	240,168.96	22,624.61	217,544.35	(0.00)
		3,362,365.44	1,631,033.44	1,731,332.00	(1,731,332.00)

## 2.14 ASSET'S DEPRECIATION

(Amounts in Lakhs Rs.)

Assets' Depreciation (Down Value Method)	1st Year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
Particulars								
Civil works	4.00	3.80	3.61	3.43	3.26	3.10	2.94	2.79
Depreciation	0.20	0.19	0.18	0.17	0.16	0.15	0.15	0.14
Depreciated value	3.80	3.61	3.43	3.26	3.10	2.94	2.79	2.65
Plant & Machinery	12.73	11.46	10.31	9.28	8.35	7.52	6.77	6.09
Depreciation	1.27	1.15	1.03	0.93	0.84	0.75	0.68	0.61
Depreciated value	11.46	10.31	9.28	8.35	7.52	6.77	6.09	5.48
Other Fixed	0.80	0.68	0.58	0.49	0.42	0.35	0.30	0.26

Assets								
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	17.53	15.94	14.50	13.20	12.03	10.97	10.01	9.14
Depreciation	1.59	1.44	1.30	1.17	1.06	0.96	0.87	0.79
Depreciated value	15.94	14.50	13.20	12.03	10.97	10.01	9.14	8.35

## 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)	36.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	152.01	146.62	167.64	199.01	219.92	219.92	219.92	
Total cost (Rs. in Lakh)	39.80	152.01	146.62	167.64	199.01	219.92	219.92	219.92	1364.83
Benefit (Rs. in Lakh)	0.00	462.00	546.00	630.00	630.00	630.00	630.00	630.00	
Total Depreciated value of all assets (Rs. in Lakh)								8.35	
Total benefits (Rs. in Lakh)	0.00	462.00	546.00	630.00	630.00	630.00	630.00	638.35	4166.35
Benefit-Cost Ratio (BCR): (Highly Profitable project)	<b>3.053</b>								
Net Present Worth (NPW):	2801.52								

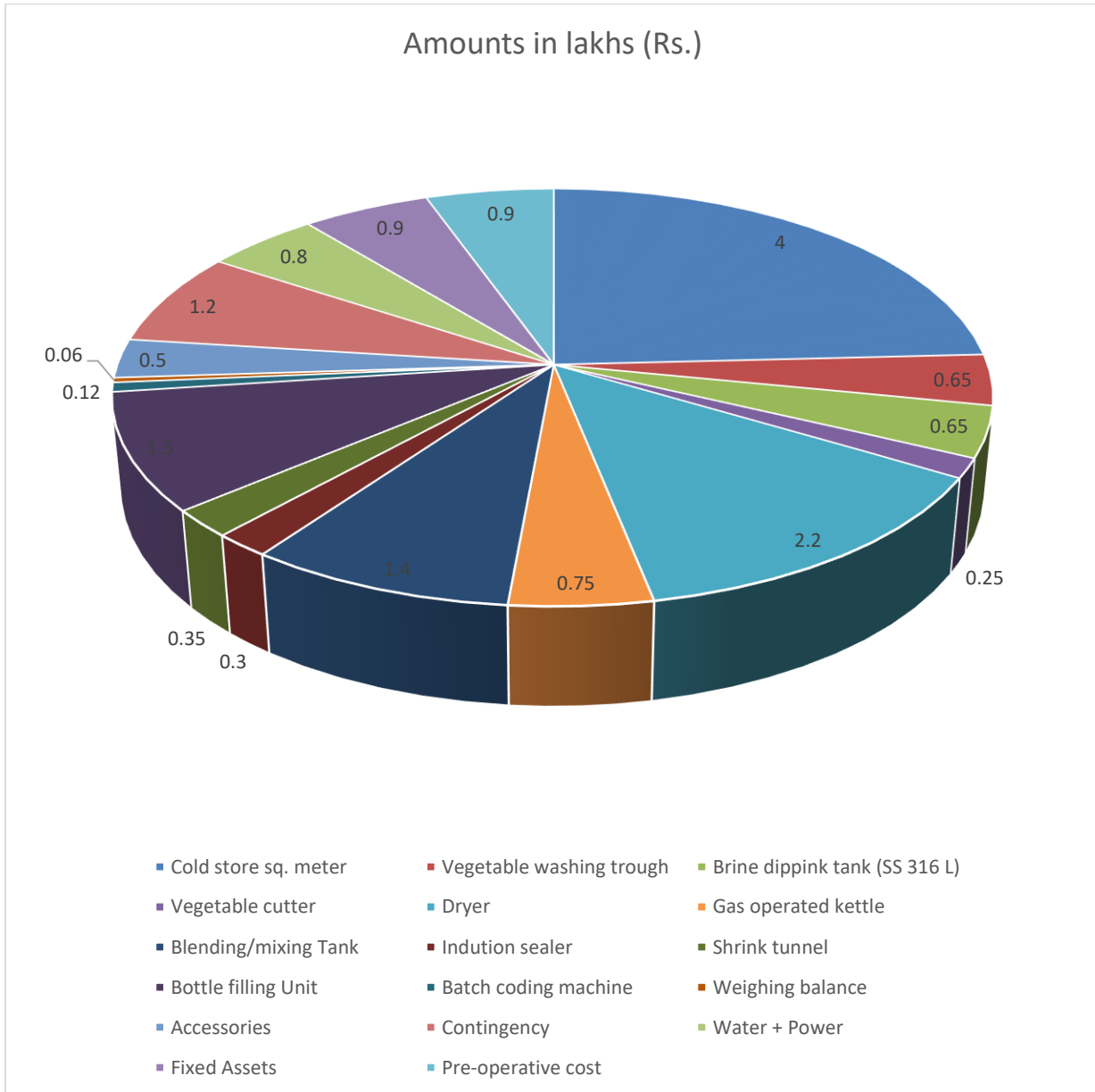
## 2.16 BREAK EVEN ANALYSIS

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.

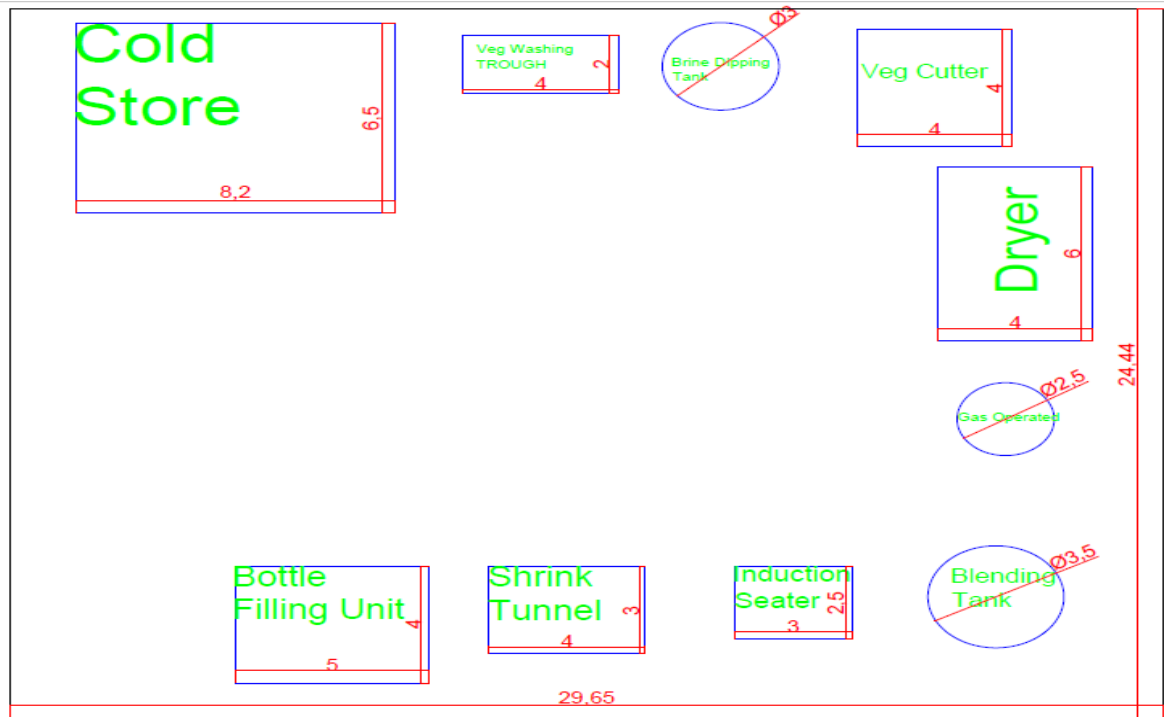
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
Production MT/Annum		82.5	97.5	112.5	135	150	150	150
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	7.284	7.284	7.284	7.284	7.284	7.284	7.284	7.284
Depreciation on building @ 5% per annum	0.20	0.19	0.18	0.17	0.16	0.15	0.15	0.14
Depreciation on machinery @ 10% per annum	1.27	1.15	1.03	0.93	0.84	0.75	0.68	0.61
Depreciation on other fixed assets @ 15% per annum	0.12	0.10	0.09	0.07	0.06	0.05	0.05	0.04
Interest on term loan	1.80	1.74	1.67	1.59	1.51	1.42	1.31	1.20
Insurance	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<b>Total Fixed Cost (Rs. in Lakh)</b>	<b>10.98</b>	<b>10.76</b>	<b>10.55</b>	<b>10.35</b>	<b>10.15</b>	<b>9.96</b>	<b>9.76</b>	<b>9.57</b>
<b>Sales Revenue (Rs. in Lakh)</b>	<b>0</b>	<b>462</b>	<b>546</b>	<b>630</b>	<b>630</b>	<b>630</b>	<b>630</b>	<b>630</b>
Variable Cost (Rs. in Lakh)								
King chilly (Av. Price @ Rs.130/Kg )	0.00	68.41	80.85	93.28	111.94	124.38	124.38	124.38
Salt @ 3 per kg	0.00	0.16	0.19	0.22	0.26	0.29	0.29	0.29
Mustard oil @ 150 per kg	0.00	27.71	32.75	37.79	45.35	50.39	50.39	50.39
Other ingredients	0.00	7.63	9.02	10.40	12.48	13.87	13.87	13.87
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	1.22	1.44	1.66	1.99	2.21	2.21	2.21
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	5.87	5.87	5.87	5.87	5.87	5.87	5.87
<b>Total Variable Cost (Rs. in Lakh)</b>	<b>0.50</b>	<b>155.78</b>	<b>181.59</b>	<b>207.41</b>	<b>245.98</b>	<b>271.69</b>	<b>271.69</b>	<b>271.69</b>
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)	-	55.44	54.60	50.40	50.40	44.10	44.10	37.80

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



## 2.18 TYPICAL KING CHILLY 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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