



# PM Formalisation of Micro Food Processing Enterprises Scheme

## DETAILED PROJECT REPORT FOR PROCESSING OF CASHEW NUTS



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Project At a Glance		
1	Name of the Project	Cashew nut
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 & 100% capacity utilization in the 2nd, 3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> & 6 <sup>th</sup> years' onwards respectively
11	Raw materials	Cashew fruit
12	Major product outputs	Cashew nut
13	Total project cost (Lakhs)	43.66
	Land development, building & civil construction	5.18
	Machinery and equipments	7.75
	Utilities (Power & water facilities)	0.8
	Miscellaneous fixed assets	0.9
	Pre-operative expenses	0.90
	Contingencies	1.20
	Working capital margin	26.98
14	Working capital Management (In Lakhs)	
	Second Year	80.78
	Third Year	95.46
	Fourth Year	130.18
15	Means of Finance	
	Subsidy grant by MoFPI (max 10 lakhs)	9.60
	Promoter's contribution (min 20%)	10.91
	Term loan (45%)	23.13
16	Debt-equity ratio	2.35 : 1
17	Profit after Depreciation, Interest & Tax	
	2nd year	246.31
	3rd year	288.83
	4th year	334.83
18	Average DSCR	2.16
	Benefit Cost Ratio	2.59
	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 CASHEW PRODUCTION, LUSTERS, POST-HARVEST MANAGEMENT AND VALUE ADDITION IN INDIA**

## **1.1 INTRODUCTION**

Cashew (*Anacardium occidentale* L.) is an important tropical perennial tree crop, originally grown in coastal areas, but now extending also far inland. Cashew is known by many names. In Mozambique, the Maconde tribe refer to it as the "Devil's Nut". It is offered at wedding ceremonies as a token of fertility and is considered by many to have aphrodisiac properties. The cashew tree, native to Brazil, was introduced to Mozambique and then India in the sixteenth century by the Portuguese, as a means of controlling coastal erosion. It was spread within these countries with the aid of elephants that ate the bright cashew fruit along with the attached nut. The nut was too hard to digest and was later expelled with the droppings. It was not until the nineteenth century that plantations were developed and the tree then spread to a number of other countries in Africa, Asia and Latin America.

Cashew processing, using manual techniques, was started in India in the first half of the twentieth century. It was exported from there to the wealthy western markets, particularly the United States.

It is a major export crop in terms of foreign exchange earnings in countries like Brazil, Vietnam, India, Nigeria, Tanzania, Indonesia, Guinea-Bissau, Cote D'Ivoire, Mozambique and Benin. Cashew nuts are common appetizers, like peanuts and pistachio nuts. They are also used in the food industry, and as an ingredient in various confectionery products. The cashew nut kernels have good nutritional values to human beings. They are a rich source of vitamins (A, D and E), fats (46.5 %) and proteins (17.8 %). Besides, they contain relatively important amounts of minerals like calcium (504.0 mg/kg), iron 90.8 mg/kg), zinc (31.3 mg/kg), copper (16.4 mg/kg), potassium (5600 mg/kg), phosphorus (4600 mg/kg), magnesium (2400 mg/kg) and sodium (22.8 mg/kg) all measured in dry weight. However, the nutrient composition in cashew nut kernels varies with cultivar and environment. Due to

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its high nutritional value, even small and broken pieces of cashew nut kernels find a market in confectionery products. Almost all varieties of *A. occidentale* produce sweet juicy apples, with high soluble sugar (fructose and sucrose) content, which are consumed as fresh fruits; or used to make various apples products, such as juice and wine.

## **1.2 ORIGIN, DISTRIBUTION AND PRODUCTION OF CASHEW**

Cashew (*A. occidentale* L.) is native to Latin America and has a primary center of diversity in Amazonia, and a secondary one in the Planalto of Brazil. Natural occurrence of cashew has been reported from Mexico to Peru, and in the West Indies. It was one of the first fruit trees from the New World to be widely distributed throughout the tropics by the early Portuguese and Spanish adventurers. The name cashew is from the Portuguese *caju*, which in turn comes from the Tupi-Indian word *acaju*. The incoming colonists in what is now Brazil found that the native Indians valued both the cashew nut and the so-called apple, the fleshy pedicel or stalk of the fruit (Deckers *et al.*, 2001).

Cashew was discovered by Portuguese traders and explorers in Brazil in 1578. It was introduced into West and East Africa and India by the Portuguese travelers in the 16<sup>th</sup> century. By then, cashew was considered a suitable crop for soil conservation, forestation, and also wasteland development. Therefore, the initial aim of cashew introduction to those areas was not to produce nuts and apples (pseudo-fruits), but to help control soil erosion on the coast (Bradtke, 2007). Use of cashew nuts and apples developed much later, and the international nut trade did not start until the 1920s (Rieger, 2006). Thereafter, cashew gradually gained commercial importance and spread in other places. It is now naturalized in many tropical countries, particularly in coastal areas of East Africa (Tanzania, Kenya, Mozambique, Madagascar and Uganda), West and Central Africa (Ivory Coast, Nigeria and Angola), Florida, Peru, Hawaii, Tahiti, Mauritius, Seychelles, Panama, India, Sri Lanka, Thailand, Malay Peninsula and Philippine.

The cashew industry ranks third in the world production of edible nuts with world production in 2000 at about 2 million tonnes of nuts-in-shell and an estimated value in excess of US\$2 billion. India and Brazil are the major cashew exporters, with 60 percent and 31 percent respectively of world market share. The major importers are the United States (55 percent), the Netherlands (ten percent), Germany (seven percent), Japan (five percent) and the United Kingdom (five percent).

Cashew kernels are ranked as either the second or third most expensive nut traded in the United States. Macadamia nuts are priced higher and pecan nuts can be more costly, if the harvest is poor. The extensive market connections of exporters from Brazil and India make it difficult for the smaller exporters to make gains in the United States market. Importers may appreciate the low prices offered by small suppliers, but the lack of reliability in quality tends to make them favors the larger, more reputable suppliers.

### 1.3 VARIETIES

Varieties of cashew grown across worldwide are:

Sl No.	Variety	Type	*Country	Salient features
1	AC4	Common	Tanzania	High yielding, desirable nut and apple qualities, tolerant to major disease and insect pests, adapted to wide range of agro-ecological Conditions.
2	AZA2	Common	Tanzania	High yielding, desirable nut and apple qualities, tolerant to major diseases (including, cashew leaf and nut blight) and insect pests, adapted to a wide range of agro-ecological conditions.

3	BRS 274	Common	Brazil	High yielding, desirable nut and apple qualities, tolerant to major disease and insect pests.
4	CCP-76	Dwarf	Brazil	High yielding, desirable nut and apple qualities, tolerant to major disease and insect pests.
5	Vengurl a-2	Common	India	High yielding, desirable nut and apple qualities, tolerant to major disease and insect pests.
6	Sulabha (K-10-2)	Common	India	High yielding, desirable nut and apple qualities, tolerant to major disease and insect pests.

Varieties of Cashew grown across India are:

SI No.	State	Salient features
1	Andhra Pradesh	BPP 4, BPP 6, BPP 8
2	Karnataka	Chintamani 1, Chintamani 2, Dhana (H – 1608), NRCC Selection 2, Bhaskara, Ullal 1, Ullal 3, Ullal 4, UN 50, Vengurla 4 & Vengurla 7
3	Kerala	Dhana, K 22-1, Madakkathara 1, Madakkathara 2, Kanaka, Amrutha and Priyanka
4	Madhya Pradesh	T No. 40 & Vengurla - 4.
5	Maharashtra	Vengurla 1, Vengurla 4, Vengurla 6 & Vengurla 7
6	Goa	Goa 1, Goa 2, Vengurla 1, Vengurla 4, Vengurla 6 & Vengurla 7

7	Orissa	Bhubaneswar 1, BPP 8 & Dhana
8	Tamin Nadu	VRI 1 & VRI 5
9	West Bengal	Jhargram 1 & BPP 8

## 1.4 HEALTH BENEFITS AND NUTRITIONAL INFORMATION

Cashews are rich in a range of nutrients. One ounce (28 grams) of unroasted, unsalted cashews provides you with around:

- **Calories:** 157
- **Protein:** 5 grams
- **Fat:** 12 grams
- **Carbs:** 9 grams
- **Fiber:** 1 gram
- **Copper:** 67% of the Daily Value (DV)
- **Magnesium:** 20% of the DV
- **Manganese:** 20% of the DV
- **Zinc:** 15% of the DV
- **Phosphorus:** 13% of the DV
- **Iron:** 11% of the DV
- **Selenium:** 10% of the DV
- **Thiamine:** 10% of the DV
- **Vitamin K:** 8% of the DV

- **Vitamin B6:** 7% of the DV

Cashews are especially rich in unsaturated fats (a category of fats linked to a lower risk of premature death and heart disease. They're also low in sugar, a source of fiber, and contain almost the same amount of protein as an equivalent quantity of cooked meat. In addition, cashews contain a significant amount of copper, a mineral essential for energy production, healthy brain development, and a strong immune system. They're also a great source of magnesium and manganese, nutrients important for bone health.

## **CONSTITUENTS AND HEALTH BENEFITS OF CASHEW**

### **Health benefits:**

The cashew tree (*Anacardium occidentale* L.) is a tropical tree native of Brazil and is being extensively grown in India, East Africa and Vietnam (Muniz et al., 2006). A main product from cashew tree is cashew nut (true fruit), which is rich in fat and protein. After picking the nut from the peduncle (cashew apple-pseudo fruit) (Garruti et al., 2006) cashew apple become biowaste. Cashew apple is used as a remedy for chronic dysentery and for sore throat in Cuba and in Brazil (Morton, 1987). Most of the fruit by-products could be used as functional ingredients when designing health foods (functional foods), especially non-digestible carbohydrates (dietary fiber) and bioactive compounds (ascorbic acid and flavonoids) (Laufenberg et al., 2003). Cashew apples are available in India in huge quantities but they find little commercial application at present except the manufacture of fenny (a type of brandy) and pectin (Maini and Anand, 1993; Ward and Ray, 2006).

Cashew apple juice is rich in sugars (Azevedo and Rodrigues, 2000), antioxidants (Trevisan et al., 2006; Kubo et al., 2006) and vitamin C (Azevedo and Rodrigues, 2000) and is widely consumed in Brazil (Nagaraja, 2007). Cashew apple juice has the potential to be a natural source of vitamin C and sugar in processed foods (De Carvalho et al., 2007). Cashew nut has a fine taste and a market potential but cashew apple even though rich in nutritive values like vitamin C and minerals, i.e., Ca, P, Fe it is not accepted as food

because it contains high tannin content and astringent taste however, the bioactive compounds, vitamins and minerals present in it, should be explored for other value addition. The cashew apple juice was found to contain a total of nine minerals in different level. Minerals like magnesium, sodium, iron, calcium, copper, sodium and zinc were also present at significant level of 279.70, 204, 133.9, 80.42, 1.17, 204.0 and 16.48 ppm, respectively in cashew apple juice (Table 1). Among the various minerals potassium was observed in high level (3337 ppm) followed by phosphorous (440.20 ppm). Potassium (K) is very essential element to prevent bone demineralization which is by controlling of calcium loss in urine (Tucker et al., 1999; He and MacGregor, 2001).

Copper is an essential and beneficial element in human metabolism and the average daily dietary requirement for copper in the adult human has been estimated as 2 mg and for infants and children at 0.05 mg kg<sup>-1</sup> b.wt. (Browning, 1969; WHO, 2004). The NRC (1980) reported that safe and adequate daily dietary intakes of copper ranging from 0.5-0.7 mg day<sup>-1</sup> for infants of 6 months age or less up to 2-3 mg day<sup>-1</sup> for adults. The copper content of 1.07 ppm observed in the cashew apple juice is within the safe prescribed limits of infants.

Sodium is the principle extracellular cation and is used for osmoregulation in inter modular fluid of human body. The recommended daily allowance of sodium is 115-75000 ppm for infants, 324-975 mg kg<sup>-1</sup> for children and 1100-3300 ppm for adults (Crook, 2006). Enzymes are involved in macronutrient metabolism and cell replications are mainly Zn dependent (Hays and Swenson, 1985; Arinola, 2008). Zinc is widely distributed in plant and animal tissues and present in all living cells. In cashew apple juice 16.48 ppm of Zinc was observed.

Magnesium is an active element in several enzyme systems in which thymine pyrophosphate is a cofactor. Oxidative phosphorylation is greatly reduced in the absence of magnesium. It also activates pyruvic acid carboxylase, pyruvic acid oxidase and the condensing enzyme for the reactions in the citric acid cycle (Murray et al., 2000). Even though the value obtained in the cashew apple juice is low as compared to the standard value, it can be used as natural sources of minerals with other food and beverages to rectify the child malnutrition.

The cashew apple color varied from bright red, orange, or yellow with a soft and fibrous fleshy. As variations in minerals and other nutrient content of apples are observed, in the present study, cashew apple available in southern part of India are analyzed for minerals and bioactive compounds.

1. Keeps the Brain Healthy and enhances its functionality
2. Improve Heart Functioning
3. Good for Preventing Cancer
4. Prevent Gallstones in the body
5. Treats Obesity and Helps in Weight Loss
6. Helps blood flow
7. Enhances Eye Health and Vision Clarity
8. Keeps the Blood Healthy
9. Helps treatment of Diabetes
10. Catalyst for Digestion
11. Keeps the Skin fresh and healthy
12. Strengthen and tones Bones
13. Keeps the Hair Shiny
14. Keeps the Teeth and Gums healthy
15. Good for Preventing Headaches

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

The cashew tree, *Anacardium occidentale L.*, belongs to the *Anacardiaceae* family of plants. The tree is native to Brazil, but has spread to other parts of tropical South and Central America, Mexico and the West Indies. The cashew tree is a tropical evergreen, resistant to drought, unexacting as to soil (although it prefers deep, sandy soil), which grows up to 12 metres high and has a symmetrical spread of up to approximately 25 metres. It has leathery oval

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leaves. Reddish flowers grow in clusters and the pear-shaped fruits, referred to as cashew apples, are red or yellowish in colour. At the end of each fruit is a kidney-shaped ovary, the nut, with a hard double shell. Between the shell and nut is black caustic oil, which is difficult to remove and can be used in varnishes and plastics. Optimum conditions include an annual rainfall of at least 889 mm (35 inches) and not more than 3 048 mm (120 inches).

### **Cultivation and Bearing:-**

The harvesting and processing of cashew is very labour intensive. After producing clusters of flowers, cashews produce the edible apple and also a nut encased in a heavy shell, which is the true cashew fruit. The cashew tree flowers for two or three months and fruit mature about two months after the bloom. The cashew nut forms first at the end of the stem.

Subsequently, the stem swells to form the "apple" with the nut attached externally. The cashew nut is 2.5 to 4.0 cm (1.0 to 1.5 inches) long and kidney shaped. Its shell is about 5 mm thick, with a soft leathery outer skin and a thin hard inner skin. When fully ripe, it falls to the ground.

Harvesting generally involves collecting the nuts once they have dropped to the ground after maturing. Workers scour the area and detach the nut from the fruit. The nuts are generally collected in baskets or sacks. Cashew fruit are generally left to fall to the ground before being collected, as this is an indication that the kernel is mature. If fruit are picked from the trees, the cashew apple will be ripe, but the kernel will still be immature. Apples to be used for processing into products such as jam or juices should be picked from the tree before they fall naturally.

Cashew nuts are dried in the sun for two reasons:

- i. To reduce the moisture content of the nut,
- ii. To mature the seed in the infrared and ultra-violet rays of the sun.

Cashew nuts should keep for 12 months or more, provided that they are dried to moisture content of eight percent or below, packed in sealed polythene bags and stored under dry conditions. The moisture content of cashew nuts at harvest is dependent on climatic conditions, moisture content of the soil, on which the nuts have fallen, weed growth density under the tree and the time between nut fall and harvest. High moisture content may cause deterioration of the kernel due to mould or bacterial attack or enzyme action. Drying the nuts immediately after harvesting is essential in preserving their quality, but this process is often neglected.

Sun drying of cashew nuts can be done on specially prepared drying floors or mats made of bamboo or palm leaves. The drying areas should be smooth and slightly sloping, so as to allow rainwater to run off. The cashew-nut layer on the drying floor should not be thicker than 10 cm, thus allowing for about 60 kg of nuts per square meter. The nuts should be constantly raked in order to ensure that they all receive the same benefit of the sun's rays and therefore they are dried evenly. The nuts should be heaped together and covered in the evenings. If the nuts are heaped while still warm, they will continue to dry under the cover of a tarpaulin. The nuts should be checked the following morning to ascertain the need for further drying.

Dried nuts should make a rattling sound when falling. Drying may take between one and three days depending upon local climatic conditions. As soon as the nuts are dry, they should be stored and protected from rain.

### **Storage**

Technical requirements for storage are dependent on weather conditions. As cashew nuts are usually produced in climates with a long dry season, simple buildings with concrete floors and walls and roofs of corrugated metal, should provide adequate storage.

Certain prerequisites must be satisfied to ensure safe storage:

1. A waterproof, dry floor,
2. A firm and secure roof,
3. Openings in the wall must be protected in order prevent water from entering the room,

4. Headroom must be adequate to allow the bags in a stack to be moved around if large quantities are to be stored,
5. The store should be easily inspected: there must be sufficient clearance between the wall and the bags, to allow individuals to walk around and check the condition of the stack,
6. The stack must be placed on a raised wooden platform, in order to prevent moisture from being drawn from the floor to the nuts.

### **Infestation of harvested nuts**

Raw cashew nuts, stored in sacks, sometimes in the open awaiting shipment and frequently without protection from rain, are subject to infestation through the stem-end. This may go undetected until damage has progressed to the point of heavy loss. Infestation also occurs in the shelled kernels at various stages of handling.

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

The nut is encased in a rock hard shell that is virtually impossible to penetrate after harvest. In order to extract the nut, the whole shell is soaked in water, softened by steaming and carefully air-dried to the final moisture content (9 percent). Each nut is hand massaged and cracked via a manual process that entails putting the nut against one sharp blade and bringing another blade, which is on a foot powered lever, through the outer shell. The blade on the foot lever is raised by an enthusiastic stomp allowing the outer shell to separate from the nut. The nut inside is carefully picked out of the outershell using a nut pick.

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

India is the main cashew processing country in Asia. The highly skilled workforce and low labour costs in India allowed it to have a virtual monopoly on the manual processing of cashew for many years.

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The traditional practice in the south Arcot region of India was to spread the nuts out on flat rocks in the sun, to allow them to dry until the shell became brittle. The kernel could then be removed from the shell by striking the nut with a wooden batten to split the shell along the natural line of cleavage. The cashew kernel was removed from the shell without becoming contaminated by the CNSL. Use of this method was made possible by the suitability of humidity and climate condition in that particular region of India. Shells are further processed to obtain the CNSL. An alternative method of removing the kernel from the shell is to subject the nuts to very low temperatures, thus causing the shell to become brittle. Following this, the nuts are mechanically cut along the natural line of cleavage and the kernels removed. The shells are then further treated to remove the CNSL. This method of kernel removal has been commercially adopted.

### **Cashew products**

Three main cashew products are traded on the international market: raw nuts, cashew kernels and cashew nut shell liquid (CNSL). A fourth product, the cashew apple is generally processed and consumed locally.

The raw cashew nut is the main commercial product of the cashew tree, though yields of the cashew apple are eight to ten times the weight of the raw nuts. Raw nuts are either exported or processed prior to export. Processing of the raw nuts releases the by-product CNSL that has industrial and medicinal applications. The skin of the nut is high in tannins and can be recovered and used in the tanning of hides. The fruit of the cashew tree that surrounds the kernel can be made into a juice with a high vitamin C content and fermented to give a high proof spirit. The cashew nut kernel is constituted of three different portions namely the shell, the kernel and the adhering testa. The primary product of cashew nuts is the kernel, which is the edible portion of the nut and is consumed in three ways:

- Directly by the consumer,
- As roasted and salted nuts,

- In confectionery and bakery products, for example, finely chopped kernels are used in the production of sweets, ice creams, cakes and chocolates, both at home and industrially and as paste to spread on bread.

The relative importance of these uses varies from year to year and country to country, but it is estimated that at least 60percent of cashew kernels are consumed as salted nuts. Separately packed cashew nuts are a good selling line, mainly as an appetizer to cocktail drinks. Salted cashews are part of the snack food market. They compete mainly with other nuts, although chips, salted popcorn and other savoury snacks can impinge on the nut market. The price of cashew nuts is much higher than the price of peanuts or other snacks so those sales must be based on a strong taste preference by the consumer.

### **Cashew kernels**

It is estimated that 60 percent of cashew kernels are consumed in the form of snacks while the remaining 40 percent are included in confectionery. The cashew competes in the same market as other edible nuts including almonds, hazels, walnuts, pecans, macadamias, pistachios and peanuts. There has recently been a considerable rise in demand for edible nuts by consumers interested in quality and health aspects of food. The breakfast cereal, health food, salads and baked goods markets are all expanding markets for cashew nuts.

### **Cashew nut shell liquid**

Cashew nut processing allows for the development of an important by-product, which can increase its added value. The liquid inside the shell (CNSL) represents 15 percent of the gross weight and has some attractive possible medicinal and industrial uses. CNSL is one of the few natural resins that is highly heat resistant and is used in braking systems and in paint manufacture. It contains a compound known as *anacardium*, which is used to treat dermatological disorders.

The cashew nut shell contains a viscous and dark liquid, known as cashew nut shell liquid (CNSL), which is extremely caustic. It is contained in the

thin honeycomb structure between the soft outer skin of the nut and the harder inner shell. The CSNL content of the raw nut varies between 20 and 25 percent. Cashew nut shell liquid (CNSL) is an important and versatile industrial raw material. There are more than 200 patents for its industrial application. CNSL is also used in mouldings, acid-resistant paints, foundry resins, varnishes, enamels and black lacquers for decorating vases and as insecticides and fungicides. In tropical medicine, CNSL has been used in treating leprosy, elephantiasis, psoriasis, ringworm, warts and corns.

### **Cashew Apple:**

The cashew "apple" or false fruit is an edible food rich in vitamin C. It can be dried, canned as a preserve or eaten fresh from the tree. It can also be squeezed for fresh juice, which can then be fermented into cashew wine, which is a very popular drink. In parts of India, it is used to distil cashew liquor referred to as *feni*. The cashew apple is between three and five inches long and has a smooth, shiny skin that turns from green to bright red, orange or yellow in colour as it matures. It has a pulpy, juicy structure, with a pleasant but strong astringent flavour. Furthermore, the fruit has medicinal properties. It is used for curing scurvy and diarrhoea and it is effective in preventing cholera. It is applied for the cure of neurological pain and rheumatism. It is also regarded as a first-class source of energy.

Cashew fruit can be made suitable for consumption by removing the undesirable tannins and processing the apples into value-added products, such as juices, syrups, canned fruits, pickles, jams, chutneys, candy and toffee. The recommended methods for removing the astringent properties of the cashew apple include steaming the fruit for five minutes before washing it in cold water, boiling the fruit in salt water for five minutes or adding gelatin solution to the expressed juice. In gathering the fruits and transporting them to be processed, the prime purpose should be to have the fruit arrive in the very best condition possible. Cashew apples should be sorted and only mature, undamaged cashew apples should be selected for use in recipes. These should be washed in clean water prior to use.

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## **Cashew wine**

Cashew wine is made in many countries throughout Asia and Latin America. It is a light yellow alcoholic drink, with an alcohol content of 6 to 12 percent.

### **Processing**

Cashew apples are cut into slices in order to ensure a rapid rate of juice extraction when they are crushed in the juice press. The fruit juice is sterilized in stainless steel pans at a temperature of 85°C in order to eliminate any wild yeast. The juice is filtered and treated with either sodium or potassium metabisulphite, to destroy or inhibit the growth of undesirable types of micro-organisms such as acetic acid bacteria, wild yeast and moulds. Wine yeast (*Saccharomyces cerevisiae* - var. ellipsoideus) should be added. Once the yeast has been added, the juice is thoroughly stirred and allowed to ferment for about two weeks. The wine is separated from the sediment and clarified by mixing fining agents, such as gelatin, pectin or casein, with the wine. Filtration is carried out with filter-aids such as fullers earth. The filtered wine is transferred to wooden vats. The wine is pasteurized at 50 to 60°C.

The temperature should be controlled, so that it does not rise exceed 70°C, since alcohol vaporizes at a temperature of 75 to 78°C. The wine is then stored in wooden vats and subjected to ageing. At least six months should be allowed for ageing. If necessary, the wine should be clarified again before bottling. During ageing and subsequent maturing in bottles, many reactions, including oxidation, occur. The formation of traces of esters and aldehydes, together with the tannin and acids already present enhance the taste, aroma and preservative properties of the wine. The product is packaged in glass bottles with corks and should be kept out of direct sunlight.

## **Dried cashew fruits**

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Cashew fruit are not readily consumed in the raw state because of their high content of astringent compounds. If these are removed and the fruit is sweetened, it can be converted into a useful dried product. The fruit must therefore be extensively processed prior to drying.

Fruits are prepared according to the following process:

Fruits are picked from the tree using special hooked sticks (note that fruits harvested at this stage of maturity contain nuts that are immature). The fruit is washed and boiled in salted water (two percent solution) for five minutes to remove the astringent compounds. The skin is pricked with a fork and the fruit pressed in a small hand press to extract the juice. The collected juice is reserved for later use. The fruit is boiled for three hours in a solution of cashew juice and raw sugar (2 kg raw sugar in 10 liters of juice). Other sweeteners can also be used, for example: 0.5 kg white sugar in 1.8 liters of cashew juice; 1.2 litres cane juice in 1 litre cashew juice; 250 ml (1 cup) honey in 2 litres cashew juice. The boiled, sugared fruit is laid out on screens and placed in a drier. In a simple solar drier, drying time takes about three days. The fruit is packaged in airtight moisture-resistant packaging.

## **2. MODEL CASHEW NUT 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 cashew producing states where cashew is grown on commercial scale are Maharashtra, Kerala, Andhra Pradesh, Orissa, Karnataka, Tamil Nadu, Goa and West Bengal.

### **2.2 INSTALLED CAPACITY OF THE CASHEW NUT PROCESSING UNIT**

The maximum installed capacity of the Cashew nut manufacturing unit in the present model project is proposed as 150 tonnes/annum or 500 kg/day Cashew nut. 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 55 percent capacity, 3<sup>rd</sup> year 65 percent capacity, 4<sup>th</sup> year 75 percent capacity, 5<sup>th</sup> year 90 percent capacity & 6<sup>th</sup> year onwards 100 percent capacity utilization is assumed in this model project.

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

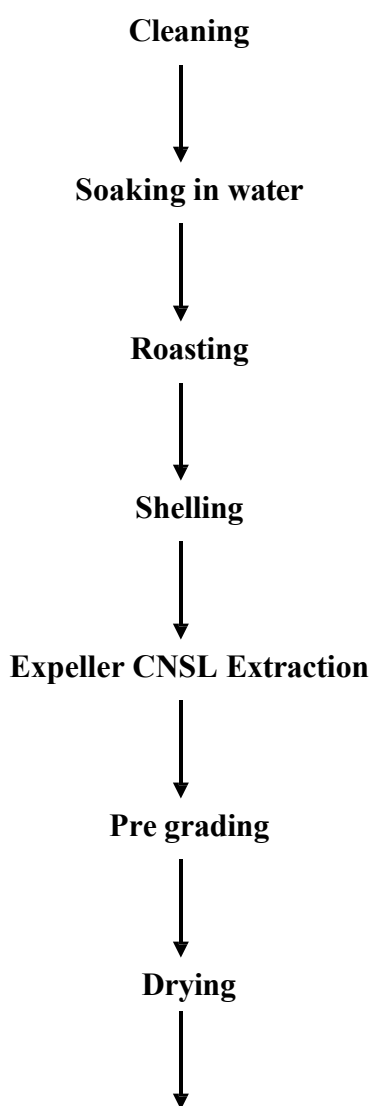
A sustainable food processing unit must ensure maximum capacity utilization and thus requires an operation of minimum 280-300 days per year to get reasonable profit. Therefore, ensuring uninterrupted raw materials supply requires maintenance of adequate raw material

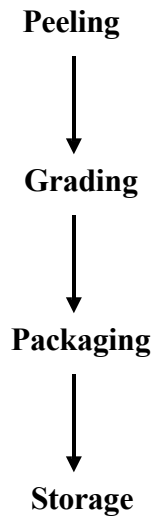
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inventory. The processor must have linkage with producer organizations preferably FPCs through legal contract to get adequate quantity and quality of raw materials which otherwise get spoiled. In the Cashew nut manufacturing project, the unit requires 467.5 kg/day, 552.5 kg/day, 637.5 kg/day, 765 Kg/day & 850 kg/day Cashew fruit at 55, 65, 75, 90 & 100 percent capacity utilization, respectively.

## **2.4 MANUFACTURING PROCESS OF THE CASHEW NUT**

**Flow chart for cashew nut:**





## **2.5 MARKET DEMAND AND SUPPLY FOR CASHEW NUT**

Cashew processing is a very competitive but also a potentially lucrative activity that can and should be exploited by more small-scale processors. African countries that are in the process of re-building their local cashew processing industry would be well advised to follow the Indian example of small scale, mainly manual processing operations. There are several good reasons why small-scale producers and processors should get involved in cashew processing, including the following:

- Cashew kernels are a high value luxury commodity with sales growing steadily at an annual rate of seven percent, with every expectation that the market will remain strong.
- There is substantial potential to exploit cashew by-products, such as cashew butter, from broken nuts, CNSL for industrial and medicinal purposes and the juice of the cashew apple that can be processed further.
- Cashew is a good crop for smallholder farmers. In Mozambique cashew is considered by smallholder farmers to be one of their most lucrative crops. It requires few inputs and harvesting does not coincide with peak labour demands for other food crops

Thus cashew has the potential to increase the incomes of poor producers, to create employment opportunities during harvesting and processing and to increase exports. However, as with all small-scale processing operations, cashew processing is not without risk or problems. In order for the small-scale processor to succeed, there are certain constraints, which also need to be considered:

- Cashew production is very weather dependent so supply is variable. World prices, although stable on average, are
- Highly volatile in the short term.
- Luxury goods must be of high quality. In order to compete directly in the world market, a high level of standards,
- Branding and marketing are required.
- Exploitation of by-products requires new technology, which may be expensive or difficult to obtain.

## **2.6 MARKETING STRATEGY FOR CASHEW NUT**

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 cashew products.

## **2.7 DETAILED PROJECT ASSUMPTIONS**

This model DPR for Cashew nut 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 nut processing line. Therefore, land and civil infrastructures are assumed as already available with the entrepreneurs.

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- 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. Cashew cost considered @ Rs.160/-per kg.
  2. 1 kg Cashew will produce 60% 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 Cashew nuts Unit	150	MT/annum
Utilization of capacity	1st Year Implementation, 55% in second, 65% in third, 75% in fourth year, 90% in fifth years, & 100% in sixth years onwards respectively.	
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	160	
Average sale prices per Kg	690	Rs/kg
Seed extraction	60	
CASHEW NUT	1.7 Kg Cashew fruit for 1 kg Cashew nut	

## 2.8 FIXED CAPITAL INVESTMENT

### 2.8.1 MACHINERY AND EQUIPMENT

Sr No.	Equipment	Capacity	Quantity	Price (Rs. In Lacs)
1	Size screen	3	Suitable	0.15
2	Soaking drum	5	200 liter	0.09
3	Open pan roaster	1	150 kg/hr	0.4
4	Automatic shelling machine	2	60 kg/hr	2.4
5	Solar dryer	1	600 kg	2
6	Humidification fan	1	suitable	0.15
7	Vacuum sealing machine	1	20 PPM	2
8	Weighing balance	1	Suitable	0.06
9	Accessories	1	Suitable	0.5
			Total	7.75

### 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 43.66 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	11.02	13.03	17.76
Work in progress	15 days	22.05	26.05	35.53
Packing material	15 days	0.45	0.53	0.73
Finished goods' stock	15 days	24.46	28.91	39.43
Receivables	30 days	48.93	57.83	78.85
Working expenses	30 days	0.79	0.93	1.27
Total current assets		107.70	127.28	173.57

Trade creditors		0.00	0.00	0.00
Working capital gap		107.70	127.28	173.57
Margin money (25%)		26.93	31.82	43.39
Bank finance		80.78	95.46	130.18

## 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	7.75
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	26.93
Total project cost (i to vii)	43.66
Means Of finance	
i. Subsidy	9.60
ii. Promoters Contribution	10.91
iii. Term Loan (@10%)	23.14

## 2.11 MANPOWER REQUIREMENTS

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

## 2.12 EXPENDITURE, REVENUE AND PROFITABILITY ANALYSIS

	Particulars	1st Year	2nd Year	3rd Year	4th Year	5th year	6th year
A	Total Installed Capacity (MT)	255 MT Cashew fruits/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					
	Cashew (Av. Price @ Rs.160/Kg )	0.00	198.00	234.00	270.00	324.00	360.00
	Packaging materials (Rs 6 per Kg)	0.00	4.95	11.70	13.50	16.20	18.00
	Utilities (Electricity, Fuel)	0.00	0.48	0.57	0.65	0.78	0.87
	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>214.01</b>	<b>256.95</b>	<b>294.94</b>	<b>351.77</b>	<b>389.66</b>
C	<b>Total Sales Revenue (Rs. in Lakh)</b>	<b>0.00</b>	<b>569.25</b>	<b>672.75</b>	<b>776.25</b>	<b>931.50</b>	<b>1035.00</b>
	Sale of Cashew nuts (Av. Sale Price @ Rs.690/kg)	0.00	569.25	672.75	776.25	931.50	1035.00
D	<b>PBDIT (Total exp.-Total sales rev.) (Rs. in Lakh)/Cash Inflows</b>	<b>-2.96</b>	<b>355.24</b>	<b>415.80</b>	<b>481.31</b>	<b>579.73</b>	<b>645.34</b>
	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	0.78	0.70	0.63	0.56	0.51	0.46
	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%	2.41	2.32	2.23	2.13	2.02	1.89
	Interest on working capital @ 12%	0.00	9.69	9.69	9.69	9.69	9.69
E	Profit after depreciation and Interest (Rs. in Lakh)	<b>-6.52</b>	<b>351.87</b>	<b>412.62</b>	<b>478.32</b>	<b>576.93</b>	<b>642.74</b>

F	Tax (assumed 30%) (Rs. in Lakh)	0.00	105.56	123.79	143.50	173.08	192.82
G	Profit after depreciation, Interest & Tax (Rs. in Lakh)	-6.52	246.31	288.83	334.83	403.85	449.92
H	Surplus available for repayment (PBDIT-Interest on working capital-Tax) (Rs. in Lakh)	2.41	2.32	2.23	2.13	2.02	1.89
I	Coverage available (Rs. in Lakh)	2.41	2.32	2.23	2.13	2.02	1.89
J	Total Debt Outgo (Rs. in Lakh)	0.80	0.89	0.98	1.08	1.19	1.32
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)	-5.37	247.35	289.78	335.69	404.64	450.63
M	Payback Period	2.5 Years					
	(on Rs. 43.66 Lakhs initial investment)						

### 2.13 REPAYMENT SCHEDULE

Year	Beginning	PMT	Interest	Principal	Ending Balance
1	2,313,735.45	320,959.49	240,628.49	80,331.00	2,233,404.44
2	2,233,404.44	320,959.49	232,274.06	88,685.43	2,144,719.01
3	2,144,719.01	320,959.49	223,050.78	97,908.71	2,046,810.30
4	2,046,810.30	320,959.49	212,868.27	108,091.22	1,938,719.08
5	1,938,719.08	320,959.49	201,626.78	119,332.71	1,819,386.38
6	1,819,386.38	320,959.49	189,216.18	131,743.31	1,687,643.07
7	1,687,643.07	320,959.49	175,514.88	145,444.61	1,542,198.46
8	1,542,198.46	320,959.49	160,388.64	160,570.85	1,381,627.61
9	1,381,627.61	320,959.49	143,689.27	177,270.22	1,204,357.39

10	1,204,357.39	320,959.49	125,253.17	195,706.32	1,008,651.07
11	1,008,651.07	320,959.49	104,899.71	216,059.78	792,591.29
12	792,591.29	320,959.49	82,429.49	238,530.00	554,061.29
13	554,061.29	320,959.49	57,622.37	263,337.12	290,724.18
14	290,724.18	320,959.49	30,235.31	290,724.18	-
		4,493,432.86	2,179,697.42	2,313,735.45	(2,313,735.45)

## 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	7.75	6.98	6.28	5.65	5.08	4.58	4.12	3.71
Depreciation	0.78	0.70	0.63	0.56	0.51	0.46	0.41	0.37
Depreciated value	6.98	6.28	5.65	5.08	4.58	4.12	3.71	3.34
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	13.73	12.58	11.53	10.58	9.72	8.94	8.23	7.58
Depreciation	1.15	1.05	0.95	0.86	0.78	0.71	0.65	0.59
Depreciated value	12.58	11.53	10.58	9.72	8.94	8.23	7.58	6.99

## 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)	43.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Recurring cost (Rs. in Lakh)	2.96	214.01	256.95	294.94	351.77	389.66	389.66	389.66	
Total cost (Rs. in Lakh)	46.62	214.01	256.95	294.94	351.77	389.66	389.66	389.66	2333.25
Benefit (Rs. in Lakh)	0.00	569.25	672.75	776.25	931.50	1035.00	1035.00	1035.00	
Total Depreciated value of all assets (Rs. in Lakh)								6.99	
Total benefits (Rs. in Lakh)	0.00	569.25	672.75	776.25	931.50	1035.00	1035.00	1041.99	6061.74
Benefit-Cost Ratio (BCR): (Highly Profitable project)	<b>2.598</b>								
Net Present Worth (NPW):	3728.49								

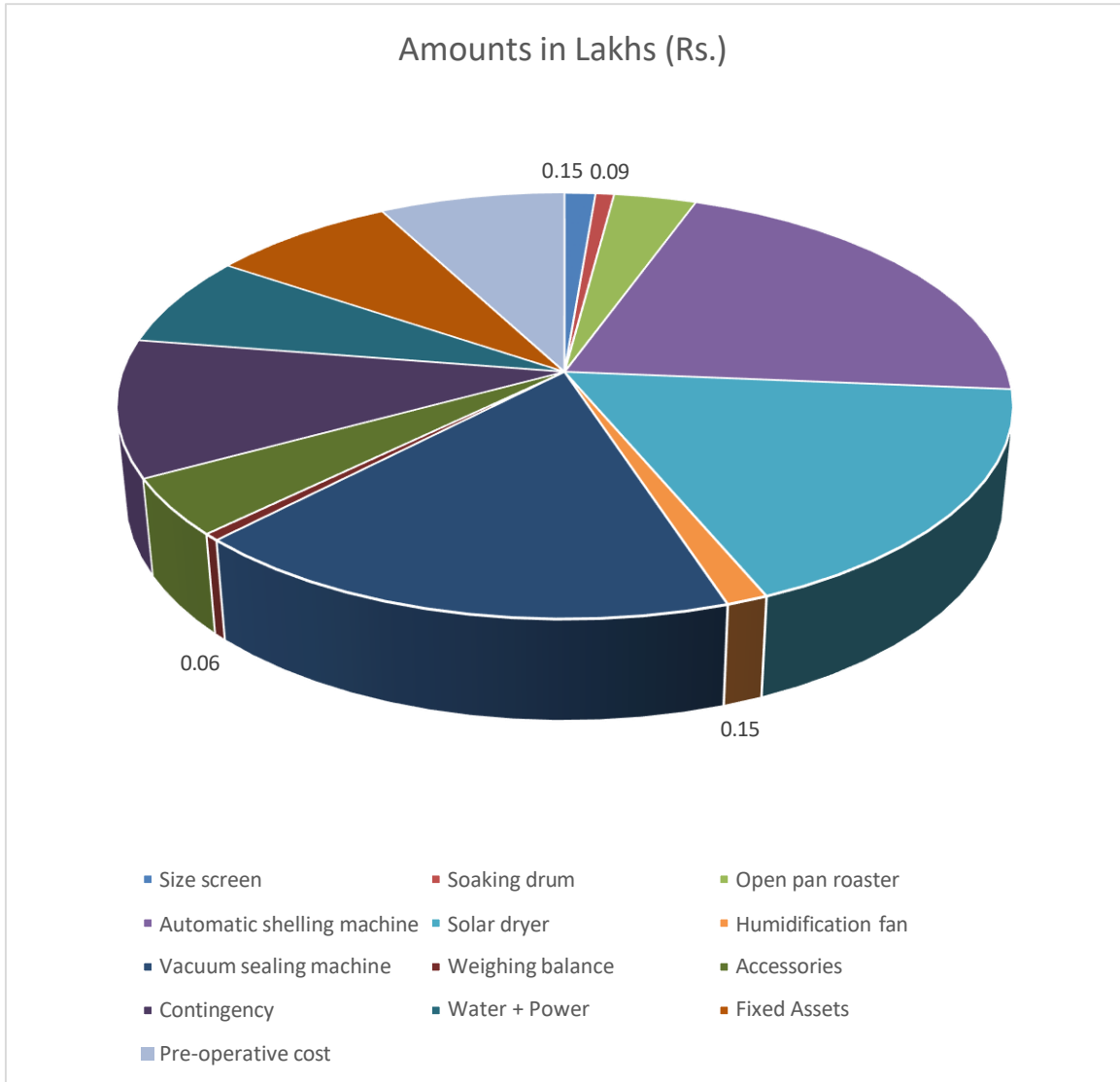
## 2.16 BREAK EVEN ANALYSIS

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.

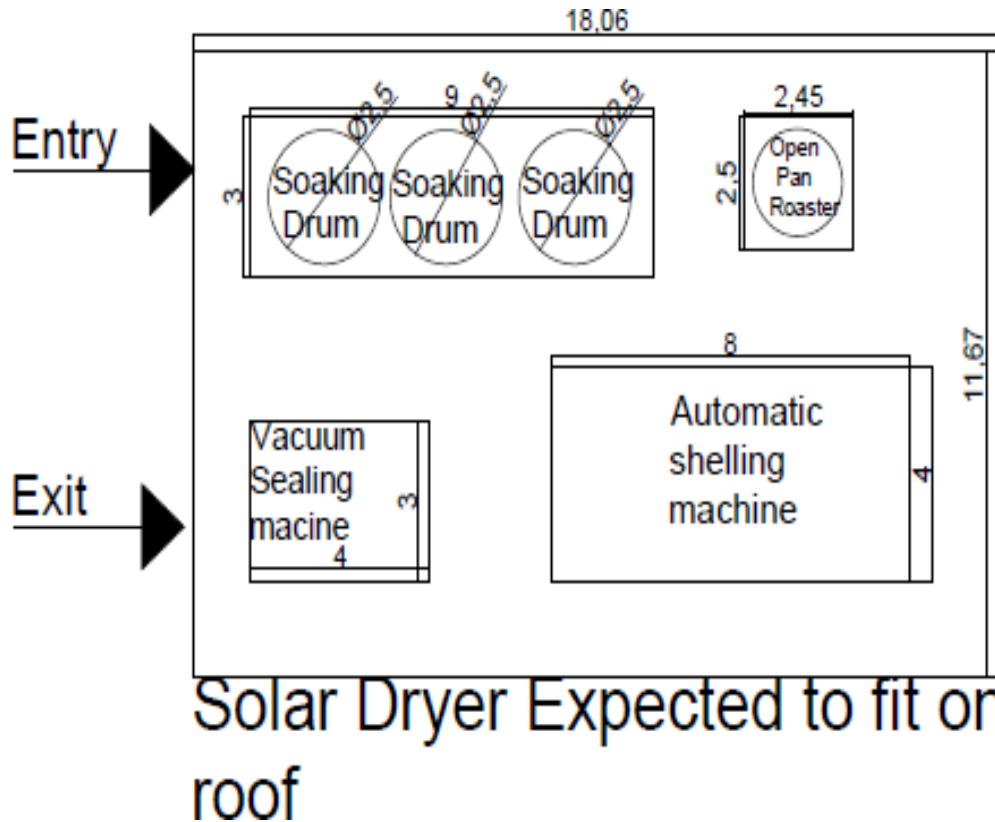
Particulars	1st Year	2nd year	3 rd year	4th year	5th year	6th year	7th year	8th year
Capacity utilization (%)	Under Const.	55%	65%	75%	90%	100%	100%	100%
Production MT/Annum		82.5	97.5	112.5	135	150	150	150
Fixed Cost (Rs. in Lakh)								
Permanent staff salaries	7.284	7.284	7.284	7.284	7.284	7.284	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	0.78	0.70	0.63	0.56	0.51	0.46	0.41	0.37
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	2.41	2.32	2.23	2.13	2.02	1.89	1.76	1.60
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>11.14</b>	<b>10.95</b>	<b>10.76</b>	<b>10.57</b>	<b>10.38</b>	<b>10.18</b>	<b>9.98</b>	<b>9.77</b>
<b>Sales Revenue (Rs. in Lakh)</b>	<b>0</b>	<b>569.25</b>	<b>672.75</b>	<b>776.25</b>	<b>931.5</b>	<b>1035</b>	<b>1035</b>	<b>1035</b>
Variable Cost (Rs. in Lakh)								
Cashew Nut(Av. Price @ Rs. 690/Kg )	0.00	198.00	234.00	270.00	324.00	360.00	360.00	360.00
Packaging materials	0.00	4.95	5.85	6.75	8.10	9.00	9.00	9.00
Casual staff salaries	0.00	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Utilities (Electricity, Fuel)	0.00	0.48	0.57	0.65	0.78	0.87	0.87	0.87
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	9.69	9.69	9.69	9.69
<b>Total Variable Cost (Rs. in Lakh)</b>	<b>0.50</b>	<b>221.61</b>	<b>258.69</b>	<b>295.78</b>	<b>351.10</b>
Break Even Point (BEP)					
as % of sale	-	12.00	10.00	8.00	8.00
Break Even Point (BEP) in terms of sales value (Rs. in Lakhs)	-	68.31	67.28	62.10	74.50

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



## 2.18 TYPICAL CASHEW NUT 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 DP**

- i. This DPR has provided only the basic standard components and methodology to be adopted by an entrepreneur while submitting a proposal under the Formalization of Micro Food Processing Enterprises Scheme of MoFPI.
- ii. This DPR is made to provide general methodological structure not for specific entrepreneur/crops/location. Therefore, information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of business, background of proposed project, location, raw material base/contract sourcing, entrepreneur's own SWOT analysis, market research, rationale of the project for specific location, community advantage/benefit, employment generation etc are not given in detail.
- iii. The present DPR is based on certain assumptions on cost, prices, interest, capacity utilization, output recovery rate and so on. However, these assumptions in reality may vary across places, markets and situations; thus the resultant calculations will also change accordingly.

#### **3.2 GUIDELINES FOR THE ENTREPRENEURS**

- i. The success of any prospective food processing project depends on how closer the assumptions made in the initial stage are with the reality of the targeted market/place/situation. Therefore, the entrepreneurs must do its homework as realistic as possible on the assumed parameters.
  - ii. This model DPR must be made more comprehensive by the entrepreneur by including information on the entrepreneur, forms and structure (proprietorship/partnership/cooperative/ FPC/joint stock company) of entrepreneur's business, project location, raw material costing base/contract sourcing, detailed market research, comprehensive dehydrated product mix based on demand, rationale of the project for specific location, community advantage/benefit from the project, employment generation, production/availability of the raw materials/crops in the targeted area/clusters
-

and many more relevant aspects for acceptance and approval of the competent authority.

- iii. The entrepreneur must be efficient in managing the strategic, financial, operational, material and marketing aspects of a business. In spite of the assumed parameter being closely realistic, a project may become unsustainable if the entrepreneur does not possess the required efficiency in managing different aspects of the business and respond effectively in changing situations.
- iv. The machineries should be purchased after thorough market research and satisfactory demonstration.
- v. The entrepreneur must ensure uninterrupted quality raw materials' supply and maintain optimum inventory levels for smooth operations management.
- vi. The entrepreneur must possess a strategic look to steer the business in upward trajectory.
- vii. The entrepreneur must maintain optimum (not more or less) inventory, current assets. Selecting optimum source of finance, not too high debt-equity ratio, proper capital budgeting and judicious utilization of surplus profit for expansion is must.
- viii. The entrepreneur must explore prospective markets through extensive research, find innovative marketing strategy, and maintain quality, adjust product mix to demand.
- ix. The entrepreneur must provide required documents on land, financial transaction, balance sheet, further project analysis as required by the competent authority for approval.
- x. The entrepreneur must be hopeful and remain positive in attitude while all situations.



## Contact Us

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