Mango butter financial feasibility analysis: Value added in the Chittoor District, Andhra Pradesh, India

by

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ABSTRACT

Mango butter is one of the byproducts from mangos that is mostly used in the cosmetic and soap industry. Hydraulic pressing is one way to extract the oil from the mango kernel. Hydraulic pressing is more cost effective for small scale processors due to both a relatively lower initial and operating cost. Moreover, the processing produces uncontaminated oil and a pure cake residue when compared to screw press or solvent extraction method. This thesis was undertaken to study the financial feasibility of value added to the mango by manufacturing mango butter in the Chittoor district, Andhra Pradesh India. The Totapuri mango variety is studied.

A number of locations in India were evaluated for the manufacturing unit location considering the area of production, mango productivity and the presence of pulp factories for raw material sourcing. The analysis indicated that the Chittoor district in Andhra Pradesh, India has a cluster of mango pulp factories that are reliable sources of raw material.

Indian consumers are generally quick to adopt new products with better experiences and more convenience. This study identifies additional uses for mango butter in countries that consume mango butter, and highlights products with which mango butter would be in competition. The advantages and limitations of competitors producing in the Indian market are discussed.

The recommendation of this study is that entrepreneurs should study the sector thoroughly before investing in mango butter production. Project size and outlay of the

depend upon the market size, the type of technology that will be used and how automated the project will be. New entrepreneurs may partner with existing merchant exporters initially to gain entry into international markets. Once entry is obtained, vast export potential for such products can be slowly tapped.

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Now, as I carry this in my hand, I carry with me memories that will enrich my nostalgia.

CHAPTER I: INTRODUCTION

1.1 Company Mission and Vision Statement

The goal of creating personal and social change through sustainable agriculture.

1.1.1 Mission statement

The production of mango kernel oil that is a byproduct of the mango fruit, using raw material sourced from a cluster of mango pulp factories at reduced cost. High quality processing is used to produce high value cosmetic and soap that is strategically marketed to deliver, flawless and beautiful skin and increase an overall youthful look that every woman desires. Also, mango butter will substitute for other tropical fats and oils such cocoa butter for use at a comparable reduced cost.

1.1.2 Vision statement

To deliver a high quality product by carefully listening to the customer needs and exceeding their expectations.

1.1.3 Core Values

Accountability, Integrity, Respect, Team Spirit, Transparency, Customer focus, Create leaders to be proactive, influence, set rules with speed, quality and innovative behavior. Finally, employees will be valued by creating highly motivated, knowledgeable and the best trained in the industry thereby achieving corporate goals.

1.2 Mango Kernel

The mango plays an important role in balancing the diet of human beings by providing about 64-86 calories of energy depending upon the mango variety. The mango kernel contains measured in dry weight about 6% protein, 11% fat, 77%

carbohydrates, 2% crude fiber and 2% ash (Abdalla, et al. 2007). Although, the mango seed kernel has a low content of protein, the quality of protein is good. The amino acid profile of different varieties of the mango seed kernel protein contains most of the essential amino acids, with high values of leucine, valine, and lysine (Abdalla, et al. 2007). Mango seed kernals are also shown to be a good source of polyphenols, phytosterols as campesterols, b-sitosterol and tocopherols (Abdalla, et al. 2007). Studies of the mango seed kernel examining nutritional and toxiocological make up have shown indicate mango seed kernel fat has the potential to be a safe source of oil that can be eaten. This nutritious and non-toxic oil has the potential to be substituted without adverse effects for fat in solid state. The lipids extracted from different mango varieties are free from toxic materials including hydrocyanic acid, and these components could be commercially valued for the vegetable oil industry (Abdalla, et al. 2007) as well as the confectionery and tanning industries. The mango seed kernel has the potential to be a source of functional food ingredients because of the high fat and protein quality and the high levels of natural antioxidants present in the kernel.

The mango kernel contains high amounts of fat and starch. The quality of oil extracted from the kernel is high, making it useful for the cosmetic and soap industries (NABARD 2017). Because of the many uses of mango kernel oil, the demand for the oil has increased. Therefore, there is a need for faster and more efficient methods of oil extraction.

After consumption or industrial processing of the mango, considerable amounts of seeds are discarded as waste. The seed represents 20% to 25% of the whole fruit. The kernel inside the seed represents from 45% to 75% of the seed and about 20% of the whole fruit. More than one million tons of mango seed is annually produced and often is discarded as waste. If such seeds could be used, wastes could be reduced and valuable products can be produced. The mango kernel flour (starch) after mixing with wheat or maize flour is used in chapatis in India. About 10% of alcohol can be obtained from fermentation.

It is important to considering the advantages of using a hydraulic press in mango kernel oil expression. It is necessary to study the effects of processing the oil recovered and the quality of oil and cake obtained through the hydraulic press (Babaria and Vashney 2012).

1.3 Strategy

Mango kernel processing seeks to coordinate the management of mango oil production in the country through a multi-pronged strategy, namely, assessment of the domestic demand for mango oil and its availability from domestic sources (Department of Food & Public Distribution 2016). Branded products are costly so newcomers to the market should focus on competitive pricing. Competition comes from imitation of the model in the same region. The following factors can be an advantage to compete effectively. Storage and Packaging are an advantage point where the entire product range manufactured follows the Weight and Measurement Act and accordingly in different standard keeping units (SKU). Products from processed kernels should be stored by the batch number allocated to their particular product. The product should be stored separately in storage areas. The “First in First Out (FIFO)” or “First expiry First Out (FIFO)” method is followed in the dispatch process. The entire product should be stored at ambient temperature in a dry place (APICOL 2014).

To maintain hygiene and quality control, the processed product will follow the Safety And Standard Authority Of India (FSSAI) Act 2006. The FSSAI Act is applicable in India for all food products. It describes the minimum standard operating procedures, food safety norms, packaging and labeling norms. The new units need to obtain a license called the FSSAI number from the Food Safety and Standards Authority of India (Food Safety and Standards Authority of India 2014).

A mismatch of demand and supply of mango oil must be assessed regarding the effect on price. In addition to the domestic market, there is good demand for fats and oils in export markets. Indian products are widely accepted throughout the world for commercial products and household consumption products (APICOL 2014). At this stage, India has to closely monitor prices of mango oil both in the domestic and in the international market and initiates policy measures whenever necessary. The Division is staffed with qualified technical people who assist The Ministry of Food and Processing to coordinate the management of mango oil particularly relating to production/availability and monitoring of prices (Department of Food & Public Distribution 2016).

1.4 Policies

Organic edible oils such as mango oil have been exempted from the prohibition of the export of edible oils. The export of edible oils has been permitted in branded consumer packs of up to 5 kg, subject to a minimum export price of 900 US$ per metric tonne (Department of Food & Public Distribution 2016).

1.4.1 Major decisions in respect of edible oils during 2014-2015

1. Vide notification No108 (RE-2013)/2009-2014 dated 6th February, export of edible oils in branded consumer packs is permitted with a minimum export price of US$ 900 per metric tonne.

2. Vide Notification No.17/2015-20 dated 6th August, 2015, organic edible oils subject to export contracts being registered and certified as "Organic" by Agricultural & Processed Food Products Export Development Authority (APEDA) and rice bran oil in bulk have been exempted from ban on export of edible oils.

3. With implementation of the FSSAI act 2006, the edible oils industry is now governed by the FASSI for issue of license, safety and standard parameters. However, the data monitoring of procurement for the edible oil industries are being administered by DVVOF (Directorate of Vanaspati Vegetable Oils and Fats) under the Vegetable Oils Products, Production and Availability (Regulation) Order, 2011.

1.5 E-Governance initiatives

To improve and systemize the data management system in the vegetable oil sector, the Directorate of Sugar & Vegetable Oils under the Department of Food and Public Distribution has developed a web-based platform (evegoils.nic.in) for online submission of inputs by vegetable oil producers on a monthly basis. This has helped the Government to make informed policy decisions for better management of the vegetable oil sector. The new system also provides transparency in the data management of the vegetable oil industry. The portal also provides for online registration and submission of monthly production return data.

1.6 Mango Butter as a substitute for Cocoa butter

Mango kernel fat alone or blended with other nut fats such as the almond or palm stearin, can act as a cocoa butter replacer. This cocoa butter replacer has good triglyceride content and thermal properties. Extracted fat from the mango seed has triglycerides, fatty acids and phospholipids that are comparable to those of cottonseed oil or cocoa butter. Mango seed kernel oil can be used in butterscotch toffee given that mango kernel oil and cocoa butter are almost identical in several of their triglycerides, fatty acids and effects on taste, odor, and texture of the toffee.

1.7 Financial feasibility study

The financial feasibility is analyzed for processing of mango butter. It is motivated by the abundant availability of raw material in the Chittor district, Andhra Pradesh, India. It helps in waste reduction from the cluster of mango pulp industries in the region and also its usage as a substitute for cocoa butter in the cosmetic, pharmaceutical and baking industry within India and around the world. Furthermore, the process of production involves uncertainties that makes projects risky. Financial feasibility assumptions are presented in this thesis that can be used as a base for comparison.

Entrepreneurs may start their new business as an individual, proprietary concern, partnership or joint stock company. Individual and proprietary companies are assigned a PAN number and it is preferred they establish bank account. Partnership firms should execute a partnership deed as per the Indian Partnership Act 1932 on a Non Judicial Stamp paper as per the Stamp Act of the State Government and register the partnership firm with the Ministry of Corporate affairs (Department of Food & Public Distribution 2016). The joint stock company can be formed as private limited, public limited or producers company as per The Company Act 2013 (Government of India 2017).

1.8 Thesis structure

The thesis is structured in the following way: Chapter 2 contains a review of mango butter, and the related theory. The Conceptual Theory is presented in Chapter 3. Discussion of the thesis concept and related data for this study and the Methodology and Data collection details and formulas are given and discussed in Chapter 4. In Chapter 5, the conclusion and summary are presented.

CHAPTER II: LITERATURE REVIEW

2.1 Global and India Mango Production

Mangos are the most important tropical fruit crop of India. It's called king of the fruits on account of its nutritive value, taste, attractive fragrance and health promoting qualities. It's an outstanding source of vitamin A and C.

The mango fruit is a large fleshy drupe, highly variable in size, shape and colour and taste, weighing up to a kilogram for some cultivars. There are more than 1,000 mango cultivars. The mango is green when unripe and after 3 to 6 months, the fruit turns reddish orange as it ripens. The fruit consists of a woody endocarp (pit), a resinous edible mesocar (flesh) and a thick exocarp (peel).

Table 2.1: Area and Production of Mango -Global Scenario -2010

COUNTRY	AREA ('000 ha)	PRODUCTION ('000 tons)	PRODUCTIVITY (tons/ha)	% SHARE IN WORLD
India	2312.3	15026.7	6.5	40.5
China	465.3	4351.3	9.4	11.7
Thailand	311.0	2550.6	8.2	6.9
Pakistan	173.7	1845.5	10.6	5.0
Mexico	175.0	1632.7	9.3	4.4
Indonesia	131.7	1287.3	9.8	3.5
Brazil	75.1	1189.0	15.8	3.2
Bangladesh	170.8	1047.9	6.1	2.8
Philippines	189.4	825.7	4.4	2.2
Nigeria	114.9	790.2	6.9	2.1
Other Countries	827.0	6578.1	8.0	17.7
World	4946.3	37124.7	7.5	

Source: FAO

Mango production covers an area of 4946 thousand ha with a production of 37.1 million tons in the world during 2010 (Table 2.1). India occupies top position among growing countries of the world and produces 40.5% of the total world mango production. China and Thailand are second and third in mango production in the world with 4,351 and 2,551 thousand tons respectively. The other major mango producing countries in the world during 2010 were Pakistan (1846 thousand tons), Mexico (1633 thousand tons) and Indonesia (1287 thousand tons).

In Andhra Pradesh, the area under mango cultivation increased from 0.6 lakh Hectares in 1951-52 to 3.9 lakh hectares in 2010-11, growing at a rate of 3.7%. As per the Horticulture of Andhra Pradesh, the area under mango is expected to increase from 2.79 lakh hectares in 1997-98 to 5.52 lakh hectares by 2020. This shift is expected to occur by shifting the cropping pattern from traditional crops to new crops including increased mango production. Andhra Pradesh mango production has increased from 23.8 MT in 1993-94 to 3,363.4 tonnes during 2010-11. However, the marketing and processing of the mango has not picked up commensurate with the level of production. Further, support mechanisms in the form of agricultural inputs, post harvesting infrastructure such as packing, precooling, cold storage, pack houses, the marketing system, and institutional credit have not increased proportionately to the increase in the production of fruit. Because of the high perishability of the mango, the seasonality in production, the absence of post-harvest facilities and a standardized supply chain system about 25-30% of the total mango production is lost during the post-harvest period, reducing further the availability of fruit for consumption, value addition and export. The importance of a commodity specific study the mango remains to address these issues.

Table 2.2: State wide Area & Production of units mango during year 2010-11

STATE	AREA (000'ha)			PRODUCTION (000'tons)			PRODUCTIVITY (tons/ha)		
	2008-09	2009-10	2010-11	2008-09	2009-10	2010-11	2008-09	2009-10	2010-11
Uttar Pradesh	271.2	276.4	267.2	3466.0	3588.0	3623.2	12.8	13.0	13.6
Andhra Pradesh	497.7	480.4	391.1	2522.0	4058.4	3363.4	5.1	8.5	8.6
Karnataka	141.3	153.8	161.6	1284.4	1694.0	1778.8	9.1	11.0	11.0
Bihar	144.1	146.0	147.0	1329.8	995.9	1334.9	9.2	6.8	9.1
Gujarat	115.7	121.5	130.1	299.8	856.7	911.3	2.6	7.1	7.0
Tamil Nadu	148.8	132.7	148.0	821.4	636.3	823.7	5.5	4.8	5.6
Orissa	164.3	177.6	190.1	449.7	577.5	642.0	2.7	3.3	3.4
West Bengal	86.0	88.1	89.5	548.9	578.0	620.2	6.4	6.6	6.9
Jharkhand	31.8	15.1	38.9	91.5	254.3	427.9	2.9	16.8	11.0
Kerala	76.7	63.8	62.2	445.4	373.2	380.9	5.8	5.9	6.1
Maharashtra	45.7	474.5	47.7	712.8	597.0	331.0	1.6	1.3	0.7
Others	585.7	182.3	6623.4	778.0	817.4	951.1	1.3	4.5	0.1

Source: (National Horticulture Board, India 2015)

The mango is grown in almost all the states of India. Uttar Pradesh tops the list of mango producing states (Table 2.2). Other major producing states are Andhra Pradesh, Maharashtra, Karnataka, Bihar and Gujarat. The rest of the states have less production.

Uttar Pradesh is the leading mango producing state with production of 3,623 thousand tons followed by Andhra Pradesh state which has production of 3,363.40 thousand tons (Table 2.2). Next comes Karnataka at 1,779 tons, followed by Bihar and Gujarat i.e. 1,335 and 911 thousand tons respectively. Area, production and productivity of mango in different states are also in Table 2.3.

2.2 Raw material availability in Chittoor District

The Chittoor district has good horticulture production base and enjoys easy access to leading horticultural bases in Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra. Mangoes, bananas, papayas and citrus are the major fruits grown in the district. The district also grows tomatoes in sizable quantities.

Mangoes dominate the horticulture resources of the Chittoor district. Of the various varieties of mangoes grown, Totapuri accounts for nearly 50 percent, Neelam 25 percent and other varieties 25 percent. Further the per acre yield of the mangoes in the district is one of the highest. Mango production in the district is expected to increase considerably in future.

Among the major growing districts of Andhra Pradesh, Chittoor has 48,913 hectares of mangoes under cultivation producing 3.91 MT (Table 2.3). Totapuri is the standard variety for pulp and is the major variety grown in the Chittoor district. It is second in the state in the area and production of the fruit. The Krishna district has 62,000, hectares and production is 4.96MT. The mango variety grown in Krishna is Baneshan. It is famous for its good flavor, flesh qualities and keeping qualities. It is mainly consumed directly as a table fruit.

Table 2.3: Area, Production & Yield of mango in Study Districts-1998-2005

Year	Chittoor		Krishna	
	Area (1000 ha)	Production	Area (1000 ha)	Production
	33	106.8	61.2	803.4
1999-00	42.8	342.1	61.3	490.5
2000-01	45.1	360.2	61.4	491.5
2001-02	45.6	368.9	65	492.7
2002-03	47.8	382.7	67.5	539.9
2003-04	52.7	421.8	72.5	579.9
2004-05	48.9	391.3	62	495.8
CARG (%)	6.8%	24.2%	0.2%	-7.7%

Source: (Directorate of Economics and Statistics, Government of Andhra Pradesh 2017)

Note: CARG Stands for compound annual rate growth it typically represent rate of the investment growth calculated over several years.

2.3 Government support

In Andhra Pradesh, three AEZs (Agri-Export-zones) have been set up for mango and mango pulp with one being located in the Chitoor district. These AEZs were established for continuity and an assured supply for export quality mangoes and mango pulp. The APEDA (Agricultural and processed food products export development authority) since its inception in 1986, has played a major role in the export of mango and mango based products by providing various services at both the national and international level.

2.4 Mango arrival into the market

Annual mango production in the Chittoor district arrives at five facilities located at Chittor, Damanacheruvu, Bangarupalem, Tirupati, and Puttur. In Chittoor, the major varieties of the mangoes are Totapuri, Banganapalli, Mulgoa, Alphonso, Natu, and Neelam. The commission agents facilitate trade between mango farmers and the purchasers. The continuous drought conditions in Chittoor during the last 4 years affected the arrival of major agricultural produce. Further, the production of mangoes fluctuates due to the alternate bearing nature of the crop. The absence of effective marketing linkages also hampers the mango arrival to various market yards. Growers prefer to sell directly to processing units, local wholesalers and directly to outside wholesalers. Processing units purchase mangoes from market yards as they are assured large quantities to run the unit continuously until the mango season is over. The main season for the Totapuri mango is May-July, with peak months being June-July.

2.5 Mango Stone Composition and properties

Depending upon the variety, the chemical composition of the mango stone are presented in Table 2.4. The physical and chemical properties of mango seed kernel oil is presented in Table 2.5. The lipids of the mango stone consist of saturated fatty acids 44-48 percent with a majority of stearic and unsaturated fatty acids 52-56 percent with a majority being oleic. The mango stone has high vitamin A when compared to other fruits.

The Jeen International Corporation, USA, describes mango kernel oil as composed of refined, fractionated and deodorized vegetable oil taken from the mango fruit (Mangifera indica) (Jeen International Corporation 2014). Mango kernel oil is semi-solid at room temperatures. The shelf life of the oil is 2 years. The specification and corresponding method of analysis for mango kernel oil suggested by Jeen International Corporation is reported in Table 2.6. Mango kernel oil is used for cosmetic and pharmaceutical applications. In the cosmetic industry mango kernel oil finds application in skin care preparations, creams, lotions and sticks.

Table 2.4: Chemical composition of Mango Stone

Sr.no	Composition	value in %
1	**Protein**	6
2	**Fat**	12
3	**Carbohydrates**	32
4	**Crude fibers**	2
5	**Ash**	3
6	**Moisture**	45

Source: (Babaria and Vashney 2012)

Table 2.5: Physical and Chemical Properties of Mango seed Kernel oil

Sr.no	Composition	Value
1	**Oil,%**	12.00±1.32
2	**Peroxide value**	0.32±0.12
3	**Free Fatty Acid ,mg/g**	4.48±044
4	**Iodine Value**	32.00±0.31
5	**Saponification**	210.00±2.54
6	**Unsaponifiable matter**	4.80±0.12

Source: (Babaria and Vashney 2012)

Table 2.6: Composition of Mango Kernel oil

Sr.no	Composition	Value	Methods of Analysis
1	Color	Max-5.0red	Lovibond 5 1/4"
2	Acid Value	Max-0.5	IUPAC 2.201
3	Peroxide Value,meq/kg	Max-5.0	AOCS Cd 8b-90
4	Iodine value	55-65	IUPAC 2.205
5	Saponification Value	185-195	
6	Consistency @20 degree c	Semi-solid	Visual
7	Unsaponiables,%	1	AOCS Ca 6a-40
8	Hydroxyl value	9	AOCS Cd 13-60
9	Density(g/cm3,@25degree C	0.91	IUPAC 2.101
10	Melting point	15	AOCS Cc 3-25
11	Cloud Point,	14	AOCS Cc 9a-47
12	Pour Point	14	AOCS Cc 9a-47
13	Refractive Index@60 degreeC	1.4532	
14	Oxidative Stability(hours@110 degree C)	18	Rancimat
15	Fatty Acid Composition ,%		IUPAC 2.302
	C 16:0	8	
	C18:0	27	
	C18:1	52	
	C18:2	8	
	C18:3	1	
	C20:0	2	
	C22:0	0.5	

Source: (Babaria and Vashney 2012)

Table 2.7: Fatty Acid Composition of Mango seed kernal lipid classes

Sr.no	Fatty Acid	Lipid fractions (%of total fatty acids)(mean±SD)
1	**Myristic C14:0**	0.5±0.1
2	**Palmitic C16:0**	5.8±0.3
3	**Stearic C18:0**	38.3±1.2
4	**Oleic C18:1**	46.1±2.3
5	**Linoleic C18:2**	8.2±0.6
6	**Linolenic C18:3**	1.2+_0.2
7	**Saturated fatty acids**	44.6±1.3
8	**Unsaturated fatty acids**	55.0±0.5

Source:(Ravani and Joshi 2013)

2.6 Mango Butter Industry Analysis

2.6.1 Constraints for the mango butter processors

The mango butter industry in Chittoor district could face a number of constraints that are illustrated in Table 2.8.

Table 2.8 Restraints on Mango Butter Industry in Chittoor District

Type of Restraint	Specific Concerns
Infrastructural	Inadequate Storage Facilities Inadequate Transport Facilities Power Shortage
Credit	Non-Availability of Credit High-Cost of Credit
Labor Related	Irregular Supply of Labor High Cost of Labor
Raw Material Supply	Inadequate availability of mango Unreliable supply of other raw materials Availability of poor quality raw materials
Market Constraints	Wide output price fluctuations Low domestic demand Demand fluctuation in the international market Lack of knowledge of quality issues

Source: Reddy and Kumar 2010

Among the infrastructural constraints are the inadequate supply of power that was reported to be the major problem (Table 2.8). The high cost of credit was reported to be a major problem.

The processing sector is highly labor intensive, with a majority of laborers coming from within the region. In recent years, there has been an increase in wages adding to the cost of processing firms. About 80 percent of those employed in processing sector are women and only 20 percent are men (Reddy and Kumar 2010). This is mainly because the activities involved are more suited for women. Secondly, to minimize the cost of production, processors favor employment of women.

The processing industry is raw material intensive. The industry faces a number of problems related to raw material supply. The supply is not consistent due to production being dependent on weather variations. In years of deficit rainfall, the firms obtain raw material supply with procurement from nearby regions and neighboring states. The mango fruit is available for processing for 120 days. During the other periods, processing of other fruits and vegetables could be undertaken by the processing firms (Reddy and Kumar 2010). The large firms can process a number of commodities. Some small firms process papaya seeds. This has implications on capacity utilization. A firm's capacity utilization can be low due to the unavailability of raw materials other than mangos. There can be lack of demand in domestic market and price fluctuations in international market. There can be competition from other body butters such as Shea butter and Cocoa butter. Fluctuations in international demand may be a major problem. This could be overcome through bi-lateral negotiations This demands extra effort managing the demand fluctuations in the international market.

Volatility in the output price is reported to be the major problem. Volatility is most readily attributed to competition in the international markets. The international market also demands the domestic industry to adhere to stricter quality controls (Reddy and Kumar 2010). The investment in the adoption of quality standards complicates the dilemma of technological upgrades. The market demands aseptic packaging of mango butter. The installation of aseptic packaging systems calls for large investment, that is difficult for smaller firms to afford. Since the raw material for processing of mango butter is abundantly available in one location, this might become a competition for substitutes such as tropical fats and oils might face an objection from alliance groups. Furthermore, pollution control clearances are required.

2.6.2 Policy implications and suggestions

Growth and sustainability of small firms is important. If small firms are technologically viable, support and incentives may be provided to allow market penetration. The mango butter processing industry may be supported as the mango butter industry has environmental effects. Contracts with pulp factories may ensure timely and adequate supply of raw materials. Domestic consumption could be promoted through marketing campaigns and by producing diversified products to serve as a cushion for the mango butter processing industry against fluctuations in demand in the international market. Cooperatives could be set up to help small processors increase their access to the international market and obtain higher prices for their output. Small firms may be poor in adopting adequate quality standards and technology. This may call for support and nurturing by government to help technology upgrades and to adopt Hazard Analysis Critical Control Point (HACCP). (Source: NABARD)

The government could promote the use of waste from mango pulp factories for value addition to the mango and other oil based seeds in the region by promoting adequate supply of raw materials throughout the year to increase the capacity utilization of the firms.

2.7 Mango butter Industry: Overall Market performance

Since the mango butter is manufactured by a nonchemical process, the market potential is large. Mango butter can be marketed to many segments such as the baking industry, the cosmetic or pharmaceutical industries depending on demand, availability, and price fluctuations of its substitutes such as shea butter and cocoa butter. Mango butter characteristics can be compared to the rest of the butter industry.

Since there is only one grade of production with homogeneity in the final product, even if a segment has high potential and is structurally attractive, a company cannot choose to target this segment alone. The company must consider its own objectives and resources and whether it can serve the group. Some attractive segments can be dismissed regardless because they are not aligned with the company's long-term objectives. The company may also lack the skills and resources required to compete successfully in a potential segment. Therefore, a company should only enter segments in which it can create value for consumers and gain advantage over its competitors.

Differentiating mango butter with its unique characteristics compared to its substitutes shea and cocoa butter helps understand the target consumer's perception of the brands in the market. Both strengths and weakness of each brand can be studied to create a message that make sense in that "category context”. Differentiating the product, can set the company's offer apart from its counterparts in the market. Documentation is needed to back up and market its "differentness" by constantly communicating the differences.

2.8 Mango Butter Industry: Major Players

2.8.1 Competitors

In the global market, especially in the USA, Europe, China, Japan, Southeast Asia, and India, the top manufacturers exist in the global market, based on capacity, production, price, revenue and market share for each manufacturer.

2.8.2 Competitor Industries

Hallstar BIOCHEMICA® Manorama Group

Jarchem Industries Inc.

AOT Alzo International Incorporated

EKOLOGIE FORTE PVT. LTD

Avi Natural

These companies are either manufacturers of refined or unrefined mango butter or major consumers of mango butter in food, pharmaceuticals or the cosmetics industries.

Within India, the Manorama Group is the main competitor but it is not collecting the kernel from pulp factories in large quantities but through hand picking by tribals in the forest and manufacturing the butter using a solvent process that may be contaminated by chemicals (Tables 2.9 and 2.10). The Manorama Group is an established rival and may be in the same region. Many small cottage industries might crop up and can be a threat of copying the model so that sellers may increase the price of mango stones to increase the return on waste. There is not much competition in the Chittor region. However, the competition from within India and the export market may not be a focus for the small local manufacturers. If there is competition in making of mango butter then all the manufacturers may need to consolidate for export or compete on price. This may hurt the purity of the product as traceability is an important concern. The company may have many raw material suppliers but not many manufacturers.

Agrichain traceability systems are the most common and essential index for food and agri-product industries in India. The Agrichain traceability system has the ability to identify the product history, location, time, and also recall defective products. Moreover, in the agriculture and food business, integrated supply chain traceability encompasses several elements. Product traceability refers to identification of the physical location and stages of the supply chain. Input traceability refers to the information about types and origin (source, suppliers) of the input materials and raw materials and information about product quality control. Disease traceability refers to the outbreak and monitoring the epidemiology of biotic hazards such as bacteria, viruses and other pathogens that are potential risks to humans. Genetic traceability refers to the genetic constitution of product including variety, type, origin and alterations in the basic DNA structure. Measurement traceability refers to the accurate calibration of the raw materials including the individual measurement of product quality and safety.

Table 2.9 Top Manufacturers of Mango Butter

Type of Mango Butter	Company	Website
Refined	Hallstar BIOCHEMICA Manorama Group Jarchem Industries	www.hallstar.com www.manoramagroup.com www.jarchem.com
Unrefined	Alzo International Inc. EKOLOGIE FORTE Pvt. Avi Natural	www.alzointernational.com www.eko-logie.com www.avinaturals.com

Source: Global Mango Butter Market research report 2017

Table 2.10 Major Mango Butter Consumers by Type, Location and Use

Type of Mango Butter	Company	Location	Use
Food	Henry Lamotte Oils GmbH Jedwards International The Organic Beauty	Germany USA USA	Chocolate, Margarine and Shortening Ingredient for food industry Replacement for cooking oil, butter
Pharmaceuticals	The Apothecary in Ingelwood Nature's Oil The Organic Beauty	CA USA USA	Treating burns and stretch marks Treating burns and stretch marks Healing acid for minor cuts, rashes
Cosmetics	Klorane The Body Shop Grant Industries	USA USA USA	Hair, Skin Body Butter, skin care Body Butter

Source: Global Mango Butter market research report 2017

CHAPTER III: CONCEPTUAL THEORY

3.1 Processing of Mango butter

Fat is extracted from dried mango kernels by hydraulic pressure or by a solvent process. Because of the many new uses of mango kernel oil, the demand has increased. Therefore, there is need for faster and more efficient methods of oil extraction. Usually, two methods are used to recover the oil; mechanical extraction or solvent extraction, either separately or in combination. The advantage of the mechanical system over solvent extraction is that it provides products free from dissolved chemicals and is inherently a safer process though solvent extraction provides higher oil recovery and dried cake than mechanical extraction. In solvent extraction, hexane, a liquid hydrocarbon is used as the extraction medium. Mechanical extraction is accomplished by a screw or hydraulic press.

3.1.1 By Hydraulic press

A hydraulic press is a machine that generates a compressive force. The pressure throughout is constant. One part of the system is a piston acting as a pump, with a modest mechanical force acting on a small cross sectional area; the other part is a piston with a larger area that generates a correspondingly large mechanical force.

3.1.2 Solvent extraction

In the solvent extraction method, hexane is used as solvent to extract oil from the oilseed cake. The oil from the miscella is separated by distillation and stripping under vacuum. The extracted meal is desolventised by heating with steam in a desolventizer. The solvent from the distillation and stripping columns as well as from desolventizer is condensed and recovered and stored in a solvent storage tank. The oil separated from the miscella in the distillation column goes to the oil storage tank after cooling. The de-oiled cake contains about 1% residual oil.

3.2 Initial preparation: Removal of Kernel from Mango Stone

The collected mango stones are washed with well-water soon after collection. After washing, the seeds are sun dried to reduce the moisture content to 12-15%. The dried seed stone is roasted in a drum roaster and the hull is removed mechanically or manually by beating with wooden clubs. The separated kernal pieces are crushed into small pieces in a hammer mill. The mango kernel pieces are conveyed to a pallet making machine and pallets are formed. The pallets are cooled to room temperature in a cooler and are conveyed to the solvent extraction plant or extracted by a hydraulic press. Some processors produce flakes by crushing the seeds in a flaking roller mill.

3.3 Solvent extraction of Mango butter

The solvent extraction method recovers almost all the oils and leaves behind only 0.5% to 0.7% residue oil in the raw material. The solvent extraction method can be applied directly to any low oil content raw materials. It can also be used to extract pressed oil cakes obtained from high oil content raw materials. Because of the high percentage of recovered oil, solvent extraction has become the most popular method of extraction of oil and fats.

The extraction process consists of treating the raw material with hexane and recovering the oil by the distillation of the resulting solution of oil in hexane called miscellia. Evaporation and condensation from the distillation of miscellia recovers the hexane absorbed in the material. The hexane is recovered and reused for extraction. The low boiling point of hexane (67C/152F) and high solubility of oils and fats are exploited in the solvent extraction process (Babaria and Vashney 2012).

3.3.1 Mango preparation process

1. Preparation of raw materials
2. Process of extraction
3. Desolventization of extracted material
4. Distillation of miscellia
5. Solvent recovery by absorption
6. Meal finishing and bagging (Department of Food & Public Distribution 2016)

Hexane is highly flammable so several steps in the process must be completed at least 50 feet away from the main extraction plant. Stages to be completed at away from solvent handling include material preparation, finishing and bagging.

3.3.2 Preparation of Raw Material

For thorough and efficient extraction, it is necessary that each and every oil bearing cell of the material be brought into contact with the solvent. Therefore, proper preparation of materials prior to extraction is important to ensure this contact. The smaller the material size, the better the penetration of the solvent into oil-bearing cells. However, too fine a size will prevent the solvent from percolating through the mass. Therefore, an optimum size is needed for best extraction. Material preparation methods vary from material to material depending on its oil content, size and physical properties. In order to make kernels with oil content of 15% or more penetrable by the solvent, the following steps of preparation are recommended.

1. The kernel is passed through corrugated roller mills with 3mm flutes to reduce the size to about 3mm.

2. The broken material is heated to about 50 C with open steam to temperor and humidify the material to raise the moisture content to about 11 to 12%.

3. A flaking of the humidified material occurs between a pair of plain rolls of 0.25 mm thickness or lower.

4. The flakes are conveyed to the extraction system after crisping them firm (Department of Food & Public Distribution 2016).

3.3.3 Process of extraction

The prepared material enters the extractor through a rotary air seal. The extractor consists of a very slow moving articulated band conveyer inside a totally enclosed chamber. The belt is lined with perforated sheets and porous steel cloth. The mass of the material moving on this belt forms a slow moving bed. During the movement of the bed through the extractor, the material is washed continuously at various points with the miscella of decreasing concentration, and finally with a fresh solvent by means of sprayers over the meal bed. The miscella percolates through the perforated bottom and collects in various hoppers below the bed. The miscella from the last hopper, which is the most concentrated, is taken off for distillation.

3.3.4 De-solventisation of Extracted Material

After the fresh solvent wash, the material is discharged from the band conveyer onto an airtight chain conveyer that moves to the desolventiser. In the desolventiser, the material is heated to about 100 C by steam, to absorb the solvent as vapor (boiling point of hexane 67°-70° C). Finally, the material is desolventized and continuously discharged through airtight seals into a pneumatic conveyer, that moves into the bagging section. The vapors evolved in the desolventiser are led through a dust catcher wherein they are washed with hot water.

3. 4 Extraction of oil from mango kernal by mechanical expression

3.4.1 Extraction by expeller

The mechanical expeller press often is a screw-type machine that presses oil seeds through a caged barrel-like cavity. Raw materials enter one side of the press and waste products exit the other side. The machine uses friction and continuous pressure from screw drives to move and compresses the seed material. The oil seeps through small openings that do not allow seed fiber solids to pass through. Next, the pressed seeds are formed into hardened cakes that are removed from the machine. The pressure involved in the expeller creates heat in the range of 60° C to 99° C.

3.4.2 Extraction by hydraulic press

A hydraulic press is a machine that generates a compressive force. The pressure throughout the closed system is constant. One part of the system is a piston acting as a pump, with a modest mechanical force acting on a small cross-sectional area; the other part is a piston with a larger area that generates a correspondingly large mechanical force.

To understand the advantages of using hydraulic press in mango kernel oil expression, it is necessary to study the effects of processing factors on oil recovery and the quality of the cake obtained through hydraulic pressing. A detailed study conducted by Babaria and Vashney found that the effect of particle size as well as pretreatments of mango kernels effect the recovery of oil. They also analyzed the quality of the mango kernel oil and cake obtained through hydraulic pressing. They suggest suitable process parameters for production of mango kernel oil through hydraulic pressing and studied the storage life of mango kernel oil.

They concluded that the suitable process parameters for the production of mango kernel oil through a hydraulic press is 500 grams of crushed mango kernels steam treated at l kg/cm^2 for 10 minutes steaming time on a 2 mm particle size subjected to 65-75 kN pressing load. This results in a 5.29 percent oil yield and 44.13 percent oil recovery. Mango kernel oil used for cosmetics or soap can be stored up to 2 years.

3.5 Calculating initial manufacturing capacity

The mango pulping units can be bifurcated into small scale industries (SSI) and medium scale industries (MSI), based on the investment range, technology level and the working capital requirement. About 85 percent of the units are SSI. In the Chittoor district, at present there are 53 fruit processing units operating with a total installed capacity of 2,06,700 MT of mango pulp, of which 46 (87 percent) are small-scale units and rest are medium scale (Appendix 1).

The most common range of installed capacity was 25 to 40 tonnes of pulp and in medium scale units, it was about 80 to 100 tonnes of pulp per day. These units predominantly process the Totapuri (also called the Bangalore or collector) variety and the average recovery (yield) of pulp is about 50 percent (on a weight basis). The alphonso mango is also processed to a certain extent and the average recovery varies between 47 to 49 percent.

3.6 Mango and its by products

The mango fruit is a large fleshy drupe, highly variable in size, shape, color and taste, weighing up to 1 kg in some cultivars. It is green when unripe but after 3-6 months, the fruit turns reddish-orange as it ripens. The fruit consists of a woody endocarp (pit), a resinous edible mesocarp (flesh) and a thick exocarp (peel). Mango varieties that are too fibrous or too soft for fresh consumption can be used for juice making (Table 3.1).

3.7 Mango waste calculation from pulp factories in Chittoor District

The mango variety used in the pulp industries is the Totapuri (Table 3.2) provides the yield and percent of products for the Totapuri and Alphonso variety.

Table 3.1: Percentage Distribution of Mango Fruit Parts (Variety-Totapuri)

Mango Fruit parts	weight in(g)	%
Pulp	680.9	68.10%
Peel	169.8	17.00%
Seed Coat	59.5	5.90%
Kernal	89.8	9.00%

Source : Calculations based from a pulp factory

Table 3.2: Average recovery (yield) of pulp

Variety	yield in %
Totapuri	50% on weight basis
Alphonso	47-49%

Source : Pulp factory

3.8 Total Mango puree collection per annum

The number of barrels of mango puree are produced in the district is 1 Million

With each barrel weighing 215 kgs. For 10MT of mango fruit, the following quantities are produced (Table 3.3) and this data illustrates the distribution of fruit parts for the Totapuri variety.

Table 3.3: Percentage Distribution of the Mango Fruit Parts

Distribution of Mnago parts In pulp factory	Weight in Kgs	Percentage %
Total Quantity of Mango Fruit	10000	100.00%
Puree recovered	5700	57.00%
Pulp Waste	370	3.70%
Peel & Stone waste	2670	26.70%
Moisture loss on ripening	1000	10.00%
Unrecoverable waste	260	2.60%

Source : Pulp factory interview with galla foods manager. The table above indicates the percentage distribution of mango fruit parts (Per Kg)

3.9 Mango butter recovery calculations from Mango Kernal flour

Table 3.4: Extraction of oil from mango kernel by hydraulic pressing

Sr.no	Sample weight in (g)	Weight of expressed oil(g)	Oil recovery(%)	Oilpoint(kN)	Weight of cake(g)	Applied load (kN)
1	1000	54.72	44.4	45	943.28(final)	Max
2	400	18.24	38.0	42	380.76	Max
3	500	22.56	37.6	44	476.44	Max
4	250	11.16	37.2	40	238.54	100
5	400	16.18	33.7	42	382.8	200
6	500	26.22	43.7	44	473.75	70
7	500	21.15	35.2	44	478.85	50
8	500	23.31	38.9	44	476.68	60

Source: (Babaria and Vashney 2012)

The important parameter in hydraulic pressing for standardization was sample size. The number of trials was conducted using different sample size in the range of 100 g to 1000 g. When sample of 1000 g was used and the maximum load was applied, oil recovery was found to be 45 percent. Whereas, for 400 g sample, it was 38 percent, and for 500 g sample, the oil recovery was 37.6 percent as shown in Table 3.4. Further trails were conducted at different pressing loads, ranging from 50 kN to 100 kN, for a sample size of 500 g. Moreover, when 250 g kernels were used and pressed under a load of 100 kN, oil recovery was 37.2 percent. Therefore, from initial trails, it was found that a small sample size gave better results. Trials were conducted using GI plates, for sample size of 500 g at different pressing loads from 50 kN to 100 kN. The percentage oil recovery obtained was 35 to 45 percent, whereas, for sample 400 g mango kernel sample was pressed under 200 kN, oil recovery was found to be 35.7 percent. Therefore, it was clear that trails conducted using GI plates gave better results. A single layer of mango kernels having 100 g sample was found good in the context to oil yield. Therefore, from the results obtained, it was decided to use GI plate after 100 g of mango kernels and total sample size for each treatment was 500 g.

Table 3.5: Mango Oil Expressed by Hydraulic Press Method

Particulars	Weight in kgs
Total weight of mangoes	10000
Total kernal weight calculated	900
Remaining peel weight	1770
Mango kernal flour after soaking ,drying ,milling,sieving	725.4
Weight of oil extracted from MKF	39.17
Final product after extraction losses	38

Note1: Final recovered kernel flour after soaking, drying, milling, sieving for 500 g of MKF is 80 percent.
Note 2: Production losses considered is 3%

Table 3.5 calculations are made using data from Table 3.2. The final kernel weight is calculated from 10 MT of mangoes is 900 kgs. The final recovered kernel flour after soaking, drying, milling, sieving for 500 grams of mango kernel is 80.6%. Total mango kernel recovered for 10 MT of mango is 725.4 kgs. The weight expressed oil for 1000 grams of kernel flour by the hydraulic press method of extraction oil is 54.72 grams for an oil yield of 5.4%, and percentage recovery is 44.36 percent (Table 3.4).

The weight of oil that can be extracted from 725.4 kgs by hydraulic press method is 39.17 kgs and final product after extraction losses of 3 percent is 38 kgs. The mango butter is sold at the market at 42 for 16 oz. Therefore, 10 MT of mangoes yields

38 kgs of mango butter by hydraulic press extraction method that would be worth $3,517.

3.10 Available Mango Butter in the U.S. market and its presence and cost details and ratings by customers

Mango butter in the U.S. is marketed by Better Shea Butter and Skin Foods, a company established in 2013 (Better Shea Butter and Skin Foods 2017). It sells expeller pressed, cosmetic grade unscented, smooth, moisturizing, vegan butter. Pure butter (100%) is a product that can be used as lighter alternative to unrefined shea butter and is sold at price of USD $42.5 plus delivery charges, for 16 oz. This is inclusive of all taxes and had 3,913 viewers and rating on Amazon is 4.6 out of 5. The first date also available on Amazon was 27 February 2016.

Table 3.6 shows the price comparison among different body butters. The price of mango butter is double. Hence, the benefits to differentiate from others is important.

The product describes skin as the body's largest organ. It deserved to be highly priced as 100% pure expeller rich mango butter is an effective and natural way to protect skin from all of skin's requirements. It is a great substitute, alternative or addition to shea or cocoa butter (Better Shea Butter and Skin Food 2017).

3.11 Cost Comparison between Mango, Shea, Cocoa Butters

Table 3.6: Cost Comparison

Butter type	Weight in(OZ)	Cost in USD	Cost in Rs
Mango	16	42	2815
Shea	16	21	1452
Cocao	16	20	1358

67 Rupees in 1 USD.

CHAPTER IV: METHODOLOGY AND DATA COLLECTION

4.1 Objective

The thesis objective is to study the economics of mango butter production in the Chittoor district, assess the financial feasibility of mango butter processing, examine the challenges processors face and suggest policies for enhancing processing plant profitability in the region.

4.2 Market Analysis

The Chittoor district in A.P. India has the world's largest concentration of mango processing units. There are more than 100 units within 200 km around Chittoor that can process 3 million M.T of mangoes every year. This is a unique opportunity to set up a mango butter manufacturing unit.

The industry potential can obtain 1,500,000 M.T of mango peel and 1,500,000 M.T of mango stones. These stones give about 1,000,000 M.T of kernels and 50,000 M.T of shells. This 1,000,000 M.T of kernels will produce 10,000 M.T of mango oil/butter, and 90,000 M.T of de-oiled cake. The estimated income from mango butter is Rs 200 Cr and another Rs 35 Cr from sale of de-oiled cake. The remaining waste can be sold to bio-thermal plants as fuel briquettes that can generate Rs 120 Cr. In this study the main focus is on mango butter and de-oiled cake. Note that 1 crore is 150,000 USD.

4.3 Data collection

Primary data were collected with the aid of pretested interview schedule at processing units. Details of information such as investment, labor needs, processing cost and production techniques were collected from the processors. Secondary data were collected from the internet. The data pertained to the agricultural year 2016-17.

4.4 Tools of Analysis

The costs and returns were estimated for the processing units and then grouped into fixed or variable categories. The gross return for the unit was estimated by adding the revenues from the sale of the mango butter and byproducts. The net profit was derived by deducting total costs from total revenue. Percentages were used in analyzing the general details of the processing units, investment pattern, and costs and returns.

4.4.1 Economic feasibility

The economic feasibility of a mango butter processing unit was measured using NPV, the Benefit Cost ration(B-C ratio) and IRR.

i) Net present value (NPV)

It is the difference between the sum of present worth of benefits and sum of present worth of costs for given discount rate. If a positive value of NPV is obtained when discounted at the opportunity cost of capital, then the investment is considered viable.

$$NPV = \sum_{t=1}^{n} \frac{Bt - Ct}{(1+r)^t} \quad (1)$$

B_t is the benefit in t^{th} year; C_t is the cost in t^{th} year; n is the number of years; r is the discount rate

ii) Benefit-Cost ratio (B-C Ratio)

The B-C ratio is the discounted benefits divided by the discounted costs. The BCR is the ratio of sum present value of benefits over the sum of the present value of costs for a given discount rate. If the B-C ratio is more than one, the investment is profitable. The Benefit-Cost ratio is expressed as

$$B - C\ Ratio = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{C_t}{(1+r)^t}} \quad (2)$$

4.4.2 Internal Rate of Return (IRR)

The IRR is the discount rate that makes the net present value of cash flow equal to zero. The investment is considered viable if the calculated IRR is greater than the opportunity cost of capital.

4.5 Project details, Requirements and Cost Involved

The major component of a small-scale mango butter processing unit are land, buildings and civil works. A project cost of Rs 74.78 lakhs has been estimated. The details of project cost are given in the appendix and the individual components are discussed in this section. Note that 1 Lakh is 1,500 USD.

Table 4.1: Project Cost

Item	Unit	Qty.	Rate (Rs.)	Amount (Rs. Lakh)
Land	acre	0.50	500,000	2.50
Land Development	Sq. ft.	20,000	LS	5.00
Civil Work	Sq. ft.	3,850	600	23.10
Plant and Machinery				40.23
Miscellaneous Fixed Assets				2.00
Preliminary and Preoperative Expenses				1.95
TOTAL				**74.78**

4.5.1 Land and building cost

Sufficient lot size for a small-scale fruit and vegetable processing unit consists of a plot of land measuring 0.5 acres with a built up area of 3,850 sq ft. The land should be classified as non-agricultural, free from any encumbrance and should be able to be mortgaged.

Permission should be obtained for nonagricultural use wherever applicable. The value of the land is up to a maximum of 10 percent of the project cost and can be used towards the margin if purchased by the owners of the project. If the land is leased, the lease period should be longer than the repayment period of the loan. The leased land should have an enabling clause to mortgage the land to banks or financial institutions. Land cost varies considerably from place to place so land cost of Rs. 2.50 lakhs has been assumed for this study. Similarly, due to the varying cost of land development a development cost of 5 lacs rupees has been assumed for this study.

4.5.2 Building and civil structure

The processing structure with utilities requires construction of a 3,850 sft building at a total cost of 23.70 lakh. The construction cost is assumed to be RS 600 per square foot. The building consists of 1,000 square feet of processing, 1,000 square feet of finished product storage area, 1,000 square feet of raw material storage area, 500 square feet of washing area, 250 square feet of toilets and 100 square feet for a guardroom. The remaining land is available for possible expansion. The processing building should be constructed according to the guidelines of FSSAI. The height of the building should ensure availability of sufficient breathing space. All windows and doors should be covered with wire mesh preventing insect access. The slope of the floor and glazed tiled flooring are preferred to ensure easy cleaning of floor.

4.5.3 Plant and Machinery

The following machinery is required for a mango butter processing plant. Various plants and machines are proposed.

A fruit and vegetable bubble washer is used to wash the kernel of any pulp residue. The purpose of this machine is to reduce the initial microbial load by washing raw materials with chlorinated water. The water used for washing must be replaced every 3 to 4 hours.

Continuous almond roaster: the roaster is for low temperature drying and high temperature baking of peanuts and other oil seeds. It reduces the labor, improves operating efficiency, has reasonable heat distribution design to make the airflow uniform. Thus, this ensures uniform roasting is obtained. The unit also has an integrated cooling system to prevent over roasting and to keep the nuts at their optimum condition. It also has a facility designed to allow the recirculation of roasting air, hence it decreases the energy consumption. Every door on both sides can be opened for easy cleaning. It should be insulated for minimum heat loss and lowering running cost.

Dehulling machine: Used for deshelling the kernel from the shell.

Hammer mill: The machine is used for both coarse and fine grinding. It is applicable in both large and small scale industries

Pallet machine: It is designed to get a shape and make a pallet to size and shape required.

Roller mill: It is used to make flakes.

Hydraulic press machine: This is the oil extraction machine.

High quality insulation edible oil storage tank: This is for storing the end product.

Selection of plant and machinery is the most important decision for starting a food-processing unit. All machinery and equipment used in the processing business should be efficient and synchronizing the capacities of different machines and equipment in a processing line requires precise guidance. A suitable consultant/food technologist should be used to design and set up the fruit processing plant. The estimated cost of the plant and machinery is Rs 40.23 lakhs (Note: 1 Lakh = 1500 USD). The plant and machinery should be constructed so that the material flow is unidirectional to avoid cross contamination. The machinery should not occupy more than 1/3rd of the floor area to enable smooth operation.

4.5.4 Miscellaneous fixed asset

To run a day to day business, some other fixed assets like furniture and fixtures, computers are required at an estimated cost of Rs 2.0 lakhs.

4.5.5 Electrical and other items

Various machines are connected to electrical motors that provide suitable power to run the equipment. Accordingly, AC-3 phase motors of different power ratings varying from 2.5 Hp to 7.5 Hp are required for powering the various operations of the plant. A total cumulative 55 Hp is needed. The cost of electrical motors is included in the cost of plant and machinery.

4.5.6 Water requirement

The total water requirement for the plant will be 1,000 litres per day. Water is required for washing and is needed for various unit operations during processing. Water is also required for domestic consumption purposes. The water should be clean and treated for hardness before use. It is preferable for water testing at a reputed testing laboratory. Reverse osmosis plants are installed to meet the water requirement of the food processing industry.

4.5.7 Manpower requirement

Fruit and vegetable processing is highly labor intensive. A majority of labor is hired on a contract basis during the season. These laborers are skilled and mostly women. To perform the work, a minimum labor requirement is 50 men and women needed. In addition, seasonal contract labor during peak processing periods is required. As a rule of thum, an expenditure on wages is R s250/per MT of raw material processed. Other manpower requirement along with salaries are specified in the Table 4.2.

Table 4.2: Man Power Required

Salary	Number	Salary (Per Month)	Total (Rs. Lakh)
Plant manager	1	15,000	1.80
Manager - Technical	1	10,000	1.20
Supervisors	3	7,000	2.52
Accountant	1	8,000	0.96
Electrician	2	6,000	1.44
Peon	1	5,000	0.60
Guard	2	5,000	1.20
TOTAL			**9.72**

4.6 Loans and Financial assistance

4.6.1 Working capital

Working capital is a crucial input for the viability of any fruit and vegetable processing unit. The raw material is seasonal in nature. Fruit and vegetable processing units need to maintain high throughput to lower per unit cost. Banks can finance working capital based on the actual need of the borrower. Adequate working capital needs to be obtained from a bank. Banks provide a cash credit limit, commonly known as CC limit to the borrowers for meeting their day-to-day expenses. The different components of working capital needed are presented.

Table 4.3: Calculation of Working Capital

Particulars	Period (Days)	Year 1	Year 2	Year 3
Raw Material stock	7	0.71	1.65	2.12
Work in progress	30	4.10	9.57	12.31
Finished goods	15	2.23	5.37	6.74
Debtors	30	4.45	10.75	13.49
Total current assets		11.49	27.34	34.66
Creditors (Current Liabilities)		4.45	10.75	13.50
Working capital gap		7.04	16.59	21.16
Margin money for W.C.	25%	1.76	4.15	5.29
Bank loan (CC Limit)		5.28	12.44	15.87
Interest on W.C.		0.74	1.74	2.22

4.6.2 Raw material and packing materials

The raw material required are the mango stones that are directly procured from the pulp industry. Other inputs are generally available locally in general stores. Because the stones may absorb or lose moisture and are highly perishable (Table 4.3), a raw material stock for only 7 days is considered for assessment of working capital.

4.6.3 Work in progress

The raw materials are converted to semi-finished product and preserved for processing in future. This results in a work process of 30 days.

4.6.4 Finished goods

Processed butter can be stored for 2 years at ambient conditions. However, a finished product storage for 15 days is assured to reduce the inventory level needed to be financed (Table 4.3).

4.6.5 Debtors

The processed butter is sold to whole sellers/retailers by the processing units. In general, it takes about one month to be paid. Therfore, a period of 30 days is assumed for working capital (Table 4.3).

4.6.6 Creditors

The mango stones are collected from pulp factories directly making cash payments. Therefore, no credit is needed.

4.7 Financial Considerations

4.7.1 Means of finance

Financing of food processing falls under priority lending. Therefore, any commercial bank, regional rural bank and cooperative bank can finance such processing units.

4.7.2 Margin money

The promotors of the unit need to show a margin as a requirement of financing. The margin money varies from a minimum 10% to 25% of project cost, with 25 percent assured financing.

4.7.3 Bank loan

The promotors of the unit can approach any bank for financing. It is compulsory to provide a bank loan under various subsidy schemes of government. Therefore, the promotors should be careful in deciding the means of financing.

4.7.4 Grant and subsidies

There are number of incentives from state governments for promoting the food industry. Some of the states have formulated their Agro Industry policy. Various incentives are available depending upon location of the unit from the District Industry Centres (DIC). Therefore, to take the maximum advantage of these incentives, entrepreneurs should contact the District Industry Centres in their state.

Some of the incentives allowed by government of Andhra Pradesh for Transforming Agribusiness Sustainability and equitably are as follows:

POWER SUBSIDY, Rs 1.50 per unit for food processing units including cold chains, cold storage units, ripening units for date of commencement of commercial production.

CAPITAL SUBSIDY, 25 percent of project cost (including plant and machinery, technical and civil works), limited to Rs 5 crores for establishing processing units. Twenty-five percent of new upgraded equipment cost limited up to Rs 1 crore for technology upgradation. Fifty percent for Primary Processing Centres (PPCs) and Primary Collection Centres (PCCs) limited to Rs 2.5 crores. Thirty-five percent for setting up of cold chain for agriculture/horticulture produce up to Rs 5 crores.

INTEREST SUBSIDY, 7 percent per annum on term loan for fixed capital investments for a period of 5 years up to Rs 2 crores for food processing units and cold infrastructure. Rs 1 crore for setting up Primary Processing Centres (PPCs) and Primary

Collection Centres (PCCs). For integrated food parks that avail loans from NABARD, an interest subsidy is not applicable.

VAT/CST/SGST, for micro & small units –100 percent reimbursement of net VAT/CST/SGST for 5 years. For medium units –75 percent of net VAT/CST/SGST for 7 years (NABARD 2017).

The ministry of the Food Processing Industry, Goi is implementing a centrally sponsored scheme known as the National Mission on Food Processing (NMFP) jointly with state governments. The scheme is operational during the 12th five-year plan. A subsidy is available under this scheme for various purposes. Goi has appointed state Nodal Agencies to implement this scheme in different states. The main objective of the Scheme is creation of processing and preservation capacities and modernization/expansion of existing food processing units with a view to increasing the level of processing, value addition leading to a reduction in waste. The setting up of new units and modernization or expansion of existing units are covered under the scheme. The processing units undertake a wide range of processing activities depending on the processing sectors that results in value addition and/or enhancing shelf life of the processed products.

The scheme is implemented through organizations such as Central and State PSUs/ Joint Ventures/Framers Producers Organization (FPOs/NGO s/Cooperatives/SHG's/Pvt Ltd companies/Individual proprietorship firms engaged in establishment/upgradation/ modernization of food processing units. Proposals under the scheme are invited through Expression of Interest (EOI) and Project Management Agencies (PMA) are engaged by MOFPI, MINISTRY OF FOOD PROCESSING INDUSTRIES. It has all details on Project components, Pattern of Assistance, Pattern of Release of Grant, Invitation of Proposals, Extension of Date for Submission of Proposal, Submit Proposal online, Download Guidelines and Circulars (Ministry of Food Processing Industries 2017).

4.7.5 Interest rate

The banks can to charge a rate of interest above their base rate within the overall RBI guidelines issue from time to time. The rate varies from customer to customer based on credit appraisal of the borrower, but base rate of a bank is the minimum lending rate below which a bank is not allowed to lend. An interest rate of 12% is assumed for project.

4.7.6 Security

As per RBI guidelines, banks are required to take security for the loans so borrowers should plan projects so that they have enough fixed assets to cover security for a bank loan.

4.7.7 Primary

The land and buildings acquired can be mortgaged to finance the loan. The mortgage can be registered. The plant, machinery and other miscellaneous fixed assets acquired by bank loan shall be pledged as collateral to secure a loan or as a condition of the loan, or a third party pledges a collateral for the loan. The value of all these assets is the primary security for the bank.

4.7.8 Collateral Security

Often the value of primary assets, especially building and plant machinery is not enough for the bank loan. The bank insists on other property or assets of the company or the promotors to be pledged.

4.7.9 Hypothecation of stocks

All stocks and inventories are pledged as an asset as collateral for a loan while retaining ownership of the assets and enjoying benefits there from to financing banks as security against bank loan extended by them.

4.7.10 Financial analysis

To determine the financial soundness of the business, key financial indicators are considered. Using historical data on cost and prices, technological and economic assumptions are estimated. The key technology and economic assumptions are presented later in this chapter. The assumptions might vary from place to place; hence they need to be considered on case-by-case basis.

4.7.11 Repayment period and debt service recovery ratio (DSCR)

The repayment period has been determined by considering net surplus available for repayment. The bank loan with interest is payable within 8 years with a grace period of one year. The debt service coverage ratio based on assumed technology and economic parameters is found satisfactory. These are discussed in Appendicies D and F.

4.7.12 Financial indicators

Based on the assumptions on input and output parameters, an income statement (Cash flow statement) is prepared. Financial indicators are the Net Present Value (NPV), Benefit Cost Ratio (BCR), and Internal Rate of Return (IRR) using a 15% discount, for the NPV and BCR.

4.7.13 Depreciation Schedule

There are two different methods for assessment of depreciation on fixed assets: The Written Down Value Method (WDV) and the Straight Line Method (SLM). These methods are to submitted to the Registrar of Companies and Income Tax Authorities. These are discussed in Table 4.6 and Appendix E.

4.8 Government Approvals /Clearance Required

The following government approvals are required.

4.8.1 Prior to Establishment

1. Registration of concern with Registrar of Companies (ROC)
2. NOC from Local Bodies like Gram Sabha/MC etc -mandatory
3. Consent to establish from State Pollution Control Board-mandatory
4. Approval of layout plan for construction-mandatory
5. Permission from dug bore well from Ground Water Survey and Development Authority (GSDA)
6. Registration with District Industry Centre (DIC) for a small and medium Enterprise
7. Application to state Electricity Board/Authority for obtion the requisite power load

4.8.2 After Establishment

1. License from FSSAI
2. Permission to commence production from state Pollution Control Board
3. License from Broiler Inspector

The above list is only illustrative. Entrepreneurs should undertake an exhaustive study of the rules and regulations prior to the establishment of any such unit. The new entrepreneur may need to hire a consultant to avoid unnecessary expenditures for compliance.

Table 4.4: Calculation of Depreciation

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Civil structures	23.10	20.79	18.71	16.84	15.16	13.64	12.28	11.05
Depreciation @ 10%	2.31	2.08	1.87	1.68	1.52	1.36	1.23	1.10
Depreciated Cost	**20.79**	**18.71**	**16.84**	**15.16**	**13.64**	**12.28**	**11.05**	**9.94**
Plant & Machinery	40.23	34.63	29.82	25.67	22.10	19.02	16.38	14.10
Depreciation @ 13.91%	5.60	4.82	4.15	3.57	3.07	2.65	2.28	1.96
Depreciated Cost	**34.63**	**29.82**	**25.67**	**22.10**	**19.02**	**16.38**	**14.10**	**12.14**
Miscellaneous fixed assets	2.00	1.70	1.45	1.23	1.04	0.89	0.75	0.64
Depreciation @ 15%	0.30	0.26	0.22	0.18	0.16	0.13	0.11	0.10
Depreciated Cost	**1.70**	**1.45**	**1.23**	**1.04**	**0.89**	**0.75**	**0.64**	**0.54**
All assets	65.33	57.12	49.97	43.74	38.30	33.55	29.41	25.79
Depreciation	8.21	7.15	6.24	5.44	4.75	4.14	3.62	3.16
Total depreciated cost	57.12	49.97	43.74	38.30	33.55	29.41	25.79	22.63
Insurance @ 0.5%	0.29	0.25	0.22	0.19	0.17	0.15	0.13	0.11

Table 4.5: Repairs and maintenance costs Years 1 through 8

Repairs and Maintenance On cost of Plant & Machinery		17%	45%	87%	132%	132%	132%	132%
Promotion and Marketing of total sales revenue	21%	25%	24%	24%	24%	24%	24%	24%
Income tax rate	36%	36%	36%	36%	36%	36%	36%	36%
Profit after depn and interest	(5.75)	5.08	14.82	16.44	17.93	18.56	19.10	19.96
Income tax	-	1.83	5.34	5.92	6.46	6.68	6.88	7.19

Repairs and maintenance on cost of plant and machinery, marketing costs, tax rates etc., are discussed in Table 4.5. These costs escalate or remain same from year 1 through year 8.

Table 4.6: Estimated Financial Indicators

Financial indicators	Estimated	Requirement
NPV @ 15% DF	44.01	Should be positive
IRR	36.74%	>15%
BCR	1.09	Should be >1.0
DSCR	1.68	Should be >1.5

4.9 Results and Discussions

If NPV is positive for a single project, the project should be accepted, since a positive NPV means that the project has greater equivalent value of inflows than outflows and therefore makes a profit. When comparing mutually exclusive alternatives the one with the greatest positive NPV is selected. Here this project is viable since the benefits are greater than the cost (Table 4.6). The values of Benefits and Cost are expressed in present value equivalents for which B/C ratio is greater than one. The Benefit –Cost ratio yields the same investment decision as the NPV criterion. The internal rate of return of 36.74% is the interest rate at which at which NPV will be zero. The IRR is greater than interest rate that makes the investor accept the decision of proceeding with this project.

4.10 Summary of assumptions

1. Total installed capacity 300 MT per annum.
2. The unit will operate in a single shift of 8 hours for 250 days
3. <u>Share of products</u>

Mango Butter	60%
Groundnut oil	20%
Pappaya Seed oil	10%
Others	10%

4. Capacity utilization

First year	30%
Second year	70%
Third year onwards	90%

5. Sale price

Mango Butter	Rs. 62,000/- per MT
Groundnut oil	Rs. 55,000/- per MT
Pappaya Seed oil	Rs. 60,000/- per MT
Others	Rs. 62,000/- per MT

6. Wastage assumptions for first three years

Mango Butter	16%
Groundnut oil	0%
Pappaya Seed oil	11%
Others	11%

7. Raw material cost, packing material cost, fuel and power for the first year is assumed and from second year onwards based on capacity utilization.

8. Fuel cost for the first year is assumed and from second year onwards based on capacity utilization.

9. Power Cost is Rs. 6 per unit. First year power consumption assumed to be 20,000 units. From second year onwards based on capacity utilization.

10. Wages for the first is assumed. From second year onwards based on capacity utilization.

11. Salary is a fixed cost and it is Rs. 9.72 lakhs. For the first year salary is 30% on Rs. 9.72 lakhs.

12. Repairs and maintenance cost is taken as percentage on value of Plant & Machinery from second year onwards.

13. Insurance charges for fixed assets considered at 0.5% of the depreciated cost of the assets.

14. Promotion and marketing expenses are calculated as percentage of total sales revenue.

15. Administrative overhead cost if fixed at Rs. 10,000/- per annum.

16. Interest on term loan considered at 12% per annum.

17. Interest on working capital considered at 14% per annum.

18. Intangible asset of Rs. 1.95 lakhs written off in five equal installments starting from third year.

19. Income tax calculated at 36%.

20. Surplus available for repayment is arrived at deducting interest on working capital, intangible assets written off and income tax from profit before depreciation and interest.

21. Debt calculation is shown in table 7 in column Total outgo in Appendix F.

22. DSCR is coverage available divided by debt.

23. NPW of total cost and benefit is calculated at 15% of discounted value.

24. IRR of net benefit is calculated taking 15% of discounted value into consideration.

CHAPTER V: MANGO BUTTER CONCLUSION AND SUMMERY

In this thesis the economics of mango butter production are discussed. The general trend in manufacturing of mango butter in India, and the past literature on setting up a hydraulic press extraction for mango butter was discussed. Additional factors such as proximity to sourcing of raw material are also discussed.

In this thesis, the role of financial feasibility and analysis in the decision-making process has been discussed. A general model that can be used to assess the financial feasibility of investment projects was presented and effective model-building techniques were provided. A mango butter manufacturing plant is used as case study to illustrate how the financial feasibility of an investment project can be analyzed using custom-made assessment model. The criteria for analyzing financial feasibility are Net Present Value, Individual Rate of Return and Benefit-Cost Ratio. NPV analysis requires assumptions regarding cash flow and other inputs. User requirements and expectations need to be clear and model was built to fulfill these. The model was built using separating inputs, calculations, and outputs. This makes improving the model easier. Assumptions are determined by the historical trend on land price, cash flows and other expenditures.

While information in the thesis is not actual firm data, the results depend on the actual capacity utilization as well as the management abilities of a particular producer. However, this thesis provides a foundation with which further analysis can be performed to arrive at a suitable feasibility for report in a particular circumstance.

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APPENDIX A

PROFITABILITY STATEMENT

1. INSTALLED CAPACITY (MT)

Installed Capacity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Mango butter	180	180	180	180	180	180	180	180
Ground nut oil	60	60	60	60	60	60	60	60
Pappaya Seed oil	30	30	30	30	30	30	30	30
Others	30	30	30	30	30	30	30	30
Total	**300**	**300**	**300**	**300**	**300**	**300**	**300**	**300**

2. CAPACITY UTILISATION (MT)

Installed Capacity	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Capacity Utilisation	30%	70%	90%	90%	90%	90%	90%	90%
Mango butter	54	126	162	162	162	162	162	162
Ground nut oil	18	42	54	54	54	54	54	54
Pappaya Seed oil	9	21	27	27	27	27	27	27
Others	9	21	27	27	27	27	27	27
Total	**90**	**210**	**270**	**270**	**270**	**270**	**270**	**270**

3. SALES REVENUE (Rs. IN LAKHS)

Products	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Mango butter	28.08	65.52	84.24	84.24	84.24	84.24	84.24	84.24
Ground nut oil	9.72	22.68	29.16	29.16	29.16	29.16	29.16	29.16
Pappaya Seed oil	4.77	11.13	14.31	14.31	14.31	14.31	14.31	14.31
Others	4.95	11.55	14.85	14.85	14.85	14.85	14.85	14.85
Total	**47.52**	**110.88**	**142.56**	**142.56**	**142.56**	**142.56**	**142.56**	**142.56**

APPENDIX B

3. SALES QUANTITY AFTER WASTAGE CALCULATION

Products	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Mango butter	45.29	105.68	135.87	135.87	135.87	135.87	135.87	135.87
Ground nut oil	17.67	41.24	53.02	53.02	53.02	53.02	53.02	53.02
Pappaya Seed oil	7.95	18.55	23.85	23.85	23.85	23.85	23.85	23.85
Others	7.98	18.63	23.95	23.95	23.95	23.95	23.95	23.95
Total	**78.90**	**184.09**	**236.69**	**236.69**	**236.69**	**236.69**	**236.69**	**236.69**

APPENDIX C

4. EXPENDITURE CALCULATION

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Raw Material Mango butter	14.98	34.94	44.93	44.93	44.93	44.93	44.93	44.93
Raw Material ground nut oil	4.14	9.67	12.43	12.43	12.43	12.43	12.43	12.43
Raw Material pappaya seed oil	3.23	7.53	9.68	9.68	9.68	9.68	9.68	9.68
Raw Material Others	2.87	6.70	8.62	8.62	8.62	8.62	8.62	8.62
Packing material Mango butter	3.31	7.72	9.93	9.93	9.93	9.93	9.93	9.93
Packing material Groundnut oil	2.05	4.79	6.16	6.16	6.16	6.16	6.16	6.16
Packing material Pappaya seed oil	1.03	2.39	3.08	3.08	3.08	3.08	3.08	3.08
Packing material Others	0.55	1.29	1.65	1.65	1.65	1.65	1.65	1.65
Fuel	0.41	0.96	1.23	1.23	1.23	1.23	1.23	1.23
Power	1.20	2.79	3.59	3.59	3.59	3.59	3.59	3.59
Wages	0.42	0.98	1.26	1.26	1.26	1.26	1.26	1.26
Salary	2.92	9.72	9.72	9.72	9.72	9.72	9.72	9.72
Repair and Maintenance	-	0.07	0.18	0.35	0.53	0.53	0.53	0.53
Insurance	0.29	0.25	0.22	0.19	0.17	0.15	0.13	0.11
Promotion and marketing	0.10	0.28	0.34	0.34	0.34	0.34	0.34	0.34
Administrative overheads	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total	**37.60**	**90.18**	**113.12**	**113.26**	**113.42**	**113.40**	**113.38**	**113.36**

APPENDIX D

5. FINANCIALS

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Profit before depreciation and interest (PBDIT)	9.92	20.70	29.44	29.30	29.14	29.16	29.18	29.20
Deprecation	8.21	7.15	6.24	5.44	4.75	4.14	3.62	3.16
Interest on Term Loan	6.73	6.73	5.77	4.81	3.85	3.85	3.85	3.85
Interest on Working Capital	0.74	1.74	2.22	2.22	2.22	2.22	2.22	2.22
Intangible assets written off	-	-	0.39	0.39	0.39	0.39	0.39	-
Profit after Depreciation and Interest	(5.75)	5.08	14.82	16.44	17.93	18.56	19.10	19.96
Tax	-	1.83	5.34	5.92	6.46	6.68	6.88	7.19
Profit after Depreciation, Interest and Tax	(5.75)	3.25	9.48	10.52	11.47	11.88	12.22	12.77
Surplus available for repayment	9.18	17.13	21.49	20.77	20.07	19.87	19.69	19.79

DSCR	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Coverage available	9.18	17.13	21.49	20.77	20.07	19.87	19.69	19.79
Debt	6.73	14.74	13.78	12.82	11.86	10.90	9.94	8.97
Value	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DSCR Ratio	1.364	1.162	1.559	1.620	1.692	1.823	1.981	2.206
Average DSCR Ratio	1.68	-	-	-	-	-	-	-
Cash accruals	4.16	23.96	38.93	39.81	40.62	41.04	41.41	41.98

APPENDIX E

6. CALCULATION OF IRR, BCR AND NPW - AS PER IT ACT

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	
Capital cost	74.78	-	-	-	-	-	-	-	
Recurring cost	37.60	90.18	113.12	113.26	113.42	113.40	113.38	113.36	
Total cost	112.38	90.18	113.12	113.26	113.42	113.40	113.38	113.36	490.14
Benefits	47.52	110.88	142.56	142.56	142.56	142.56	142.56	142.56	
Depreciated value of assets								3.16	
Total benefits	47.52	110.88	142.56	142.56	142.56	142.56	142.56	145.72	534.15
Net benefits	(64.86)	20.70	29.44	29.30	29.14	29.16	29.18	32.36	
Discounting factor	15%								
NPW @ 15% DF	44.01								
IRR	36.74%								
BCR	1.09								

APPENDIX F

7. REPAYMENT SCHEDULE

O/S bank loan at start of year	Disb. During the year	Total loan outstanding	Surplus for repayment	Interest	Interest payment	Repayment of principal	Total outgo	O/S Bank loan at end of year	Balance left
-	56.09	56.09	9.18	6.73	6.73	-	6.73	56.09	2.45
56.09		56.09	17.13	6.73	6.73	8.01	14.74	48.08	2.39
48.08		48.08	21.49	5.77	5.77	8.01	13.78	40.07	7.71
40.07		40.07	20.77	4.81	4.81	8.01	12.82	32.06	7.95
32.06		32.06	20.07	3.85	3.85	8.01	11.86	24.05	8.21
24.05		24.05	19.87	2.89	2.89	8.01	10.90	16.04	8.98
16.04		16.04	19.69	1.92	1.92	8.02	9.94	8.02	9.75
8.02		8.02	19.79	0.96	0.96	8.02	8.98	0.00	10.80

Term loan taken at 75% of total Project Cost i.e. 74.78*75%
Loan repayment in 7 years with one year grace period.

S.No.	Name of the Processing unit	Total Qty processed (tonnes)
1.	Suvera processed foods pvt	1600
2.	Ravindranath Fruit Canning Ltd. Industries	2450
3.	Ranga Fruit Products	3000
4.	India Canning Industries	1400
5.	Anand Processed Foods	700
6.	Sreenivasa Processed Foods	750
7.	Chittoor Canning pvt. Ltd.	5400
8.	V enugopal Fruit Processing Industries	1600
9.	Sri Balaji Fruit Canning Industries	1750
10.	Creative Seasonal Canning	1200
11.	Sri Krishna Fruit Canning Industries	850
12.	BRVM Fruit Products	1400
13.	Nava Bharathi Food Products	1300
14.	Sai Krishna Food Products	900
15.	Maruthi Fruit Canning Industries	1800
16.	Sri Manjunatha Fruit Canning Industries	900
17.	Hayat Foods	2100
18.	Poorna Processed Foods	1800
19.	New Ranga Fruit Products	2200
20.	Bhagya Lakshmi Fruit Canning Industries	1600
21.	Jayabhaskar Processed Foods	1200
22.	Gold Cuits Agro Pvt. Ltd.	1400
23.	United Canning Co. Pvt. Ltd.,	1000
24.	Clean Foods Corporation Ltd.,	19000
25.	Sun Star Food Products	750
26.	Vinsari Fruit Tech Ltd.,	750
27.	Sri Parandama Fruit Products	800
28.	Sri Sai Fruit Products	750
29.	V enu Gopal Semi Foods	500
30.	Sarvani Food Products Ltd	650
31.	Navarasa Food Products Ltd.,	1460
32.	Sree Srinivasa Fruit Processing	900
33.	Sun Gold Processed Foods	2800

S.No.	Name of the Processing unit	Total Qty processed (tonnes)
34.	KNN Food Products	2650
35.	Sri Dhanalakshmi Fruit Canning Industries	1750
36.	New Parle Bisleri Pvt. Ltd	950
37.	New Parle Bisleri Pvt. Ltd.,	1600
38.	Capricorn	2400
39.	Parrot Processed Foods	650
40.	Chengalva Agro Tech Ltd.,	4100
41.	Sri Varadaraja Fruit Products	750
42.	Vallivedu Fruit Canning	1100
43.	V enus Fruit Canning	1450
44.	Ala Foods, Gollmadugu	750
45.	Cool Beach Industries	1000
46.	Krishnapriya Food Processing Unit	900
47.	V arsha Food Products	600
48.	R.M.M. Food Products	1300
49.	K.K. Foods	850
50.	Foods And Inns	2000
51.	Galla Foods	3900
	Total	**95360**