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POTENTIALS OF AGRO PROCESSING UNITS IN GUJARAT

(Sponsored by Agro Cl. matic Regional Planning Unit,  
Planning Commission)

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## CONTENTS

Preface

### Part I

#### Agro Processing Industries: Conceptual Framework and Potential in Gujarat.

		Pages
Chapter 1	Introduction	1-2
Chapter 2	Agro Processing Industries : A Conceptual Framework	3-8
Chapter 3	Agro Processing Industries : Profile and Recent Trend in India	9-16
Chapter 4	Gujarat State : Resource Potential	17-23
Chapter 5	Agro Processing Potential of Gujarat	24-39

### Part II

#### Illustrative Feasibility Studies and Project Profiles

Chapter 6	Introduction to Illustrative Feasibility Studies	40-46
Chapter 7	Feasibility of Brackish Water Aquaculture Project	47-54
Chapter 8	Feasibility of Particle Board Project	85-117
Chapter 9	Summary and Recommendations	118-120

**Part I**

## Chapter I

### INTRODUCTION

#### Background

In the Agro Climatic Zonal planning exercise, the country has been delineated into 15 agro climatic zones. Gujarat State forms zone no.13 which also includes Union Territory of Daman & Diu. Since the broad zonal classification displayed heterogeneity within the zones, the zone 13 was further subdivided into seven sub-regions (SRs). These are as follows:

No.	Sub-region	Districts Covered
(1)	South Gujarat (A)	Dangs and Valsad
(2)	South Gujarat (B)	Surat and Bharuch
(3)	Middle Gujarat	Vadodara, Kheda & Panchmahals
(4)	North Gujarat	Ahmedabad, Gandhinagar, Mehsana Sabarkantha & Banaskantha
(5)	North West Arid	Kachchh
(6)	North Saurashtra	Bhavnagar, Amreli, Rajkot Jamnagar and Surendranagar
(7)	South Saurashtra	Junagad

(\*) Agricultural Planning for the state of Gujarat based on Agro-climatic Regional Planning Exercise, Agro-climatic Regional Planning Unit, Planning Commission, Ahmedabad, May, 1990

Recently the Agro Climatic Regional Planning unit of Planning Commission located at Ahmedabad has presented a comprehensive profile, a development strategy, and programmes for zone no 13 (Gujarat plains and hills).

This document has indicated the existing status and development

try generates new demand on the farm sector for more and different agricultural outputs which are more suitable for processing. An agro-processing plant can open up new crop and livestock opportunities to the farmer and thus increase the farm income and employment<sup>2</sup>.

Derived from the raw material processed by them, Agro Industries display unique characteristics: seasonality, perishability, and variability<sup>3</sup>. The ground and tree crops, fisheries, and livestock undergo a reproductive cycle. Therefore, agro-industries have to procure raw materials only in the season (or there are wide fluctuations in the availability between the seasons), while the processing operations continue for a longer period and the demand for the products is round the year. The raw materials processed by the agro-industries are often perishable (more quickly in the food processing industries), and therefore greater speed and care in handling, storage, and processing are required. Unlike non-agro-industries, the raw materials obtained and processed by the agro-industries are often of varying quality.

These characteristics make the procurement sub system for raw materials the crucial determinant of the performance of these enterprises. Agro-industries are amenable and more viable to be located nearer to the source of raw material allowing a spatial distribution of industries (reducing the regional disparities in

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2. James E Austin, Agro Industrial Project Analysis, John Hopkins University Press Baltimore and London, 1981.

3. U.K. Srivastava, Project Planning, Implementation and Evaluation with Special Reference to Agro-Industrial Projects, Indian Institute of Management, Ahmedabad, 1981.

industrialization). Agro industries also have a large export potential.

The potential for agro-processing can be viewed in two ways: 1) the degree of processing of primary raw material, and 2) degree of processing of all the by-products under the commodity system.

#### Degree of Processing

The degree of processing of various raw materials varies from cleaning and grading of apples to milling of paddy and cooking, mixing and chemical alteration that create instant and ready to eat foods (Table 1). As the transformation of raw materials moves from Category I to IV, the value added as well as the price of finished products also rises. For example, the shrimp exports from India have been normally in the block frozen form (after being deheaded, deviened and shelled). More recently the effort has been to export the shrimp after processing it through instant quick frozen (IQF)

Table-1: Categories of Agro-Industry by Levels of Transformation Process

I	II	III	IV
Manual-Mechanical	Mechanical	Mechanical-Chemical	Chemical

Types of Processing Activity

Cleaning Grading	Ginning Milling Cutting Mixing	Cooking Pasteurization Canning Dehydration Freezing Weaving Extraction Assembly	Texturization Chemical alteration
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Illustrative Products

Fresh fruits Fresh vegetables Eggs	Cereal Grains Meat Spices Animal feeds Jute Cotton Lumber Rubber	Dairy products Fruits and vegetables Meats Sauces Textiles & garments Oil Furniture Sugar Beverages	Instant foods Textured vegetable Products Tyres
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Source : Austin, op. cit. p.4.

method. These exports are expected to fetch 50% to 70% higher value than in block frozen form\*. Similarly, tea exported in branded tea packets fetches additional value.

As we move from the preliminary degree of processing, capital investment, technological complexity, and managerial requirements also go up. Therefore, it has to be examined for each commodity

4. U.K. Srivastava, B.H. Dholakia, S. Vathsala and K. Chidambaram, Fisheries Sector of India, Oxford IBH Publishing Company, New Delhi, 1991, p.190.

as to what level of transformation is to be encouraged in the light of the present status and profile of the industry, technology options available, investment required, purchasing power of the target group in the domestic market, and specification of the international markets<sup>5</sup>.

#### Degree of Processing of All the By-products

The agro-industrial potential becomes manifold when the processing possibilities of the entire commodity system are taken into account<sup>6</sup>. For example, a farmer cultivates paddy, and when a plant is put up to process the paddy the plant produces the following:

Straw (about 50% by weight), husk (about 10.5% by weight), bran (about 3.5% by weight), rice kernel (about 36% by weight). A recent study<sup>7</sup> has indicated that with an initial investment of Rs. 2 crore to 3 crore, each block of 10,000 hectare under paddy crop with two paddy seasons in a year and 4 MT/ha of production has a potential of supporting a complex of processing industries (rice mills, solvent extraction plant for rice bran oil, processing of husk for a variety of products, and straw paper/board mills). This yields 107% net value added on the raw material price. Such exercises can be done for all commodity by-product systems.

Similarly in animal based products we get the following raw

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5. U.K. Srivastava, Agro Processing Industries Potential, Constraints and Task Ahead, op. cit. p. 244.

6. Abhay Sah and U.K. Srivastava, Rice Bran Oil Industry: An Insight into Technology and Commercial Aspects, Concept Publishing Company, New Delhi, 1985.

7. V. R. Gaikward, "Application of Science and Technology for Integrated Agricultural and Rural Development: A Farm Industry Linkage Approach", Consultancy and Development, No. 8, June pp. 63-90. Gaikward, V.R. and V.K. Gupta, A Guide to Management of Integrated Rice Co-operatives in Asia, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

materials : meat, blood, bones, hides, skins, glue stock, horns and hoofs, wool, hair, feathers, glands and casings<sup>8</sup>. Processing of all these raw materials opens up large value addition possibilities. In remote rural areas, the farmer have been able to recover only hides and skins, and the opportunity for processing of other by-products is lost.

By-products influence the price of meat (main product) and the price paid to the producer for the livestock depending upon the extent of utilization of all the potential. For example, 150 deep sea trawlers at Vishakapatnam throw 1,30,000 tonnes of fish back into sea<sup>9</sup>. for economic reasons. The fish hold of trawler is 40 tonnes. The ratio of fish prices to prawn prices is 4 : 50 to 60. Therefore, every trawler prefers to keep the hold empty for prawn catches, except for the fish caught in the last fish haul on the return trip. Prawns catch is not more than 10 tonnes. Had this fish caught been brought to shore and processed into edible products like fish keema, sausages, fish cutlets, and fish balls high value products could have been produced and the overall value added from the activity would have gone up substantially. Technology exists at least on pilot scale to achieve the high value product<sup>10</sup>.

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8. Mann, I Animal By-Products : Processing and Utilization, Food and Agricultural Organization, Rome 1978.

9. P.N. Bhatt, KKG Menon, and HC Srivastava (Eds) Animal Productivity, Oxford and IBH Publishing company Pvt. Ltd, New Delhi, 1989.

10. Govindan, T.K. Fish Processing Technology, Oxford & IBHPublishing Co. Pvt. Ltd., New Delhi, 1985. U.K. Srivastava et al., Fishery Sector of India, op. cit., 1989.

### Chapter III

#### AGRO-PROCESSING INDUSTRIES : PROFILE AND RECENT TRENDS IN INDIA

##### Profile<sup>11</sup>

In India substantial portion of net value added from the agro-industry is derived from unregistered and cottage scale units. Only 42.6% of value added, as shown in Table 2, was derived by the registered units in 1986-87. Between 1970-71 and 1986-87, the percentage share of unregistered units in value added has gone up from 47.8 to 57.4. This is contrary to the usual observations on the process of industrialization.

Table 2 : Net Value Addition from Registered and Unregistered Units

Years	Percentage Share of Net Value from	
	Registered Units	Unregistered Units
1970-71	52.2	47.8
1980-81	49.9	50.1
1984-85	51.3	48.7
1985-86	42.7	55.3
1986-87	42.6	57.4

Note: These units includes commodities like food products, beverages, tobacco and tobacco products, textiles, wood and wood products - furniture and fixtures, paper and paper products and leather and leather and fur products.

Source: Central Statistical Organization National Accounts Statistics - 1980-81 to 1986-87, New Delhi, 1989.

For example, agro food processing industries in the cottage and unorganized sector include 79,000 rice hullers, 2,66,000 flour

11. Drawn from U.K. Srivastava, "Agro-Processing Industries, Potential, Constraints and Task Ahead", op.cit pp.245 - 249.

chakkis, 10,000 dal mills, 2,20,000 oil mills, 50,000 bakeries, 5,000 pasta goods units, 15,000 traditional food units, and 2,000 poha making units. In all these cases, 88% to 90% of the total value added came from only primary processing. Secondary and tertiary processing accounted for only a very small portion of the net value added<sup>12</sup>.

As shown by the Annual Survey of Industries 1985-86, agro processing units account for 39% of all factories, 12% of all fixed capital, 23% of working capital, and 15% of the total capital employed in the industry in the organized sector. This 15% of capital investment generates 36% of total employment, 26% of output, and 21% of net value added (Table 3).

The fixed capital investment per factory is only Rs.18 lakhs in the total agro-based industries as compared to the average fixed capital investment of Rs.86 lakhs per factory in the non-agro-based industries (Table 4). This indicates that bulk of the units in the agro-processing sector are very small and that they were set up mainly for primary product processing.

Other observations on the profile of agro industries visa-vis non agro industries are as follows<sup>13</sup> :

1. The working capital as a percentage of the total capital employed is about 48 in agro industries as compared to about 28 non-agro-industries.

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12. Government of India, Agro Food Processing Industry : VII Five Year Plan - Draft Report, Ministry of Food Processing Industries, New Delhi, August 1989.

13. U.K. Srivastava, Agro Processing Industries: Potential Constraints and Task Ahead, op. cit., p. 248.

2. The ratio of fixed capital to net value added is 1.4 for the total agro based industries as compared to 2.9 for non agro industries.
3. Capital-labour ratio is only 0.25 in the total agro-based industries as compared to 1.1 in the non agro industries indicating the labour intensive character of the agro-based industries.
4. Capital productivity of agro based industries is almost double (0.7) that of non-agro-based industries (0.35).
5. Labour productivity in agro based industries is less than half of the labour productivity in non agro based industries.
6. However, the share of total emoluments in the value added is 57% in agro-based industries as compared to only 45% incase of non-agro-based industries.
7. The ratio of net value added to total output is only marginally lower than that of the non-agro-based industries.

Table 3. Key Variable of Agro Industry in Relation to Total Industry

Description	No. of Factories (Number)	Fixed Capital (Rs. lakh)	Working Capital (Rs. lakh)	Invested Capital (Rs. lakh)	Total Persons Employed (Number)	Total Enroll- ment (Rs. lakh)	Total Inputs (Rs. lakh)	Value of Output (Rs. lakh)	Net Value Added (Rs. lakh)
	N	FC	WC	K	L	EML	I	O	MVA
1. Agro Food Industries	18179	236568	2855462	521930	1025424	79223	1172811	1581136	194301
2. Agro Non-Food Industries	21258	462414	351661	814075	1739516	199683	1185339	1567770	297964
3. Total Agro-Industries	39437	698882	637123	1336005	2764940	278906	2358150	3148906	4992265
4. Non Agro-Industries	61579	530642	2165534	7475176	4819067	829207	6890689	8866634	1834382
5 Total Industries	101016	6008524	2802657	8811181	7584007	1108113	9248839	12015540	2326647
6. % Agro Food Industries to total Industry	18.00	3.94	10.19	5.92	13.52	7.15	12.68	13.16	8.35
7. % Agro Non-Food Industries to Total Industry	21.04	7.70	12.55	9.24	22.94	18.02	12.82	13.05	12.81
8. % Total Agro-Industries to Total Industry	39.04	11.63	22.73	15.16	36.46	25.17	25.90	26.21	21.16

- Note: 1. It includes manufacture of food products (200 to 219) and manufacture of beverages (220 to 224)
2. It includes manufacture of cotton textiles (230 - 231), wool, silk and synthetic fibre textiles (240, 241 & 249), jute, hemp and mesh. textiles (250-253 & 259), wood and wood products (furniture and fixtures, paper and paper products (280-283), leather and leather products, and rubber and rubber products (300 - 302)

Source: GOI, Central Statistical Organization Annual Survey of Industries - 1985-86.

#### 4: Key Structural and Technical Ratios of Agro Industries

Description of Industry	Fixed Capital per Factory Rs.Lakh	% of Working Capital to invested Capital	Fixed Capital /Net Value Added	Capital Labour Ratio	Capital Productivity	Labour Productivity	Share of Emoluments in Value Added	Net Value Added to Total Output
	FC/M		FC/NVA	FC/L	NVA/K	NVA/L	EML/NVA	NVA/O
Total Agro-Based Food Industries	13.008	54.69	1.217	0.230	0.821	0.1894	0.4077	0.122888
30° Total Agro-Based Non-Food Industries	21.752	43.19	1.551	0.265	0.644	0.1712	0.6701	0.190055
Total Agro-Based Industries	17.721	47.68	1.419	0.252	0.704	0.1780	0.5665	0.156328
Non Agro Industries	86.224	28.96	2.894	1.101	0.345	0.3806	0.4520	0.206885
C Total Industries	59.480	31.80	2.582	0.792	0.387	0.3067	0.4762	0.193636

As per the details explained in the footnote of table 4.

Source: GOI, Central Statistical Organization, "Annual Survey of Industries - 1985-86".

The agro-industries at present have been contributing between 35% and 40% of total exports (Table 6). Bulk of the exports are still accounted for by primary commodities. For example, 50% of leather exports are in the form of semi-finished leather, instead of value added products. Similar is the case of various products from agro based food commodities as well as agro-based-non-food commodities. As in almost all commodities, there is a supply constraint after meeting the needs of domestic market, the emphasis has to be placed on larger unit value realization by exporting value added, branded, and packaged products.

#### Recent Trends

The process of agro-based industrialization is already on in this

country in response to increasing demand for various agro based products for direct consumption, industrial use, and export. There is already a shift from the early mechanical engineering based agro-industries to chemical based industries. For example, in addition to traditional agro-industries (rice mills, sugar mills, cotton ginning, spinning and weaving factories, jute factories, oil mills, etc.) in recent years many new agro industries have been established plants for solvent extraction for oilseeds, modern dairies for producing bottled milk, butter, cheese, chocolate, milk powder, etc., factories for producing a variety of paper and boards from paddy straw, bagasse, banana stems for producing alcohol, acetone, acetic acid and other chemicals from molasses and cassava, for producing medicines from medicinal plants, roots and tubers, for producing starch, glucose and variety of products from maize and cassava, for fruit and vegetable products, fish and meat products, wines for export and man-made fibres from forest plantations. Fresh water, coastal, and deep sea fishery industries are getting increased attention<sup>14</sup>.

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14. V.R. Gaikward, "Application of Science and Technology for Integrated Agricultural and Rural Development", op. cit., pp. 63-90.

**Table 5 : Export of Agro-based Commodities from India**  
(Value Rs. Crore)

Exports of Agro-Based Industries			
Commodities	1985-86	1986-87	1987-88
Total Agro-based Exports	4308.8	4943.87	5511.80
Total Exports	10894.6	12452.40	15741.20
% of Agro based Exports to Total Export	39.5%	39.7%	35.0%

Source: Government of India, Economic Survey 1988-89. Monthly statistics of Foreign Trade of India Vol. I March 1984, 1985, 1986 & 1987.

Note : Total Agro-based commodities include agro-based-food commodities (Coffee, Tea, Cashew, Kernels, Spices, Sugar and Molasses, Rice, Fish and Fish Preparations, Meat and Meat Products, Fruits and Vegetables and Others) and Agro-non-food commodities (Oil Cakes, Tobacco, Raw Cotton, Cotton Yarn and Fabrics, Coir Yarn and Jute manufacturers, Leather and Leather Products, Natural Silk and Wool and Woollen textiles).

During last six years, there has been a significant increase in investment in plant and machinery for mechanized and highly automated production of pasta products: instant noodles, vermicelli, and ready to fry snacks. These products have been backed by intensive advertising and promotion. Similarly some major investments are in process in fruit and vegetable industries, biscuits and confectionery industries, and other snack foods. Some major investments have been made even in setting up of integrated paddy-rice processing complexes.

The trends in the growth of agro-processing can be summed up as follows:

1. By-product processing of major agricultural commodities has opened up the vast potential of agro-industrial growth in

2. The degree of processing has been considerably intensified and modernized by the growth of processed food industry which is based on cooking, mixing, and chemical alteration producing a textured vegetable food.
3. The development of agro processing industries has attracted higher capital investments, enhanced technological complexities, and managerial requirements. Many companies have also found the agro-processing and processed food, as lucrative avenues for diversification.

In agro based non-food sector more investments have been made to improve the product designs and product diversification into more value added products. It is this trend of converting the potential of processing of main products as well as by products which has to be accelerated in future years<sup>15</sup>

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15. U.K. Srivastava. "Agro Processing Industries : Potential Constrains and Task Ahead", op. cit., pp. 248-249.

## Chapter IV

### GUJARAT STATE: RESOURCE POTENTIAL

#### Background

The agro-processing potential is dependent upon the agricultural development of a state, the agricultural development of the development of the state is dependent upon the agro-climatic and geographical characteristics of the state. The chapter discusses these details, in respect of Gujarat State.

Some of the salient features of Gujarat State are as follows<sup>16</sup>:

- |                              |                               |
|------------------------------|-------------------------------|
| 1. Geographical area         | 6% of India                   |
| 2. Landmass                  | 1.96 lakh sq.km.              |
| 3. Population                | 34.09 million <sup>a</sup>    |
| 4. Total literacy            | 43.7% <sup>b</sup>            |
| 5. Female literacy           | 32.3% <sup>c</sup>            |
| 6. Rural poverty             | 28% <sup>d</sup> (India: 40%) |
| 7. Urban population          | 31% <sup>e</sup>              |
| 8. Density                   | 174 persons/sq.km.            |
| 9. Average landholding       | 3.45 ha <sup>f</sup>          |
| 10. Agri.labour productivity | Rs.3122/capital <sup>g</sup>  |
- (a) Southern, middle, and northern parts are more densely populated than Saurashtra. Arid Kutch has a density of only 23 persons sq.km.
- (b) Above national average
- (c) Above national average

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16. Agro-Climatic Regional Planning At State Level-Profile, Issues, Strategies and Programmes, ARPU Working Paper No.5, July 1991, p. 61.

- (d) Less in Saurashtra. Almost double in other parts of state.
- (e) Evenly spread in all parts. The southern regions have a high population of scheduled tribes.
- (f) More in Kutch and northern Saurashtra.
- (g) Highest in South Saurashtra and lowest in southern hilly areas.

The state can be divided broadly into four regions: South, Middle, North and Saurashtra-Kutch. Large parts of the state are plains, more in central and northern Gujarat. The eastern part forms the border with Maharashtra, Madhya Pradesh and Rajasthan with mountainous areas. A small part in southern Saurashtra has an elevation above 300 m of MSL, and some parts along the Gulf of Khambhat are below MSL.

Rainfall varies from 340 mm in the western arid districts of Dangs and Bulsar. Most parts receive a rainfall of around 800 mm. Nearly 25 per cent of the geographical area in the western part is arid. Another 34 per cent in the north is semi-arid and about 50 per cent of the talukas in middle Gujarat are arid/semi-arid. Nearly 20 per cent of the area covering 42 talukas in 19 districts is drought-prone.

Across the state there are also large variations in soil types. Coastal alluvial and blacksoil is predominant in south Gujarat. In middle Gujarat medium black soil is found. In the north and northwest it is grey brown and coastal alluvial soils. Saurashtra has calcareous medium black and to some extent coastal alluvial soils.

### Agroclimatic Regions

The state is divided into seven agroclimatic regions based on topography, rainfall, and soils (Table-6).

Table-6: Agroclimatic Grouping of Regions in Gujarat State

Region	District	Rainfall in mm.	Climate	Soils
1. Southern Hills	Dangs, Bular	1793	Semi-arid	Deepblack dry, sub-coastal humid alluvian
2. Southern Gujarat	Surat, Bharuch	974	-do-	-do-
3. Middle Gujarat	Baroda, Kheda Panchmahals	904	Semi-arid	Med-black
4. North Gujarat	Ahmedabad, Gandhinagar Mehsana Sabarkantha Banaskantha	735	Arid to semi-arid	Gray brown coastal alluvian
5. North West Arid	Kutch	340	Arid	Gray brown Deltaic alluvian
6. North Saurashtra	Amreli, Bhavnagar, Rajkot Saurashtra	537	Semi-arid	Med.black calcareous
7. South Saurashtra	Junagadh	844	Dry semi-arid	Coastal alluvian Med.black

Source : ARPU Working Paper No. 5 op.cit.

Table-7 provides the land use pattern by regions:

Table-7: Land Use Pattern in Different Regions of Gujarat State

Region	Geographical Area (000 ha)	Land Use as of 1984-85				
		NSA	Forest	ALAC	NIA	MSA
1	701	43.2	42.8	4.2	60	20.2
2	1670	53.5	18.4	7.5	162	19.4
3	2385	65.2	13.6	6.2	503	32.8
4	3848	63.1	7.2	7.1	919	35.1
5	4561	18.7	9.1	33.4	83	12.5
6	5373	63.8	5.0	9.2	731	23.7
7	1061	57.9	19.0	12.4	154	25.2
8	19598	52.9	10.8	12.9	1612	27.2

Source : ARPU Working Paper No. 5 op.cit.

The net sown area (NSA) for the state is about 53% with middle, northern and Saurashtra areas having over 60%; forests in the state account for 11% of area. The additional land available for cultivation (ALAC) in the state as a whole is as high as 13%, Kutch alone accounts for 33.4%.

Irrigation development in the State is about 27% of net sown area.

### Cropping Pattern

Table-8 gives the cropping pattern and land productivity.

Table-8: Cropping pattern and Land Productivity (1984-85)

Region	Lead Crops			Cropping Pattern	Land Productivity (Rs./ha)
	I	II	III		
1	Rice	Ragi	Scane	1	6535
2	Jowar	Cotton	Tur	2	5571
3	Rice	Cotton		4	3479
4	Bajra	Cotton		3	2600
5	Bajra	G.nut	Jowar	3	1705
6	G.nut	Cotton	Bajra	4	2319
7	G.Nut			4	4300
8.State	G.nut	Cotton	Bajra	4	3022

- (1) Rice Area > 50% of CGA
- (2) Pulses area > 40% of CGA
- (3) Other cereal area > 40% of CGA
- (4) None of the above

Source : ARPU Working Paper No. 5 op.cit.

From the above Table it can be seen that food and non-food crops occupy almost equal proportion. Groundnut and cotton are the main cash crops. Groundnut account for 28% of area and 24% of production of the country. Cotton represents 19% of area and 23% of production in the country.

The total animal wealth of the state is 18.34 million: 38% cattle, 24.2% buffaloes, 13% sheep, 13% goats and about 7% of other animals, with an average of about 2.2 animals/ha CGA.

In middle and north due to well developed dairy industry buffaloe population is higher. The milk production of the state is 31.0 lakh tonnes (202) g / capita / day).  
 1981 → 49 → 1991

Southern areas owing to its proximity to Bombay is registering rapid development of poultry.

#### Regional Variations

The southern hills region is the smallest and north Saurashtra the largest region of the state. Saurashtra registers high agricultural labour productivity due to the crop cultivated there namely groundnut. In southern region also the productivity is high due to high value crops of fruits, vegetable and sugarcane. Nearly one-third of the geographical area in Kutch is wasteland. In southern part has a good canal network. In the northern and western regions, the major irrigation source is groundwater.

The south hilly region, in the last 15 years, has moved from coarse cereal to rice cultivation due to irrigation development. The cotton area in south and middle Gujarat has changed in favour of tur, largely under rainfed conditions. In the north and arid Kutch, however, the cropping pattern has not changed and coarse cereals, particularly bajra and jowar still dominate in view of large animal population needing dry/green fodder, as well as due to low rainfall.

Overall the cropping pattern of the state is seen as follows:

Overall foodgrains	50% of cropped area
Of which:	
Cereals	40%
Gram Tur	5%
Fibres + Oilseeds	47%
Fibres	17%
Oilseeds	30%
Sugarcane	1.2%
Tobacco	1.2%

Source : ARPU Working Paper No. 5 op.cit.

Rice, wheat and bajra are major cereals grown in the state. Rice is confined to south and central area, wheat is more dispersed and bajra is confined largely to semi-arid and arid north Gujarat, Kutch/Saurashtra.

A recent survey by Agroclimatic Regional Planning Unit of Planning Commission has indicated the following:

- 1) Kheda, Panchmahals, Surat, Vadodara, Rajkot and Junagadh have potential for agricultural growth.

- 2) Bhanaskantha, Bharuch, Bulsar, and Bhavnagar have recorded reasonable growth and with further development in land and water resources can lead to substantial growth.
- 3) If the resources of Surendranagar, Kutch and Jamnagar are to be tapped fully the resources, technology and management will have to be strengthened.

Thus it can be seen that at the overall state level, Gujarat with 53% of NSA (with 50:50 cash/food crops) and 13% of additional land available for cultivation shows good potential. Also the positive growth rate in the form of high productivity of pulses is a favourable condition.

However, with 78% of land as rainfed area, and large areas under semi-arid and arid conditions and the low forest area are some of the constraints for agricultural growth.

The two major cash crops of the state are cultivated mostly in traditionally concentrated pockets, groundnut in Saurashtra and cotton in middle and northern regions. These two crops are central to the economy of the state.

Livestock population in the state has been increasing. With only 4.4% area under pastures and only 9% under fodder crops, there is a large gap of over 130 lakh tonnes of dry fodder and 63 lakh tons of green fodder.

The 1640 km coastline, 188 lakh ha of inland water body in the form of ponds, tanks, reservoirs and rivers, and about 3.68 lakh ha of saline marshes offer very good scope for marine, inland and brackish water fisheries.

## Chapter V

### AGRO-PROCESSING POTENTIAL OF GUJARAT

#### Agriculture in Gujarat

The share of agriculture in Gujarat's domestic product is about 35% to 40%. The State's share in national foodgrain output is just over 3%. As stated in a previous chapter, in non-foodgrain crops, Gujarat is a major grower of oilseeds and cotton.

The share of Gujarat in national agricultural output is given in Table-9.

Table-9: Gujarat's Share in Indian Agriculture Output (1986-87)

Crops	Share in all India Output (%)
Total Foodgrains	3.72
Rice	1.34
Wheat	3.27
Jowar	5.68
Bajra	26.15 /
Maize	6.30
Other cereals	1.55
Pulses	4.83
Oilseeds	17.22 /
Cotton	22.60 /
Sugarcane	4.10
Tobacco	38.27 /
Spice	1.50
Fruits and Vegetables	5.00

Table-10 gives the details of agriculture output in Gujarat from where it can be seen that Bajra, maize, oilseeds, cotton, sugarcane, tobacco, spices and fruits and vegetables are major crops in Gujarat as of 1984-85.

Table-10: Agriculture Output in Gujarat

Crops	1984-85			1985-86			1986-87			Major Regions
	Area	Prod.	Y/Hct	Area	Prod.	Y/Hct	Area	Prod.	Y/Hct	
1	2	3	4	5	6	7	8	9	10	11
<b>Cereals</b>										
Rice	6561	8382	4181	4917	4542	924	5111	4460	870	Kheda, Valsad, Surat, Ahmedabad, Panchmahal, Baroda
Wheat	6349	13293	2087	4314	7828	1815	1351	6617	2100	Rajkot, Junagadh, Mehsana, Ahmedabad, Banaskantha, Sabarkantha
Jowar	8744	4987	570	8935	3549	397	8821	2451	277	Surat, Banaskantha, Baroda, Mehsana, Kheda, Ameli, Kutch
Bajri	13776	15353	1118	13155	6359	483	12744	10269	806	Banaskantha, Bhavnagar, Mehsana, Kheda, Ameli, Kutch
Maize	3100	3836	1237	3165	1143	361	3138	4530	1386	Panchmahal, Sabarkantha, Baroda, Kheda
Ragi	446	442	992	448	334	744	407	222	547	Danga, Gandhinagar
Kodra	536	391	729	519	80	155	466	117	351	Baroda, Kheda, Panchmahal
Small Millets	534	256	479	584	85	146	490	49	100	Danga, Panchmahal
Barley	66	61	920	67	68	1015	-	-	-	Banaskantha, Sabarkantha, Mehsana
<b>Pulses</b>										
Tur	3288	2511	764	3025	2234	738	3187	1461	458	Baroda, Bharuch, Surat
Mug	1628	1126	692	1613	229	142	1576	140	89	Banaskantha, Mehsana, Bhavnagar, Kutch
Math	910	286	314	839	49	58	696	43	62	Ahmedabad, Banaskantha, Kutch, Surendranagar
Urad	760	442	449	804	220	273	821	340	414	Bharuch, Valsad, Panchmahal, Sabarkantha

Green	1157	1012	875	808	445	563	436	281	645	Panchmahal, Jamnagar, Junagadh
Other	543	283	521	471	197	418	363	89	245	Panchmahal, Surat
<b>Oil Seeds</b>										
Groundnut	20611	15723	763	17915	4182	250	18245	12917	708	Amreli, Bhavnagar, Junagadh, Jamnagar, Rajkot, Kutch
Sesamua	1440	499	346	1268	196	155	1325	124	92	Surendranagar, Kutch, Bhavnagar
Rape / Mustard	1953	2393	1226	1924	2089	1085	1817	2349	1293	Amreli, Banaskantha, Mehsana
Cotton	13834	20688	254	14040	19867	241	13662	10534	136	Ahmedabad, Baroda, Mehsana, Sabarkantha, Surendranagar, Rajkot
Tobacco	1084	1735	1600	1062	1678	1580	1104	1828	1656	Kheda, Baroda
Sugar	1033	7582	7342	908	6490	7144	692	5566	8045	Valsad, Surat, Amreli, Junagadh, Rajkot, Kheda, Mehsana
Cumin	604	352	593	330	186	502	372	209	526	Banaskantha, Mehsana, Bhavnagar, Rajkot
Chillies	143	140	980	137	94	683	126	108	855	Mehsana, Jamnagar
Inabgul	336	307	916	269	188	699	253	176	661	Banaskantha, Mehsana
<b>Fruits and Vegetables</b>										
Potatoes	98	3226	32918	81	1531	18880	110	2536	23117	Ahmedabad, Banaskantha, Baroda, Bharuch, Valsad, Danga, Kheda, Mehsana, Panchmahal, Sabarkantha, Surat, Jamnagar, Junagadh
Onion	149	4991	32951	169	4777	28244	122	2791	22871	Grown in all districts except Danga and Kutch
Garlic	213	NA	NA	35	158	4460	122	2791	2871	Banaskantha, Baroda, Bharuch, Kheda, Panchmahals, Sabarkantha, Surat, Jamnagar, Junagadh, Rajkot
Banana	124	4655	53824	-	-	-	-	-	-	Ahmedabad, Baroda, Bharuch, Valsad, Kheda, Surat, Panchmahal, Bhavnagar, Junagadh, Kutch

Source: GITCO Ltd., Study Report to Encourage the Growth of Agro Processing Industry in Phase I, of Sardar Sarovar Project Area, April 1990.

Table-11 gives the production of major crop groups and projections for 1988-89 and 1994-95, where from it can be seen that in foodgrains coarse cereals are expected to continue to lead in 1995. In oilseeds groundnut will continue to lead and sugarcane is expected to have a predominant place.

Table-11 : Area and Production of Major Crop Groups/Crops and Projections

Crop/Crop Group	TE 1988-89		TE 1994-95		State Targets
	Area	Prod.	Area	Prod.	
Rice	464	532	575	1100	1230
Wheat	386	842	827	2213	1900
Coarse Cereals	2297	1578	2400	2570	2826
Gram + Tur	382	216	476	439	NA
Total Pulses	720	315	796	654	720
Foodgrains	3867	3267	4598	6717	6676
Groundnut	1566	2083	2342	2631	2292
Total Oilseeds	2017	2713	3158	3549	3048
Cotton	1059	161	1057	318	338
Sugarcane	82	6783	125	12156	10050
Fruits & Vegetables	NA	NA	258	1449	1677*

(\* Fruits Only

Area = '000 ha, Production = '000 tonnes

#### Agro-processing Enterprises in Gujarat

The annual survey of industries a minimum of 50 persons. This annual survey for 1985-86 provides details of these enterprises. According to this survey Gujarat accounted for 8.4% of the national output, though number of units was just 3.6% in Gujarat. Some of the other details are as follows:

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 Table-12: Census Sector Data for Gujarat on Agro-Processing  
 Industries (1985-86)  
 -----

1.	No. of enterprises in food/beverage/ tobacco products	1193
2.	Fixed capital of these enterprises	Rs.19723 lakh
3.	Employment	9594 people
4.	Value of output	Rs.11794 lakh
5.	Value added	Rs.11480 lakh

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 Therefore, the per enterprise fixed investment was Rs.16.5 lakh,  
 employment 6.4 person, annual output Rs.12.4 lakh and value  
 addition Rs.9.6 lakh.

Table-14: Gujarat's Share in Indian Agriculture  
 Output Year 1986-87

Crops	% Share in all-India Output
Rice	1.34
Wheat	3.27
Jowar	5.68
Bajra	26.15
Maize	6.30
Other cereals	1.55
Pulses	4.83
Total foodgrains	3.72
Oilseeds	17.22
Cotton	22.60
Sugarcane	4.10
Tobacco	38.27
Tea	Nil
Coffee	Nil
Jute	Nil
Spice	1.50
Fruits and Vegetables	5.00

*Repetition of 7.9*

Table-13 gives the place of Gujarat in national output in respect  
 of different agro-processing industries. It can be seen that  
 Gujarat possesses considerable share in the national output in  
 terms of dairy products, canning and preservation of fruits and  
 vegetables, canning, preserving and processing of fish crus-  
 tacean, sugar, khandsari, gur from sugarcane and palm juice,

common salt, hydrogenated oils, vanaspati, ghee, edible oils, icecream, animal feeds, starch soft drinks and carbonated water.

#### Composition of Enterprises in Agro processing

Only about <sup>(5.5%)</sup> 379 of the 6797 new enterprises being set up every year in Gujarat pertain to food processing. In 1988 there were 4822 agro-processing (both food and non-food units) were in the small scale sector in Gujarat.

In fruits and vegetable processing by 1984 there were 131 FPOs, of which public sector/cooperative sector accounted for only 4. Home scale/cottage scale licensees were predominant.

Table-14 provides details of production of fruits and vegetable processing sector in Gujarat.

Where is this?

13  
**Table-14: Status of Gujarat in National Agro Processing Industries (1985-86)**

(Rs. in lakh)

Sl. No.	Product	Gujarat	India	Percentage
1.	Slaughtering, preparation and preservation of meat	587.3	3,774	15.6
2.	Manufacture of dairy products	36,080.8	177,711	20.3
3.	Canning and Preservation of fruits and vegetables	1440.8	13,818	10.4
4.	Canning preserving and processing of fish, crustacean and similar foods	2,725.3	26,275	10.4
5.	Grain mill products	11,850.4	340,991	3.5
6.	Manufacture of bakery products	1,344.2	42,672	3.1
7.	Manufacture and refining of sugar (vacuum pan sugar factories)	13,447.2	262,499	5.1
8.	Production of indigenous sugar, boora, khandsari, guar etc. from sugar cane and plant juice etc.	4,285.0	31,661	13.5
9.	Production of common salt	2,596.6	4,314	60.2
10.	Manufacture of cocoa, chocolate and sugar confectionery (including sweet meats)	451.6	4,995	9.0
11.	Manufacture of hydrogenated oils, vanaspati, ghee, etc.	14,887.1	128,673	11.6
12.	Manufacture of other edible oils and fats eg. mustard oil, groundnut oil, til oil etc.	26,029.4	169,305	15.8
13.	Coffee curing, roasting and grinding	46.3	4,205	1.1
14.	Manufacture of ice cream	363.2	2,225	16.3

15.	Manufacture of prepared animal feeds	5,132.4	24,486	21.0
16.	Manufacture of starch	5,359.4	11,892	45.1
17.	Manufacture of food products not elsewhere classified	4,133.5	54,342	7.6
18.	Soft drinks and carbonated water	1,473.2	14,434	10.2

Source : Annual Survey of Industries 1985-86, op. cit.

In 1986 Gujarat held a significant proportion of national production in respect of dehydrated vegetables (81%), canned food-bottled vegetables (21% and mango slices (21%). It may also be seen that sweetened aerated water, fruit pulps, dehydrated vegetables and canned/bottled vegetables were the most important product groups followed by pickles, mango slices, candied/crystallized fruits and tomato products.

In canned/bottled fruits the place of importance is held by mango (96% share). Mango pulp alone with a production level of Rs.337 lakh/year held the first position in the vegetable and fruits based products.

In the fruit juice section pineapple holds first position followed by lime and pineapple. Papaya is normally candied and crystallized.

Among dehydrated vegetables Gujarat's share was substantial in garlic (nearly 10%). Carrot and cabbage one the other dehydrated vegetables that hold substantial share in Gujarat's agro processing.

As of 1986, the value of processed vegetable based products amounted to Rs.367 lakh and the quantity processed amounted to

2797 tons. In fruits, mango based products were predominant with 3386 tons of mango processed at a value of Rs.410 lakh.

Table 15 gives the agro processing scene of Gujarat in respect of other products.

Table-15: Agro Processing Scene of Gujarat (1987)

S.No	Raw Material Tonnage Production	Utilization in Processed Products
1.	Sugarcane, 60,78,000	78% of cane for which sugar in 17 sugar mills. Sugar production 5.8 lakh tons, Molasses output 2.6 lakh tons.
2.	Oilseed, 17,66,000 (Groundnut 73%)	Edible oil production NA Oilcake production NA Vanaspati 77,000 tons
3.	Roller flour milling	29 mills Annual output: 6 lakh tons
4.	Pulse milling	125 mills annual output: 1,50,000 tons
5.	Rice Milling	3400 units, 4,00,000 tonnes of rice per year
6.	Maize	2 large starch plant process 1,45,000 tonnes to produce 80,000 tonnes of starch
7.	Tobacco	Non-virginia tobacco is processed in 500 units. Annual output is 460,000 tonnes
8.	Cotton ginning	800 ginning enterprises processes 4 lakh tons of cotton every year
9.	Guargum	Gujarat produces over 80,000 tons of guar seed. There are 15 guargum units in Gujarat producing 10,000 tons of guar-gum per day.
10.	Spices (main products cumin, funnel, chilli)	Mainly in cottage sector. However, there are 7 units which grind, mix and process 2000 tonnes of spice every year.
11.	Isabgul	Concentrated in north Gujarat

(Animal) output of 20 units is 8000 tonnes.

12. Biscuits One organized sector unit, six automatic continuous units and numerous cottage units. Combined production of all the units is 10,000 tonnes per annum.
13. Bread/Bakery 20,000 tonnes per annum
14. Confectionery 22 units with total annual output of 4500 tons.
15. Papad Five national brands: Lijjat, Tasty, Swad, Sonal and Gits with annual output of 3000 tonnes.

As of 1987-88 the number of SSIs in food processing industries in Gujarat was 1897 as against a total SSIs registration of 33,948. There has been a declining trend in SSIs for food processing over the years (7.1% in 1984-85 to 4.8% in 1987-88).

Table-16 gives the categorywise and sectorwise distribution of FFD licenses in Gujarat as of 1984.

Table-16 : Category-wise and Sector-wise Distribution of FFD Licensees in Gujarat During 1984

State	Category of Licensee	Sector		Total		No. of Units	%
		Private	Cooperative	Public			
		No. of Units	%	No. of Units	%		
Gujarat							
Large Scale	23	(9.0)	-	-	2	(10.0)	25 (8.8)
Small Scale-B	16	(6.1)	-	-	-	-	16 (5.5)
Small Scale-A	9	(4.8)	-	-	-	-	9 (4.5)
Cottage Scale	35	(7.1)	-	-	-	-	35 (6.8)
Home scale	38	(3.0)	1	(6.2)	-	-	39 (3.0)
Relabeller	6	(1.4)	-	-	1	(11.1)	7 (1.6)
<b>Total</b>	<b>127</b>	<b>(4.4)</b>	<b>1</b>	<b>(1.9)</b>	<b>3</b>	<b>(3.4)</b>	<b>131 (4.3)</b>

Table-17 gives the production of FPO licenses for the period 1980 to 1987.

Table-17: Quantity (T) of Different Product Groups Produced by the Different Licensees in Gujarat During the Years 1980-86

Product	1980	1984	1985	1986
1. Canned/Bottled Fruits	52.3	40.0	119.4	64.4
2. Canned/Bottled Vegetable	489.0	1138.2	822.8	875.7
3. Jams/Jellies/Marmalades	7.0	165.3	265.6	29.8
4. Fruit juices	542.3	218.5	145.4	165.6
5. Fruit pulps	1541.9	1771.4	3192.0	2600.0
6. Squashes/Cordials/Crushes	4.8	8.0	3.8	4.7
7. Fruit Syrups	-	-	4.3	-
8. Fruit Nectars	0.4	-	2.1	-
9. RTS Fruit Beverages	38.3	35.1	87.4	238.3
10. Fruit Juice Concentrates	-	16.3	Nil	-
11. Chutneys	43.6	65.0	108.2	123.7
12. Pickles (MSIB)	363.5	456.9	805.2	487.4
13. Mango slices in Brine	2318.6	302.8	522.4	326.2
14. Preserves	12.6	2.9	0.8	102.4
15. Candied and crystallised fruits	33.3	142.1	193.9	332.0
16. Dehydrated fruits	-	-	-	-
17. Dehydrated vegetables	851.7	2501.9	1524.0	1621.9
18. Frozen fruits	-	16.8	-	-
19. Frozen fruit products	-	-	-	-
20. Frozen vegetables	-	-	-	-
21. Tomato products	59.2	198.1	266.7	266.5
22. Sauces (other than Tomato)	40.1	15.8	50.3	33.7
23. Soups (other than Tomato)	-	-	-	-
24. Other Misc. Products	0.1	-	-	-
25. Brewed Vinegar	214.6	182.3	164.4	162.3
26. Synthetic Vinegar	11.7	16.9	20.3	20.3
27. Synthetic Jellies	-	-	-	-
28. Synthetic Syrups	22.7	27.2	17.5	25.0
29. Synthetic non-aerated beverages	-	-	-	-
30. Sweetened Aerated water	7147.0	19266.8	19063.9	19443.5
<b>Total</b>	<b>12605.7</b>	<b>26588.0</b>	<b>27370.4</b>	<b>26922.2</b>

Source: GITCO Report, op. cit.

Table-18 provides the basic data of agro-based industries for Gujarat for three time periods. It can be seen that the growth rate of factories in agrobased industries for all the three periods was much less than for other industries.

The fixed capital in all sectors (agrobased, agrofood, agro-non-food and other industries as well as total industries) show a cyclical trend.

In working capital a steady trend of 12 to 13% is seen for agro-food industries, whereas agro-non-food, total agro-based industries, other industries and total industries registered a dip in 1980-81 again to recover in 1985-86.

The invested capital showed a dip in 1980-81 for all categories, and a positive growth in 1985-86.

The number of persons engaged for agro-based industries showed a negative growth in 1980-81 for both agro-food and agro-non-food whereas other industries recovered from negative to positive growth. In 1985-86 the non-food industries showed a growth of 14.06% as against 0.98% only for agro-food industries.

The total emoluments for agro-food industries remained almost constant around 14 to 15% during the three periods, whereas for agro-non-food it dipped to 4.77% in 1980-81 from 1975-76 to recover to 9.46% in agro non-food industries. The other industries also maintained a 17% growth in all the three periods.

The total industries have had a cyclical trend for all categories of industries for the three periods, the agro-food industries showing a lower growth than others.

In net value addition for all industries put together there was a constant growth of 13.5%, food industries started with 16%, going down to 8.3% recovered to 11.69%, non-food moved from 12.3 to 4.5 to 7.93, and other industries from 14% to 21% to 17.6%.

The fixed capital investment per factory as of 1985-86 for agro-food was 16.5 lakh, whereas for non-food industries it was 35.8 lakh, and for other industries it was 51.5 lakh. Thus the agro-non-food unit was smaller than other industries and the agro-food unit was only half of the agro-non-food unit.

Some of the other observations on the profile of agro-industries are as follows<sup>17</sup>:

- 1) The working capital as a percentage of the total capital employed is 32.75% as compared to 15.75% for other industries.
- 2) The ratio of net value added to fixed capital in respect of agro-based industries was 61% as against 34% for other industries.
- 3) The capital-labour ratio is 0.7 for agro industries as compared to 1.7 for other industries.
- 4) Capital productivity ratio of agro-based industries is 0.31 as against 0.24 for other industries.

The average wage bill to value added for agro industries is 0.52, as against 0.37 for other industries. The agro-based industries

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17. See U.K. Srivastava and N.T. Patel, Managing Food Processing Industries in India and Indepth case studies of Manufacturer Exports and Analysis, in Press with Oxford & IBH Publishing Company, 1992.

in Gujarat thus are labour intensive.

A comparison between agro-food and agro-non-food industries performance in Gujarat in 1985-86 reveal the following:

	Agrofood	Agro-nonfood
1. No. of factories	29.35	70.65
2. Fixed capital	16.00	84.00
3. Working capital	24.00	76.00
4. Invested capital	20.00	80.00
5. Persons engaged	00.22	99.80
6. Emoluments	15.00	85.00
7. Total Input	24.00	76.00
8. Value of output	23.00	77.00
9. Net value added	15.00	85.00

Thus it can be seen that in Gujarat the non-food agro industry holds a more dominant position than the agrofood industry.

Some of the other observations on the profile of agro food industries vis-a-vis agro-non-food industries are as follows:

- 1) The working capital as a percentage of total capital employed is 39% in agrofood industry as compared to about 31% in agro-non-food industry.
- 2) The ratio of fixed capital to net value added is 0.58 for agro-food industry as compared to 0.6 for agro non-food industry.
- 3) Capital labour ratio for agro-food industry is 1.5 as

against for agro-non-food industry 1.37.

- 4) Capital productivity for agro-food industry is 0.24 as against 0.33 for agro non-food industry.
- 5) Labour productivity is 0.25 in agro-food industry as against 0.39 in agro non-food industry.
- 6) Share of total emoluments in value added is 1.96 for agro-food industry as against 0.33 for agro-non-food.

These ratios demonstrates that the agro-non-food industry in Gujarat was only marginally better performing than agro-food industries.

#### 5. Agro Processing Potential of Gujarat

The agro-processing possibilities for Gujarat can be visualized as follows: (Table-19).

Table-19: Agro Processing Potential of Gujarat

1. Paddy:	Milling, Mamra/pavva/flour
2. Ricebran:	oil, cattlefeed
3. Rice husk :	Animal feed, Particle Board
4. Paddy straw:	Cattle feed
5. Wheat:	Flour mill, bakery, sujimaker
6. Maize:	Milling, dextrose, starch, popcorn
7. Jowar:	Milling
8. Pulses:	Milling, papad making
9. Groundnut:	Oil milling, roasting, salting, peanut butter protein meal, cattlefeed, solvent extraction oil refining, vegetable ghee.

10. **Seaum/Rape/ Mustard:** Oil milling/refining/oilcake
11. **Castor seed:** Oil milling/oil based chemicals.
12. **Cottonseed:** Ginning, pressing, cattle feed, oil milling, refining, deshelling of linters, furfural from hulls.
13. **Tobacco:** Gradation, Bidi making, cigarettes
14. **Sugarcane:** Sugar, Khandsari, gur molasses, cattle feed Bagasse, paper, paper board
15. **Fruits and vegetables:** Processed vegetables, chips, snacks, grading, cleaning, cutting, powder, dehydrated flakes pulp, slices, canning.

At present Gujarat has a fairly well developed processing base for paddy milling, cattlefeed, animal feed, dextrose, glucose, starch, popcorn, pulse milling, papad, oil milling, oil refining, vegetable ghee, cotton ginning, tobacco sieving, sugar, molasses based industries, mango processing, vegetable processing spices processing, dairy and icecreams.

## Chapter VI

### INTRODUCTION TO ILLUSTRATIVE FEASIBILITY STUDIES

The Agro Climatic Regional Planning Unit has mapped out the existing production of agricultural and horticulture crops, animal husbandry and fisheries and tree crops in various regions of Gujarat. An effort has also been made to make projections of the availability of some of the raw materials in coming years. These data have been presented and analyzed in previous chapters. Similarly an analysis of existing industries in Gujarat indicates that it has its reasonable share in the total production of the country in sugar, cement, vanaspati, polyester filament yarn, cotton yarn, LPG, paper and paper boards, caustic soda, sulfuric acid, viscose filament yarn, vat dyes, nitrogenous fertilizers, iodized salt, Azo dyes, soda ash, DMT, cotton and cloth, basic drugs etc. But the agro processing unit in general and food processing unit in particular have not been developed to their potential.

Gujarat has a well developed institutional network setup by the State Governments to facilitate industrial growth. These institutions include Gujarat Industrial Development Corporation (GIDC) to develop industrial estates. Gujarat State Finance Corporation (GSFC) and Gujarat Industrial Investment Corporation (GIIC) to meet the need of the finance of the industries. Gujarat Small Industries Corporation (GSIC) assists in raw material procurement and marketing of products. It is a unique state in terms of establishment of a single point contact

organization, Industrial Extension Bureau Intextb. The state also has Gujarat Agro Industries Corporation (GAIC) for developing Agro based industries. and Gujarat Fisheries Development Corporation (GFDC) to develop fisheries sector.

Gujarat is also very well developed in terms of infrastructure facilities like electricity, transport, communication, bank coverage etc. (Table 1). Gujarat also has very well developed infrastructure in the form of industrial states created by Gujarat Industrial Development Corporation (Table 2). It has also received a very significant share of IDBI assistance and State Finance and Invest Corporation have also performed well and assisted the Entrepreneurs from this state keeping the above analysis, opportunities in mind, it is necessary to develop the project profiles and feasibility studies for agro based industries in various agro climatic zones in Gujarat.

IntextB has recently taken up the task of preparing a comprehensive assessment of potential and profile of these industries for benefit of Entrepreneurs.

The feasibility studies and profile should indicate the following dimension for the selected projects ideas.

1. Technical Viability
2. Commercial and Managerial Viability
3. Financial Viability
4. Economic Viability

The purpose of this report, as per the terms indicated in chapter 1 was also to present illustrative feasibility studies of atleast

two project ideas where the industries are less developed but potential is high. We selected these project ideas from the following two Agro Climatic Regions

No.	Sub-region	Districts Covered
(1)	South Gujarat (A)	Dangs and Valsad
(4)	North Gujarat	Ahmedabad, Gandhinagar, Mehsana

The illustrative feasibility studies are presented in chapter 7 and 8. These feasibility studies should be used as model for developing a large number of such studies so that the potential for agro based industries can attract the attention of the Entrepreneurs, Bankers, Policy Makers and Industrial Promotion Agencies as mentioned above.

Table : 1 Comparison at a Glance Gujarat vs India In Terms of Infrastructure Facilities				
Sl.No	Items	Units	Gujarat	India
1.0	Electricity-1988-89			
1.1	Electricity Generated (excluding Nuclear)	Billion Kwh	178	2640
1.2	No. of Towns and Villages Electrified	Nos.	17892	455491
2.0	Banking - March 1989			
2.1	Banking offices of banks	Nos.	3326	58901
2.2	Population per bank office office	000	8	7
2.3	Deposits of scheduled banks	Rs. in million	97900	1748230
2.4	Advances of scheduled banks	Rs. in million	57390	1026710
3.0	Transport and Communication			
3.1	Total railway length (at the end of 1988-89)	Kms	5616	61813
3.2	Total length of highways (as on 31st March 1989)	kms	64180	1285828*
3.3	Total surfaced roads (as on 31st March 1989)	Kms	56682	747003
3.4	National Highways (as on 31st March 1989)			
	(as on 31st March 1989)	Kms	1421	31817
3.5	State Highways	kms	15575	97041
3.6	No. of motor vehicles Registered (as on 31st March 1989)	000	1604	12347*
3.7	No. of post offices 1988-89	*	9	144*
3.8	No. of telegraph offices 1988-89	*	2	142*
3.9	No. of telephone connections 1989-90	*	453	5996
4.0	Stock Exchanges			
4.1	No. of Stock Exchanges (1989-90)	Nos.	3	19
4.2	Listed Companies	Nos.	731	5968

4.3	No. of Stock Issues Listed	Nos.	1297	8289
4.4	Paid up value	Rs. in million	125650	277500
4.5	Market value of capital	Rs. in million	318350	705210

Source : INDEITb Industrial Extension Bureau (A Govt. of Gujarat Organization), Gujarat, India.

Table : 2 Important statistics on Infrastructure and Other Facilities in Gujarat				
Sl No.	Indicator	Reference As on	Unit	Progress
1	2	3	4	5
1.0	Progress by GIDC			
1.1	Industrial Estates	March 1980 March 1985 March 1990 March 1991 Dec. 1991	Nos. Nos. Nos. Nos. Nos.	109 162 175 185 186
1.2	Plots Allotted	March 1980 March 1985 March 1990 March 1991 Dec. 1991	Million Sq.m. Million Sq.m. Million Sq.m. Million Sq.m. Million Sq.m.	26.24 42.64 65.49 69.47 71.19
1.3	Shes allotted	March 1980 March 1985 March 1990 March 1991 Dec. 1991	Nos. Nos. Nos. Nos. Nos.	5.234 8.274 10.752 11.192 11372
1.4	Housing allotted	March 1980 March 1985 March 1990 March 1991 Dec. 1991	Nos. Nos. Nos. Nos. Nos.	2955 7925 9929 10110 10297
1.5	Development expenditure	March 1980 March 1985 March 1990 March 1991 Dec. 1991	Rs. Million Rs. Million Rs. Million Rs. Million Rs. Million	711.0 1954.0 3051.7 3227.2 3292.1
1.6	Details about units set up in GIDC Estates			
1.6.1	Functioning units	1979-80 1984-85 1989-90	Nos. Nos. Nos.	5192 10695 18821
1.6.2	Investment	1979-80 1984-85 1989-90	Rs. in Million Rs. in Million Rs. in Million	2910 11310 26790
1.6.3	Production	1979-80 1984-85 1989-90	Rs. in Million Rs. in Million Rs. in Million	8440 23130 76530
1.6.4	Employment	1979-80 1984-85 1989-90	Nos. Nos. Nos.	93403 157242 366752
2.0	Assistance from GSFC			
2.1	Amount sanctioned	March 1980 March 1985 March 1990 March 1991 Dec 1991	Rs. in Million Rs. in Million Rs. in Million Rs. in Million Rs. in Million	1900 5120 10543 12690 14640

2.2	Units assisted	March 1980	Nos.	12918
		March 1985	Nos.	24485
		March 1990	Nos.	34664
		Dec. 1991	Nos.	36530
3.0	Assistance from GIC (Under general scheme)			
3.1	Amount sanctioned	March 1980	Rs. in Million	1010
		March 1985	Rs. in Million	2420
		March 1990	Rs. in Million	5840
		March 1991	Rs. in Million	7070
		Dec. 1991	Rs. in Million	8520
3.2	Units assisted	March 1980	Nos.	645
		March 1985	Nos.	874
		March 1990	Nos.	2960
		March 1991	Nos.	3079
		Dec. 1991	Nos.	3191
4.0	Assistance from IDBI			
4.1	Amount sanctioned	March 1989	Rs. in Million	40286
		March 1990	Rs. in Million	48988
		March 1991	Rs. in Million	56604
4.2	Percentage share in India	March 1989	%	12.2
		March 1990	%	12.2
		March 1991	%	12.2
† Figure during the year.				

Source : INDEXTb Industrial Extension Bureau (A Govt. of Gujarat Organization), Gujarat, India.

## Chapter 7

### AN ILLUSTRATIVE FEASIBILITY STUDY OF BRACKISH WATER AQUACULTURE AT MATWAD VILLAGE IN VALSAD DISTRICT

#### Introduction

Prawns (shrimps) are aquatic organisms inhabiting sea, estuaries and backwaters. They are produced from these water bodies through fishing and farming. They breed and spawn in the sea and the young ones migrate towards coastal waters/estuaries/backwaters for feeding and growth and return to the sea for reproduction. Thus the costal waters/estuaries/backwaters are natural "cradles" of these animals and this phase is usually taken advantage of for farming of these organisms.

There are several varieties of shrimps available in the sea and fetch very high price in the export market as they are a delicacy in the diet of the people in the developed countries of Europe, U.S.A., Japan etc. Prawns play an important role in Indian's sea food export trade. India is the largest exporter of prawns in the world. The exploitation of prawn resources from the marine sector during the seventies was so fast that now there is sign of stagnation, and in certain pockets even declining trend has been there. To increase India's production and there by exports, the only resource is to exploit brackish water potential in the country.

#### World Production

At present world production of prawns both culture (farming), and capture (fishing) sources is about 2.71 million tonnes, of which

about 76 % comes from capture and the rest 24 % from culture. The total world production from culture is about 699 thousand tonnes from 1.1 million hectares. 89 % of the producing countries are from Asian countries. The largest prawn producing countries are China, India, Indonesia and Thailand.

A look into the trend in the world production of prawns during the last three decades shows certain striking features. In the early 70's, almost the entire output of shrimps was from capture fisheries, mainly landed by shrimp trailers and the output from culture, mainly traditional type (trapping and filtering) was minimal. Over the years, prawn production from capture fisheries has grown only at a slow pace and even stagnated. In contrast to this, shrimp aquaculture has witnessed phenomenal growth. From a minimal production of 20,000 tonnes in the seventies, shrimp production from culture has increased to 3,00,000 tones in the early eighties, jumped to 5,60,000 tonnes in 1989 and now to the new high of 6,99,000 tonnes. Bulk of these cultured prawns came from China, Thailand, Indonesia, Philippians, Taiwan etc.

Of the countries producing cultured shrimp, China tops the list with an average production of 1138 kg/ha. (total production 1,65,000 tonnes from 1,45,000 ha.). The other leading world producer are Ecuador, Taiwan, Philippines, India, Mexico and Indonesia. By adopting extensive method of shrimp farming Ecuador, panama and Mexico are producing 2 - 3 tonnes/ha./year. Ecuador alone in producing about 70,000 tonnes through shrimp farming, which are supported by several hatcheries, producing

over a billion seeds for farming activities.

Taiwan has achieved an average production of 12 tonnes/ha./year by adopting semi-intensive farming. Taiwan has actually made a break through by developing appropriate nutritionally balanced high quality prawn feed with a conversion ratio of 1 : 1.6, costing around US \$ 1/kg. 2,200 small hatcheries and 63 feed mills have been set up to supply seed and feed to farmers. The latest techniques in induced maturation and sprawling, development of microencapsulated diet for larvae, maintenance of water quality through pumping and aeration supplementary feeding with nutritionally balanced feed enriched with molting and growth parameters are some of the reasons attributed for Taiwan's success.

Japan has achieved the highest production of 40 tonnes/ha./year by adopting the intensive system of farming, but with very high production cost of US \$ 30/kg. Indonesia produces 90,000 tonnes from 3,00,000 ha. and intends to further develop 1,00,000 ha. for shrimp farming. Currently 90 big hatcheries, several backyard hatcheries and 10 feed mills meet the demand of the farmers for seed and feed.

Philippines has developed about 70,000 ha. for farming and produces 34,000 tonnes. About 400 hatcheries and 7 feed mills have come up for seed and feed supply. Thailand produced 1,10,000 tonnes from 80,000 ha. and has about 1500 hatcheries and 15 feed mills to support the farming.

### World Importers

World Trade in prawn has increased significantly from US \$ 3 billion in 1981 to US \$ 7 billion in 1991. Japan remains the single largest market in the world, followed by U.S.A. West Europe and Middle East are other important importers.

Of the US imports 65.2 % is the headless whole shrimp, 18.3 % peeled type and 2.9 % is of canned. The Japanese prefer the whole shrimps, and Black Tiger Prawn, White shrimps and peeled shrimps constitute 28.5 %, 21.1 % and 23.6 % respectively of the Japanese imports.

### World Exports

Though India has been the largest exporter in the past, China has overtaken over in the recent years due to their production from cultured prawn farming. Thailand, Indonesia, Taiwan, Philippines, Greenland, Ecuador and Mexico are other exporters of prawn.

The table on the next page shows the share of some of the major exporters in Japan and U.S.A. imports.

Name	Japan	U.S.A.
	(% Share, 1988-89)	
China	14.7	20.5
Indonesia	14.9	-
India	12.4	5.7
Thailand	8.4	9.7
Taiwan	8.0	1.5
Philippines	7.2	-
Greenland	5.4	-
Ecuador	-	16.1
Mexico	-	12.1

## Product Forms

The important product forms which are traded internationally are:

- i) Whole, Shell-on, Frozen
- ii) Whole, Shell-on, cooked not frozen
- iii) Whole, Shell-on, frozen
- iv) Headless, Shell-on, Raw, cooked
- v) Headless, Cooked, peeled, frozen
- vi) Headless, peeled, undeveined, Raw, Frozen
- vii) Headless, Peeled, Deveined, Raw, Frozen (PUD)
- viii) Headless, Cooked, Peeled, and Canned (F&D)

The present Indian export constitutes PUD and P&D forms. With IQF (individual Quick Freezing) plants coming up, whole Shell-on Frozen Type exporters will increase as it is most preferred internationally.

## Indian Scenario

India has a vast brackish water area of about 1.4 million hectare comprising mudflats, mangrove swamps, lagoons, lakes, and creeks. The following table gives state-wise details of total brackish water area and area under culture (1990).

STATE	ESTIMATED B.W. AREA (HA)	AREA SUITABLE (HA)	AREA UNDER PRAWNS (HA)	ESTIMATED PRODUCTION (TONNES)
West Bengal	405000	58000	33625	12150
Orissa	80000	32000	3370	2350
A.P.	150000	17000	4100	4600
Tamil Nadu	56000	15176	400	850
Pondichery	800	NA	NA	NA
Kerala	242000	17000	3380	5160
Karnataka	8000	6800	1805	835
Goa	18500	10000	6510	3165
Maharashtra	80000	15800	1820	725
Gujarat	376000	8100	125	90

### Project Description

#### Project Objectives

The proposed prawn production and processing unit in Gujarat aims at :

1. To meet the growing export demand
2. To provide employment to the local people in the Pipavav Bunder thereby helping a small section of people who face employment problem.
3. To earn foreign exchange which is needed by the Government of India at present, contributing to self-reliance.
4. To enhance the value of shrimp exported and introducing modern technology by setting up IQF plants.

### Project Components:

The project consists of :

1. Construction and Management of Hatcheries.
2. Construction and Management of Ponds.
3. Construction and Management of Feed Mills.
4. Construction and Management of Processing Unit.

**Pond Area:**The total pond area proposed to be brought under prawn production is 130 ha. This will consist of 1,00,000 hecter ponds in an area of 128 ha and 2 ha for hatcheries.

**Location, Site Details and Micro Survey :**In Gujarat, it has been found that 6 places are most suitable for prawn production. They are Mahuva Bunder in Amreli District, Pipavav Bunder in Junagadh District and Vansi Bonni, Matwad, Dnjal and Umbergaon in Navsar District.

In the proposed project ponds and hatcheries, at Matwad village feed mill and processing unit will be constructed.

**Pond Construction:**It is proposed to have puffed farm because of the following reasons:

- a) The Construction cost is much less since special structure like sluice gates and feeder canal are not necessary.
- b) Full harvest will be possible as no dewatering problem is involved.
- c) Population control will be facilitated as predator problem will be much less.

**Farm Layout:**A 100 ha farm has 18 ponds in length and 6 ponds in width each with 1 ha in area out of the 108 ha. 8 ha will be used

as storage tank to pump sea water of a day's requirement and store them for supply of water to the ponds whenever wanted. The layout is so arranged that one supply channel feeds to 14 to 18 ponds each on either sides and similarly the drainage channel receives water from 7 to 9 ponds each on either sides. The channel section 1 m wide and 0.9 m high with necessary shutter arrangements for controlling the flow. The inlet sluice of each pond provides for continuous exchange of water. This would mean exchange of entire water of the pond is 15 days, allowing for evaporation and seepage. The depth of water that will be maintaining in the rearing pond would be 90 cms.

**Water Management:** One storage tank of capacity 1,08,700 cu. m. is provided to meet the requirements of daily water exchange of about 72,000 cu.m. for 100 ha farm thus leaving a reserve capacity for initial filling of ponds and also for meeting the increased demand of water whenever needed. 3 electric pumps of 25 hp will be used for filling the storage tank. One electric pump of 25 hp and a diesel pump of 25 hp will be stand by. In addition, 10 mobile diesel pumps of 2 hp are proposed for emptying about 8 ponds at a time, and also used a standby in case of power failure continuously for a couple of days.

#### **Farm Elements**

**Ponds:** The pond will be constructed square to economies on the bund length and also provide uniform aeration irrespective of the direction of the wind. Each pond is 100 m \* 100 m in size at the bottom with a increase pond of 1/10 of the productive area of the

pond. The productive area would be around 0.9 ha and that of nursery would be 0.09 ha.

**Sluices:**The ponds are provided with an inlet sluice from the supply channel and an outlet sluice to the drainage channel for continuous exchange of 7 cm of water for 12 hours during the day time or any time the managers would prefer. The nursery pond is also provided with a similar inlet sluice but for outlet, a bigger sluice opening right upto the bottom is to be provided for the nursery pond for each release of juveniles into the main pond. Two sluice with hinged flat shutters are also proposed at the tail end of the drainage channel of the periphery bund to prevent flood for the water entering the farm through the drainage channel.

**Periphery Bund:**The periphery bund proposed all around the farm is 1.8 m above the ground level to protect the farm from floods and steam surges. The top width of the bund is kept 3 m for movement of vehicles.

**Pump House:**A pump house of area 60 sq.m is proposed for housing the pumps and for pumping water from the approach channel to the storage tank and store the mobile pumps.

**Pond Management:**The pond will be managed by one farm manager, 4 technical assistants, one electrician, two pump operator and a watchman. On the administrative side one accountant, one clerk cum steno, an office boy and a driver will be recruited.

**Hatcheries:**To ensure timely and adequate supply of required fish seed (p. Mondon), it is assumed to construct a 70 million seeds

per year hatchery. But the actual production in this hatchery will be only 44 million/year i.e., 22 million per cycle. Out of this 22 million, it is assumed that only 20 million will survive which will be delivered to growing ponds at the rate of 2,00,000 per hectare pond.

**Feed Mill:** To achieve the targeted production of prawn, nutritional feed is required. To ensure adequate supply of appropriate nutrients during growth stages in the ponds, the project provides for construction of a feed mill with an annual capacity of 5000 tonnes. But in the initial stages only 2400 tonnes of feed will be produced in this mill. The feed mill will be set up in Veraval.

**Processing Unit:** Keeping in view the economic advantage of exporting shrimp in IQF form, the main objective of the project is to increase the quantum of IQF in the total volume of shrimp exports. IQF produces a higher quality product having longer shelf life and better preservation. This process meets the national objectives of enhancing the value of exported items and introduction of modern technology into the country. The capacity of the plant is 10 tonnes/day. The final recovery is 70% of the raw material used. The Indian IQF shrimp can fetch approximately 25 to 50% higher value than black frozen for the same quality of raw material.

**Technological Considerations:**

- a) Farm: Though pumped and tide fed farm are feasible, it is proposed to go for in for pumped farm in all states, because

of the reasons mentioned earlier.

- b) **Hatcheries:** Hatcheries of 70 million seeds per annum are proposed. The design of the hatching is given in figure 2.
- c) The hatching will produce *P. Monodon*. It is proposed to utilize only 63% of the total capacity. If the demand increases in near future, the hatchery will be used for outside markets also.
- d) **Feed Mills:** The components involved in the feed mill are mixing, grinding, and pulverizing. The sundried process is required for feed manufacturing since low quality fish can also be used in the process and there is no difference in material value when compared to wet reduction process.
- e) **Processing Unit:** An IQF plant with 10 tonnes per day capacity will be used for processing because it provides 25% to 50% higher value to Indian shrimp. In addition to this, the technical expertise is available with MFDEA who will help at time of need.

#### **Project Implementation Schedule**

The overall project is assumed to have an economic life of 25 years. For ponds the economic life is 25 years. For hatcheries 12 years and for feed mill 15 years.

The construction of ponds, hatcheries and feed mill is proposed to be undertaken in a phased manner. Starting from the date the loan becomes effective. The construction will be completed within one year. For the project the land will be obtained from Government on lease for 25 years.

### Manpower Requirements

As the construction of ponds, feed mill, hatcheries is going on, the recruitment of staff will also start and adequate training will be given. Staffing for various components will be discussed in the subsequent chapter.

### Marketing the Produce

The prawn will be marketed by us at prevailing market prices though the established exporters in the initial phase. We have taken the price of a kg prawn US \$ 12 (exchange value Rs. 25 for US \$ 1-price adjusted for exchange rate fluctuations). The value per kg of prawn sold is Rs. 300 which includes DIF.

### Project Implementation Chart

Activity	Average or Most likely time to finish (months)	Range (months)
1. Land Acquisition	2	1-2
2. Pond Construction	4	2-6
3. Hatchery Construction	3	2-5
4. Electrical Connection in Veraval	3	2-5
5. Feed Mill Construction	6	4-9
6. Processing Unit	4	9-12

### III Cost Estimates

The total cost of the project is estimated at Rs. 34.859 million. It would consist of total capital cost Rs. 23.775 million and working capital margin of Rs. 11.075 million. The estimates of capital cost include physical contingencies at the rate of 10% and also price contingencies at the rate of 10% of the estimated balance costs. Componentwise cost estimates are as follows:

Rs in lakhs			
Project Component	Cost of Machinery civil, equipments	Working capital margin	Total
1. Hatchery	29.51	0.40	29.91
2. Feed Mill	42.55	60.60	103.15
3. Pond	90.69	20.00	110.69
4. Processing	75.00	29.75	104.75
Total	237.75	110.75	348.50
less Subsidy from MPEDA			1.50
Grand Total			347.00

The overall project is assumed to have an economic life of 25 years. With regard to the expected life of different components of the project, it is assumed that the economic life is 25 years for ponds, 12 years for hatcheries and 15 years for the feed mill and 25 years for processing unit.

The project cost of Rs 347 lakhs will be financed by through equity and loans. For fisheries, though the debt equity ratio of 10:1 is permissible, we have taken a debt equity ratio of 6:1 for project as a whole.

The equity and loan portion for the entire project is Rs 49.5 lakhs and Rs 297.5 lakhs respectively. Rs 49.5 lakhs equity will be contributed by 5 promoters, each contributes Rs. 9.9 lakhs. Rs. 297.5 lakhs will be contributed by long term loan from financial institutions. The entire working capital requirement would be met through short term loans and borrowing.

The rate of interest on the borrowed funds for different components of the project will be as follows:

Long term commercial borrowing = 15% per annum (because of the recent increase in interest rates by RBI)

Short term Commercial borrowing = 18%

For deriving weighted average cost of capital for unit as a whole it is assumed that the expected average return on equity invested in the project is 20% per annum. So the overall cost of capital is derived as follows:

Cost of borrowing  $15 * 6/7 = 12.85\%$

Cost of equity  $20 * 1/7 = 2.85\%$

Weighted cost of capital = 15.70% say 16%

These rates have been used as the required discount rates for obtaining the net present value of the project and its respective components while conducting the financial analysis.

#### Environmental Impact

The construction of ponds, hatcheries and feed mill and processing unit is not expected to have any significant environment effects.

#### Energy Impacts

The main form of energy required for hatcheries and ponds and feed mills will be fuel and lubricant. Only in processing unit electricity is needed. As the approach roads as well laid out of the project site availability of fuel and lubricants would not be a problem.

#### **IV Organization and Management**

The project consists of four major components:

1. Pond Management
2. Hatchery Management
3. Fish Feed Mill Management
4. Processing Unit Management

The organization chart and staffing pattern is given in annexure 5,6 and 7.

Hatchery with capacity of 70 million seeds and Feed mill with 5000 tonnes/annum and processing unit with 10 tonnes/day are proposed. The staffing pattern for each unit is given in annexure. The pond with 44 million capacity also proposed.

#### Technical Consultancy

The unit may seek the technical assistance of MPEDA and CMFRI for improving the quality of prawn produced.

## V FINANCIAL AND ECONOMIC ANALYSIS

### Financial Rate of Return

The overall project consists of the following components. Ponds, hatcheries, feed mill and processing unit. The details regarding the assumption of costs and benefits for each components are given in annexure. The financial rate of return and the estimated net present value for different components of the project are given below:

### Financial Returns

Components	Financial Rate of Return	Net Present Value Rate of Discount	NPV Rs Lakh
1. Project as a Whole	74.5	16%	322.85
2. Ponds	62.6	16%	82.78
3. Hatcheries	89.9	16%	257.80
4. Feed Mill	86.9	16%	309.83

It is evident from the results of the financial analysis of the project presented above that each component of the proposed project is financially viable and the project as a whole is expected to yield substantial financial returns on the total invest of the proposed in the project.

#### Sensitivity Analysis of FIRR

A number of sensitivity tests have been carried out to determine the effect of changes in the underlying assumptions on the financial rate of returns for the project as a whole. The results of sensitivity analysis are given below :

#### Sensitivity Analysis of FIRR for the Total Project

1. Base case	74.5
2. 10% increase in total capital cost	71.8
3. 10% increase in operating cost	66.7
4. Both 2 & 3	62.4
5. 10% decrease in hatchery production	61.6

The results of the sensitivity analysis clearly shows that the project as whole remain financially viable even at substantially

higher capital cost or operating costs or a combination of both these unfavorable assumptions. Thus, the investments in the project are expected to yield significant financial returns even in the situation of various types of unfavorable developments that could take place.

#### Economic Rate of Return

To estimate the economic rate of return of the project as a whole, certain adjustments have been made in the valuation of projects benefits and costs which were used for calculating FIRR.

#### Shadow Pricing of Project Output

Prices of prawns sold in the world market are fixed on the basis of global demand and supply. For economic analysis the farm gate price is assumed to be \$ 16 kg (exchange rate US \$ 1 = Rs. 25-adjusted for exchange rate fluctuations). Since international prices of prawns are higher than the domestic prices, the shadow pricing of output would result in a significant increase in the economic value of the benefits of the project.

#### Shadow Price of Capital

The overall conversion factor for all items of capital cost taken together derived as a weighted average of components wise conversion factors will be 0.8. Thus a true economic value of capital cost for the project as a whole turns out to be 20% less than the corresponding financial value.

#### Shadow Pricing of Inputs

The weighted average of components wise conversion factor yields an overall conversion factor of 1.2 for the operating cost of the

project. Thus, the true economic value of various items of operating cost taken together turns out to be 20% higher than the corresponding financial value.

The economic rate of return for the project as a whole turns out to be 199.5%. This indicates that the project is expected to yield substantially high economic returns on the aggregate investments to be made on the project.

#### Sensitivity Analysis of EIRR

A number of sensitivity tests have been carried out to examine the effect of changes in the underlying assumptions on the economic rate of return of the project. The results of the sensitivity analysis of EIRR are summarized below:

#### Sensitivity Analysis of EIRR

---

1. Base Case	199.5
2. 10% increase in total capital cost of the project	186.3
3. International price decreases by 10%	183.2
4. Combination of 2 and 3	177.8
5. Hatchery production decreases by 10%	185.7

---

The results of the sensitivity analysis of EIRR clearly show that the project remains economically viable under a range of several unfavorable assumptions as given above. Thus overall investments in the proposed project are expected to yield significant economic benefits even under adverse conditions that could develop in future.

#### Employment Implication of the Project

The project will produce direct employment for persons who work in the unit. The construction of pond hatcheries also provides an

additional employment to laborers. In addition to this in the processing unit. The processing unit will be carried out by women so the proposed project also meets the national objective of providing employment to the women force.

#### Foreign Exchange Impact

The project will have a favorable impact on the country's foreign exchange earning capacity. The export of shrimp produced under the project will yield additional annual foreign exchange of around \$ 4.4 million every year. (exchange rate of \$1 = Rs 25). Thus a financial and economic analysis of the project and other relevant aspects such as employment generation and foreign exchange earnings, the project can be regarded as a highly acceptable and viable project.

## Annexure 1

### **Prawn Farming Technology**

The process of growing the baby shrimps up to a marketable size in an enclosed water body can be termed as prawn farming. It includes at times allied activities like seed production through hatchery, feed production, harvesting, processing and marketing. Types of prawn farming according to the nature of scientific inputs and management are traditional, extensive, semi-intensive and intensive farming.

#### Traditional System

In the traditional system of prawn farming, the incoming tides are trapped along with young ones of shrimps, fishes and other organisms that coexist in the environment into the already existing impoundments adjutant to estuaries and backwaters. Escape of these organisms is prevented by fixing suitable screens in the sluice and the crop is harvested at frequent intervals. Owing to organisms and indiscriminate stocking of both desired and undesired varieties of shrimps and fishes, the production under this system is normally unpredictable and often loss in quantity and quality.

#### Extensive System

The extensive system of shrimp farming is an improved method of traditional farming, involving construction of new ponds ranging from 1 to 5 ha. in size, selective with fast growing prawn seeds at a comparatively lower density ranging from a few thousand to 100,000 seeds per ha, without much supplementary feeding and the

water quality is maintained through the natural fall and rise of tides. The production under this system normally ranges from 2 to 3 tonnes per ha. per year in two crops.

#### Semi-intensive system

The semi-intensive system of shrimp involves construction of earthen ponds ranging from 0.2 to 1.0 ha. in size, selective stocking with fast growing species at a comparatively high density ranging from 1 to 4 lakh per ha, maintenance of water quality by exchanging 10-50% daily, aerating the pond with airblower/paddle wheels and feeding the shrimps with supplementary feed. The production in this system ranges from 8 to 10 tonnes/ha/year.

#### Intensive system

In this system, concrete ponds of 0.03 to 0.1 ha. size are constructed. Selective stocking is done with quality prawn seeds, extensively processed from hatcheries at a density ranging from 5 to 10 per ha. water quality is maintained by exchanging up to 300% a day. The pond is aerated with air blower/agitators etc. Nutritionally balanced high energy feed is given to shrimps. the production from this system ranges from 20-30 tonnes/ha/year.

The extensive system of prawn farming is widely practiced in all shrimps producing countries. But in recent years, the semi-intensive system of prawn farming is making rapid strides. Intensive farming found to be highly risky due to diseases and other associated problems and therefore it is practiced in

limited scale only.

#### Area for Prawn Farming

Prawn farming is growing the young ones upto marketable size in land based facilities by providing suitable environmental conditions. The basic requirements are suitable land adjutant to costal areas, estuaries or backwaters having accessibility to good quality water sources. So in the process of developing shrimp farms, selection of a proper site is the initial step and also a crucial factor. The key factors to be considered in site selection are availability of quality water in abundant quantity, tidal amplitude, land elevation, soil quality, salinity, temperature, pollution, exposures to flood, infrastructural facilities and access to essential inputs and markets.

It is preferable to have a plain flat land with sandy clay loam to sandy soil for semi-intensive type of farming and loamy to sandy soil for extensive type of farming. The water should have a pH of 7.5 to 8.7 with a temperature of 26-33 degrees centigrade with 15-35 ppt. saline. Dissolved oxygen should be 3-12 ppm. It is better to avoid acidic soils. Regarding the tides, it should be between slightly above Minimum Low Water Level (MLWL) to slightly below Maximum High Water Level (MHWL) but should not exceed 2 metres for semi-intensive pond.

#### Seeds

Prawn seed is a major input in prawn farming and most of our farmers still depend on the wild stock collected from estuaries for stocking the ponds, which is seasonal and undependable. A few

make use of hatchery produced seeds from the limited quantity available from the existing hatcheries. Presently there are about 15 hatcheries under operation (both Government and Private) and another 5 more are proposed by the ministry of agriculture.

An assessment of the future requirement of prawn seeds for prawn development in India indicates that, at an estimated development of 4924 hectares of new area for prawn farming every year. The seed requirement per annum will be around 246 million of white prawn and 129 million of tiger prawn. Anticipating a 10% mortality during transit from hatchery to the pond, the total seed production per annum should be around 270 million white prawn seeds and 135 million tiger prawn seeds. In the next 10 years it will be 2700 million and 1350 million seeds for white and tiger prawns respectively. The total number of hatcheries required to meet this potential demand in the course of next 10 years has been estimated at 80 at 50 million seed capacity per unit per annum.

The present production of seed from the existing hatcheries is estimated to be around 200 millions and is very low compared to the demand. There is tremendous need and scope in this area also.

#### Feed

Nutritionally balanced high quality compounded feed is another basic requirement for prawn farming, but it is yet to be commercially manufactured in India. Good quality feed has been a major constraint for taking up semi-intensive farming. Shrimps are bottom feeders and are slow in eating so the feed should have

at least 6 hours of water stability. Some private companies have produced sample feeds which are being tested in the field and its results are under evaluation. Private entrepreneurs are trying to develop nutritionally balanced good quality feed for semi-intensive farming. However, they are not comparable to those available in the world market. So the government has allowed import of feed with duty concession for farmers and without duty for exporters. Several entrepreneurs are trying to establish feed mills by borrowing technology from abroad. It is essential that large area of the farms should ensure sufficient availability of feed to meet the requirements by the time they go into operations. Some of the ingredients used in feed in India, apart from vitamin and minerals are Soyameal, Shrimp wastes, Fish meal, Rice/Wheat bran, Wheat flour, Rice, Maize, Coconut cake etc.

#### Research and Extension

Due to continuous research, development and extension by various institutes, technical know-how for extensive type of farming is fairly known in India. ICAR institute like Central marine Fisheries Research Institute (CMFRI), and Central Institute of Brackishwater Aquaculture (CIBA) are doing research in this field. Several Fisheries colleges and state level organizations are also involved in research and extension.

Marine Products Export Development Authority (MPEDA) and Export Inspection Agency (EIA) are two other promotion and regulation institutions under Ministry of Commerce. Brackish water Fish Farmer Development Agency (BFDA) is another agency doing some

extension work apart from MPEDA. There are several agencies involved but there is no proper extension network to cover the areas under development.

### Yield

The traditional system of shrimp farming is carried out in West Bengal, Kerala, Karnataka and Goa popularly called the "filtration system". Here one crop of paddy is followed by one crop of prawn during December to June. Inputs needed in this system are minimal and the yield is around 200-500 kg/ha/season that too mostly low valued prawns.

However, the recently developed new areas by private sector in Andhra Pradesh, Orissa, Tamil Nadu, Kerala etc. have reached a productivity level ranging from 500 to 2000 hg/ha/crop by farmers could achieve a production level of 500 kg/ha/crop progressive farmers have achieved a level of 1500-2000 kg/ha/crop in 4 to 5 months culture period. The highest production of more than 8000 kg/ha/crop has been achieved by some of the progressive entrepreneurs in Sunderbans of West Bengal and Tuticorin of Tamil Nadu by adopting some intensive methods.

### Harvesting

Harvesting can be done when prawn reach marketable size after 3 to 5 months of rearing, preferably during 4th and 8th day after full and new moon phases. If the pond is stocked at high density, partial harvesting is suggested. Normal size for harvesting 15 to 20 gms for white prawns and 30 to 35 gms for tiger prawns.

Harvesting is done by draining the pond water through a bag placed in the sluice. Prawns which do not come through the watergate in the pond can be hand-picked. Where complete draining is not possible, cast net is operated during night hours by keeping a light on the dyke to attract the prawns.

Annexure 2

Assumptions - Hatchery

1. Total Number of Oblated Female	80 * 2 =160 Actual will be 104
2. Female mature and Spawn	70%
3. Average Number of eggs per female	80,000
4. Larval tanks	26 Nos.
5. No. of FL5 expected from these tanks	2.5 million
6. Duration of Hatchery run	13-14 days
7. Hatchery runs per year	18
8. capacity of hatchery	70 million
9. Production	45 million
10. capacity utilization	64 %
11. Same capacity utilization is assumed throughout the project	

Annexure 3 : Assumptions : Growing Ponds

1.	Number of 1 ha ponds	100
2.	Prawn Density/pond	2,00,000
3.	Survial Rate	60 %
4.	Number of Final Catch/pond	1,20,000
5.	Weight of matured Pond	22 gms
6.	Yield per pond	2.64 tonnes/cycle
7.	Number of cycles per year	2
8.	Water Charging	Continous. Entire water will be changed once in 15 days (7 cm/day)
9.	Yield per year	5.28 tonnes
10.	Harvesting	1 1/2 ponds/day i.e., 70 days + 70 days = 140 days per year
11.	Same Yield is assumed for every year throughout the project	

Annexure 4 : Assumptions : Feed Mill

1.	Feed requirement/prawn in whole life	55 grms
2.	Feed conversion ratio	2.5 : 1
3.	Total feed requirement	$(55 \times 2,00,000 \times 100 \times 2) / (1000 \times 1000)$ = 2,200 tonnes
4.	Capacity of feed mill	5,000 tonnes/year
5.	Production	$11 \times 200 = 2,200$ tonnes
6.	Feed Price	Rs. 30/kg
7.	Unit located at Veraval	
8.	Capacity Utilization	48 %
9.	The same capacity is assumed throughout the project	

Annexure 5 : Processing Unit

1. Location Veraval	
2. Processing Capacity	10 tonnes/day
3. Storage	20 tonnes
4. Prawn Processed	70% of the production = 369.6 tonnes = 370 tonnes (say)
5. Price of processed prawn/kg	US \$ 12
6. Exchange Rate US \$ 1 = Rs. 25	CIF = Rs. 300
7. Capacity Utilization	35 %

Cost and Funding

		Rs. in Lakhs
Cost of machines		50.00
Cost of Building		25.00
		-----
		75.00
Raw material cost per kg	Rs.175.00	
Freezing Cost per kg	Rs. 30.00	
Packaging & Others	Rs. 34.00	
	-----	
	Rs.239.00	
	-----	
Subsidy		NIL
Capital Required		75.00
Loan		64.29
Equity		10.71
Wt. Cost of Capital	16 %	

## Annexure 6 : Hatchery : Capital Cost

Rs. in Lakhs

<b>I Buildings</b>		
a.	@ Hatcheries shed with glass roofing @ Rs. 1000/sq.m. for 800 sq.m.	8.00
b.	Maturation shed with asberstas roofing @ Rs. 600/sq.m. for 66 sq.m.	0.79
c.	Store, Lab, Duty room for 220 sq.m. @ Rs. 900/sq.m.	1.98
d.	Generator room/Air blower room for 25 sq.m. @ Rs. 800/sq.m.	0.20
<b>II Fiberglass Tank</b>		
a.	Larval Rearing	3.25
b.	Spawns 200 lt. capacity 4 nos.	0.80
c.	Culture Tank 10 nos.	0.50
d.	Maturation Tank 2 nos.	0.70
<b>III Equipments</b>		
a.	Sea Water and Fresh Water Supply System	5.00
b.	Generator 10KVA 16HP Diesel Motor	0.50
c.	5 HP Twin Low air blower 4 nos.	0.80
d.	0.5 HP Electric Pumps 4 nos.	0.12
e.	Deep Freezer 1 no.	0.30
f.	Areation Grid	0.30
g.	Microscope, PH Metre, Salino metre, etc.	0.25
h.	Oven Mixie & Hand pellatings	0.10
i.	Furniture	0.25
<b>IV Other Works</b>		
	Slite Development and Fence	0.75
		24.59
	10 % Contingency Physical	2.46
	10 % Price Contingency	2.46
	<b>Total</b>	<b>29.51</b>
<b>Hatcheries : Operating Cost</b>		
<b>I</b>	Lease Land @ 10,00/ha for 2 ha.	0.20
<b>II</b>	Salary One Supervisor @ Rs. 2500/month Two Technician @ Rs. 1800/month/person Six Skilled Worker @ Rs. 1200/month/person Four Helper @ Rs. 750/month/person One Office Boy @ Rs. 600/month One Watchman @ Rs. 800/month	2.13
<b>III</b>	Contingencies	
a.	Plastic Glass ware	0.10
b.	Energy Cost	0.25
c.	Chemicals	0.08
d.	Brood Stock Rs. 7/female * 104*18 rum	0.13
e.	Feeding Brood Stock	0.03
f.	Feeding Larva	0.06
g.	Others	0.20
<b>IV</b>	Maintenance	0.20
	<b>Total</b>	<b>3.20</b>
	Interest on Working Capital for 1.6 taken @ 18 %	0.29
		<b>3.49</b>

Annexure 7	
Pond Construction : Investment	
	Rs. in Lakhs
1. Micro Survey	1.00
2. Earth Work Excavation and Formation of Bunds @ Rs. 20/cu.m. for 2,28,000 cu.m.	45.60
3. Sluices	
a. Inlet (100 for Nursery and 100 for rearing pond @ Rs. 750/inlet)	1.50
b. Outlet (100 for rearing ponds @ Rs.1500/outlet)	1.50
c. Nursery Sluices(100for nursery @Rs.1500/Sluice)	1.50
d. Storage Tank Sluice 4 nos. @ Rs. 15000/Sluice	0.60
4. Pumps	
a. 25HP Pump 6 nos. @ Rs. 25000/pump	1.50
b. 2 HP Diesel Pump 10 nos. @ 8500/pump	0.85
c. Drinking Water Borewell	0.75
5. Foundation for Pumps and Pipes	0.75
6. Turfing @ Rs. 40/sq.m. for 22,900 sq.m.	9.16
7. a. Construction of Office Building	2.0
b. Watchman Shed	0.20
c. Fumhouse	0.25
d. Store House	0.75
8. Managerial Cost @ 2 % of Item 2 and 6	1.10
9. Electrical Installation	5.00
Base Line	74.01
Physical Contingency	7.40
Price Contingency	7.40
	88.81
10. Aerator	1.64

	90.45
Operating Cost : Ponds	
1. Seed	110.00
2. Feed	660.00
3. Land	12.80
4. Predator	2.00
5. Fertilizer Lime	4.66
6. Staff Salary	1.43
7. Labour	5.00
8. Harvesting	12.00
9. Diesel	80.00
10. Maintenance	20.00
11. Chemical and Office Expenses	20.00
	927.89
18% Interest on Working Capital 157.89 for 6 months	14.11
	942.00

Annexure B

Feed Mill Capital Cost

	Rs. in Lakhs
1. Building	4.00
2. Godown	4.00
3. Road and Fencing	1.50
4. Machineries	23.95
5. Other Equipments	2.00
	35.45
10 % Physical Contingency	3.55
10 % Price Contingency	3.55
	42.55

Operating Cost

	Rs. in Lakhs
1. Raw Material	460.00
2. Salary for 21 Person	3.00
3. Electricity	16.00
4. Repair and Maintenance	6.00
5. Lease Land	0.10
6. Interest on Working Capital for 6 Months	43.65
	-----
	528.75
	-----

## Annexure 9

## Hatchery Unit

Year	Capital Cost	Operating Cost	Cash Outflow	Cash Inflow	Net Cash Inflow
1	29.51	-	29.51	-	- 29.51
2	-	3.49	3.49	112.5	109.01
3					109.01
4					109.01
5					109.01
6					109.01
7					109.01
8					109.01
9					109.01
10					109.01
11					109.01
12					109.01
13	15.67	3.49	19.16	112.5	95.84
14				2.5	109.91
15					109.91
16					109.91
17					109.91
18					109.91
19					109.91
20					109.91
21					109.91
22					109.91
23					109.91
24		3.49	3.49	112.5	109.91
25		3.49	3.49		3.00

NPV 257.80

Annexure 9 : Cash Flow and FIRR for Ponds						
Year	Capital Cost	Operating Cost	Cash Outflow	Cash Inflow	Net Cash Flow	
1	90.69	-	90.69	-	-90.69	0.862
2		942.00	942.00	977.00	35.00	0.743
3		942.00	942.00	977.00	35.00	0.641
4					35.00	0.552
5					35.00	0.476
6					35.00	0.410
7					35.00	0.354
8					35.00	0.305
9					35.00	0.263
10					35.00	0.227
11					35.00	0.195
12					35.00	0.166
13	21.61	942.00	963.61	977.00	15.39	0.145
14					35.00	
15					35.00	
16					35.00	
17					35.00	
18					35.00	
19					35.00	
20					35.00	
21					35.00	
22					35.00	
23					35.00	
24		942.00	942.00	977.00	35.00	
25					25.00	0.024
				NPV	82.78	

Annexure 10 : Cash Flow and FIRR for Feed Mill					
Year	Capital Cost	Operating Cost	Cash Outflow	Cash Inflow	Net Cash Flow
1	42.55	-	42.55		-42.55
2	-	529	529	660	131
3					131
4					131
5					131
6					131
7					131
8					131
9					131
10					131
11					131
12					131
13					131
14					131
15	-26	529	555	660	108
16		529	529	660	131
17					131
18					131
19					131
20					131
21					131
22					131
23					131
24		529	529	660	131
25					131
					3
				NPV	309.83

Annexure II a : Projected Profit &amp; Loss Statement

Item/Year	1	2	3	4	5	6	7	8	9	10	11	12
Net Sales		110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00	110.00
Operating Expenses		883.18	883.18	883.18	883.18	883.18	883.18	883.18	883.18	883.18	883.18	883.18
Financial Charges												
Int. & Repayment on Borrowing		44.82	41.07	37.32	33.57	29.82	26.07	22.32	18.52	14.82	11.07	7.32
Interest on Working Capital		58.06	58.06	58.06	58.06	58.06	58.06	58.06	58.06	58.06	58.06	58.06
Depreciation		19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
Profit before Tax		104.94	108.69	112.44	116.19	119.94	123.69	127.44	131.19	134.94	138.69	142.44
Tax @ 55% on 30% of Profit							20.00	20.65	21.30	21.86	22.47	23.70
Net Profit (PAT)		104.94	108.69	112.44	116.19	119.94	103.69	106.79	109.89	113.08	116.22	118.74
Prel. & Pre Operating Expenses & Fined Expenses	347.10											
Depreciation		19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00
Int. on Long Term Borrowing		44.82	41.07	37.32	33.52	29.82	26.07	22.32	18.52	14.82	11.07	7.32
Net Cash Flow	397.1	168.76	168.76	168.76	168.76	168.76	148.76	148.76	147.91	146.29	146.29	145.69
Subsidies (1.5 Laths)	1.7											
Discount Factor	0.862	0.743	0.641	0.552	0.476	0.410	0.354	0.305	0.263	0.227	0.195	0.168

NPV = Rs. 322.85

IRR = 74.5%

\* Tax is calculated from 7th year onwards on 30% of the profit @ 55% under Section 80 HHC 80T.

Annexure II b : Projected Balance Sheet												
Months/Years	1	2	3	4	5	6	7	8	9	10	11	12
<b>Fixed Asset (FA)</b>												
Gross FA	237.75	237.75	237.75			237.75						237.75
less Acc. Dep.		19.00	30.00			95.00						209.00
Net FA	237.75	218.75	199.75			142.75						28.75
<b>Current Assets</b>												
Inventories												
Receivables												
Cash & Bank Balance	110.85	172.99	207.54			197.04						161.07
Total Asset	348.60	391.74				339.79						189.82
<b>Liabilities</b>												
<b>Shareholders Fund</b>												
Share Capital	49.80	49.80	49.80			49.80						49.80
Reserves & Surplus		104.94	108.69			116.19						116.22
<b>Long Term Loan</b>												
Loan Received	298.80	298.80	298.80			298.80						298.80
less Cumulative Repayment		25.00	50.00			125.00						275.00
Loan Outstanding	298.80	273.80	248.80			173.80						23.80
<b>Current Liabilities</b>												
Bank Borrowing												
Trade Credit												
Total Liability	348.60	391.74	407.29			339.79						189.82

## Chapter 8

### ILLUSTRATIVE FEASIBILITY STUDY OF PARTICLE BOARD PLANT

#### AT SAMI TALUK IN MAHSANA DISTRICT, GUJARAT

##### I BACKGROUND

The housing and other building construction industry is growing at a rapid rate (around 8%). Government is taking active interest for promoting housing activities through its several policy measures. Housing activity needs many raw materials. One of them is wood for doors, windows, furniture and also false roofs in commercial buildings.

On the other hand the environmental balance requires to have a forest coverage of 33% as against the existing less than 20%. So any activity which uses forest wood as input is further going to deplete the forest cover and will not be allowed.

As can be seen from above, these two objectives work against each other. It is in this context that any activity which can reduce the pressure on forest wood to meet the growing need of housing and other related activities will be greatly welcomed and encouraged.

Particle board is one such product which substitutes wood for the housing activities. It is a composition board made up largely of individual, essentially dry wood particles (fibers) which have been coated with a binder (like synthetic resin or dehydrating agent) and formed into flat sheet by applying heat and pressure. Its end products are panels, doors, cupboards, false ceiling decoration and acoustic etc.

Since dry wood particles can be of any tree, this has the scope of using trees outside the forest cover and also all parts of the trees are used, thus reducing the wastage.

The substitutes for particle board are mainly plywood and medium density fibre (MDF) board. Plywood needs wooden logs as the main input which is in short supply in India. The manufactures resort to import from other countries which is also not an assured supply and also due to foreign exchange rate fluctuation cost of inputs vary.

On the other hand MDF is highly power intensive and needs costly chemicals making it a high priced item. Against these substitutes the particle board will find itself in a comfortable position, as it offers many advantages like -

- it does not warp
- it is easier to install
- attractive price

## II PRELIMINARY ANALYSIS OF ALTERNATIVES

Any alternative defined must have

- 1) Size (capacity)
- 2) Location
- 3) Technology

In this section after considering each possible variations a final alternative will be chosen.

### 1. Size

The factors that will decide size of an unit are:

- a) Demand supply gap

- b) Raw material and utilities availability
- c) Status of technology
- d) Availability of machinery
- e) Economy of scale
- f) Investment constraint
- g) Government policy
- a) Demand - Supply Gap:
  - i) Demand

The demand for particle board depends upon application in end user sectors like housing, industrial, commercial, institutional etc. Each sector has its own norms of consumption. They are given below in Table 1.

Table 1  
Norms of Consumption of Particle Board

Category	% requirement of particle board over total floor area
Housing	10
Industrial	20
Commercial	50
Institutional	10
Miscellaneous	25

Source : Market Sources and ICB consultants, Bombay.

After considering the building activities of various heads, (in square meters) their approximate growth rate of 8.3% (using urbanization rate as proxy) and consumption norms as mentioned above, the total demand in square meters for future period will be arrived at. In order to convert the demand in tonnes, the average thickness of the board has been taken as 16 mm and the bulk density of the board considered as 0.7 t/m<sup>3</sup>. Considering the

above mentioned assumption, the demand forecast of particle board on all India basis till 2000 AD in terms of tonnes have been worked out and is given in table 2.

Table 2 Demand Forecast for Particle Board

Year	Demand in Tonnes
1990-91	71500
1991-92	77435
1992-93	83862
1993-94	90813
1994-95	98361
1995-96	106525
1997-98	115367
1998-99	135312
1999-2000	146543

Source: Market estimates by the ICB consultants, Bombay.

On the basis of present consumption figures, the typical breakdown of the consumption would be follows:

Type	Percentage
Plain	25
Veneered	25
Laminated	50

ii) Supply :

As per the information available, presently there are 10 units in the country which are manufacturing particle board. The name location and their individual capacities are given below in Table 3.

Table 3 Manufacturing of Particle Board

Sl. No.	Name	Location	Installed capacity in tonnes
1.	Bhagat Plywood and Timber Product	Kerala	2,500
2.	Central India Board Products	UP	7,000
3.	Indian plywood Mft. Co.	Karnataka	7,000
4.	Madras Chip Board Ltd.	T. Nadu	17,000
5.	Mysore Chip Board Ltd.	Karnataka	7,500
6.	Particle Board India Ltd.	Maharashtra	6,000
7.	Plywood Products	UP	6,000
8.	Novapan India Ltd.	AP	19,200
9.	Nuboard Manufacturing Co.	Maharashtra	7,200
10.	Manojalam Timber		26,400
Total			90,500

Source: Ministry of Commerce, GOI.

Most of their capacity utilization is around 50% due to raw material constraint. In addition to above units three more units are expected to start manufacturing in recently or in process of doing so. There are:

Name	Capacity in tonnes
1. Indian Pharma Products Ltd.	45,000
2. Bhartia Electric Steels Ltd.	11,000
3. Nasic Eucalyptus Producers Cooperative	15,000

First two units are expected to have 40% capacity utilization in first year and 50% thereafter. Nasic Unit will have 60% (first

year), 75% (second year) and 90% capacity utilization in subsequent years. These units were expected to start production in 90-91, 91-92 and 93-94 respectively.

Based on these assumptions, the anticipated supply of particle board and thus demand supply gap has been worked out.

Table 4

FORECAST OF DEMAND SUPPLY GAP (in Tonnes)

*These 21 my. lit. 1990-*

Year	Existing Units	India Pharma	Bharatia	Nasik Unit	Total Supply	Total Demand	Gap
90-91	45250	18600	---	----	63250	71500	8250
91-92	45250	22500	4400	----	72150	77435	5285
92-93	45250	22500	5500	----	73250	83862	10612
93-94	45250	22500	5500	9000	82250	90823	8573
94-95	45250	22500	5500	11250	84500	90823	8573
95-96	45250	22500	5500	13500	86750	106525	19775
96-97	45250	22500	5500	13500	86750	115367	28617
97-98	45250	22500	5500	13500	86750	124742	38192
98-99	45250	22500	5500	13500	86750	135312	48562
99-2000	45250	22500	5500	13500	86750	146543	59793

Source: ICB consultants, Bombay.

So there will be a gap of 8000 tonnes from 1992-93 and increases thereafter from 1994-95 suggesting enough potential for a new unit. Considering this a capacity of 20,000 tonnes per annum unit with capacity utilization of 40%, 60%, 75%, 90% starting in 1993-94 is suggested.

b) Raw Material and Utilities Available

The main raw material is eucalyptus, binding agents, power and fuel and water. For raw material an arrangement for an assured supply has to be made (explained under location). Other utilities would not pose any serious constraint on capacity.

c) Status of technology

The status of technology is no constraint for the capacity mentioned above. The technology can be taken from internationally reputed company like Carl Schenck AG of Germany. Regarding the equipment the above company can supply the major equipments. The equipments like belt or chain conveyor, fabrication work etc. will be procured and fabricated indigenously.

d) Economies of Scale

Since there is going to be large unmet demand in the coming years there are two alternatives to exploit this -

- Start with low capacity and then expand
- Start with high installed capacity with capacity utilization level of match the demand potential.

Considering the efforts involved, cost escalation, foreign exchange rate fluctuation and other uncertainties it was decided to have a capacity of 20,000 tonnes/annum which would ensure economies of scale.

e) Investment constraint and government policy should not pose any problem if the project is financially viable.

Thus a plant capacity of 20,000 tonnes / annum with capacity utilization of 40% (2 years ) 60% (3 rd year), 75% (4th year) 90% (5th year onwards) is recommended.

## II. PROJECT DESCRIPTION

The brief details of chosen alternative are mentioned here.

### 1. Location:

- a) The location is Sami Taluka of Mehsana District. ✓

- b) Availability of Power and Fuel : This will not be a problem as Gujarat has a good record for assured power supply.
- c) Transport Facilities are good as this place is near to National Highway 15, Ahmedabad Delhi Railway line and is situated on state high way.
- d) Proximity to market: Gujarat will be a good location as goods can easily reach to major markets like Ahmedabad, Bombay, Delhi, Bhopal, Indoor, Baroda, Surat etc.
- e) Labour Availability: There should not be any problem with regard to availability of unskilled and skilled manpower as Gujarat is one of the highly literate and industrialized state.
- f) Infrastructure like schools, hospitals, transport, communication are available.

Each tonne of particle board need 1.8 tonnes of eucalyptus wood i.e. about  $20000 \times 1.8 \times 1.8 = 36000$  tonnes/year. Assuming about 30 Tonnes yield/acre 1200 acra land is required. If we an average 4 years cycle of cutting period, about 5000 acres land is required for this plant. It is preferable to have this within 1-2 neighboring districts to reduce transportation cost. But it may not be possible to get so much cultivated area to start with.

Mehsana is a major eucalyptus growing district in Gujarat. To meet long term requirement it is suggested to have permanent contract with farmers (both existing and new). New crop will take 4 years but the plant will become operative in two years. It is keeping this in mind that plant capacity is restricted to 40%.

In other words in first two years of operation it will make use of existing eucalyptus wood and thereafter gradually switch to the contracted farmers.

Availability of binding material will not be a constraint.

## 2. Technology

The wood is broken down into small chips from which flakes are produced. The flakes will be mixed with binding agent. Then the board of required thickness is prepared using heat and pressure. The surface is smoothed by sanding process.

This is a modern technology and environment friendly as it does not cause pollution of either air water or land.

## 3. Input Requirements

Eucalyptus - would be supplied by contracted farmers

Binding agent - would be procured from market

Power - by Gujarat State Government

Fuel - Coal would be transported by train

## 4. Labour and management requirement

Unskilled - From local area

Skilled - within state

Managerial - On all India basis

## 5. Transport Requirement

Eucalyptus - By Road from neighboring districts.

Binding agent - By road from local or Ahmedabad market

Fuel / Coal - By train (either from Bihar, AP, or MP)

## 6. Phasing of Construction

a) Site selection and land procurement 1.5 - 2 months

- b) Site clearance - two months
- c) Civil work - 9 months (from 2nd to 11 month) (Construction of factory shed, godown, administrative building, security, boundary and fencing).
- d) Order Placement : The equipment should arrive by the time civil work is completed. Placement of orders can start from 2nd month till 4th month.
- e) Delivery of machine : 14 months (from 3rd to 16th) It includes time taken for placing order, the time taken for shipment and inland transportation.
- f) Erection: Six months (15 to 20th Month) For complete erection of plant, electrical connection, provision for water supply etc.
- g) Trial run and Commissioning: About 3 months are required for trial run and commissioning of the plant. On a conservative basis it should take about 24 months (2 years) for making the plant commercially operational.

#### 7. Production build up:

As mentioned in the last section, to adjust to the demand potential and raw material constraint the plant will operate at

- 40% for first 2 years
- 60% 3rd year
- 75% 4th year
- 90% 5th year onwards.

### III MARKETING PLAN

#### 1. Place

The earlier analysis indicated the demand potential for the product. As the plant starts operation at 40% capacity in the first year, the marketing strategy is to concentrate initially on nearby markets (like Ahmedabad, Baroda, Surat). Later as the production increases other parts of the country can be reached.

#### 2. Promotion

Since the product is already available in the market there is no need to have product oriented promotion. However the brand (company) specific promotion is essential to create awareness about the brand with special emphasis on particular advantage the brand offers (like Eucalyptus based etc). One segment to be targeted for this purpose is construction industry, architects, contractors who are major influences (if not consumers) for purchase of this product. The association of architects, contractors journal can be thought of as a media for promotion as these journal can be thought of as a media for promotion as these journal would be circulated among those professionals. As a supplement to this, sending company salesmen in the initial periods to these professionals and taken part in exhibitions is also recommended.

#### 3. Distribution

For the distribution purpose it is suggested to have a distributor for each city. This is required as the company would not have much contacts and experiences in this line. Since the

place is well connected to different parts of the country both by rail and road, transportation of the particle board would not be a major problem.

#### 4. Price

A sales price of Rs. 13,750 / tonne would be recommended/assumed (net realized price). Sales expense of 1% of sales price is anticipated.

### IV. CAPITAL REQUIREMENT AND COSTS

The estimated cost of the project after including subsidy and margin money for working capital is about Rs. 325,745,000. The details of project cost are given in exhibit 1.

#### 1. Land and Site Development

Land cost of 5 acres at the rate of 30,000/ acre is considered. Similarly developmental charges of Rs. 120,000/ acre is considered. Other expenses of internal roads, fencing, drainage, gates are mentioned in Exhibit 1.

#### 2. Building and Civil Work

It includes factory building, non-factory building, auxiliary services, equipment foundation. Their cost is estimated based on the floor area and rate of construction / unit of floor area in each category.

#### 3. Plant and Machinery

It includes both imported, indigenous and erection charges. The imported items are adjusted to rupees value after taken the current foreign exchange rate into consideration i.e. one DM = Rs 11.5

The custom duty on the imported equipment is also accounted for. Erection charges of Rs. 70,08,0000 is estimated.

#### 4. Technical Fees

The technical fee by the collaborators in rupee value comes to about Rs. 21,51,000.

#### 5. Miscellaneous fixed assets

The item like furniture, office machinery, equipments, cars, cost of equipment and installation for the distribution of power and water, miscellaneous tools and equipments and laboratory equipments and their estimated cost is included as a part of project cost.

#### 6. Preliminary and Capital Issue Expenses

Preliminary expenses for flotation of company, brokerage charges etc. are considered at Rs. 30,000.

#### 7. Pre-operative Expenses

- a) Establishment: The salaries of people, wages, benefits (50% of salary) during construction period is estimated at Rs.18,93,000. The people will be recruited during the period of construction so that the start up will be smooth.
- b) Rent, rate, taxes are estimated at Rs. 23,000
- c) Travelling expenses during construction is Rs. 2,31,000
- d) Miscellaneous expenses include, postage, stationeries telex etc. and are estimated at R. 1,46,000.
- e) Interest (12%) and commitment charges (1%) on the long term loan during construction period will be R.28,690,000.

- f) Insurance during construction is considered at 5% fixed assets. Development charges and erection charges are not considered as fixed assets.
- g) Mortgage expenses are taken at Rs. 73,000.
- h) Start up expenses (Exhibit 2) are estimated at Rs. 2,13,000.
- i) Expenses incurred for constructing with farmers, supplying saplings is put at Rs. 20,00,0000.

#### 8. Provision for Contingency

A contingency of Rs. 16,824,000 is provided for to meet any fluctuation in the cost.

#### 9. Margin money for working capital

In the first month of operation the firm needs working capital for raw materials, finished good, accounts receivable and other operating costs like salary, power, packaging, sale expense. Out of these, bank finances part of expenses for raw material, finished goods, outstanding debtors, work in process. Margin money for above and the operating cost for first period (here one month) has to be provided in for by the entrepreneur and this is called core working capital and is allowed to be financed from long term loan.

The requirement of working capital at different capacity utilization is given in Exhibit 3.

To find the stock of finished goods at cost, the cost per unit at different capacity is calculated as shown in Exhibit 4.

To find cost of finished goods, the depreciation for each of the years is given in Exhibit 5. The same depreciation schedule is

used for profit and loss statement. The pre-operative expenses, technical fee, preliminary expenses are allocated to other headings proportional to their cost for the purpose of depreciation.

#### 10. Subsidy

A subsidy of Rs.25 lakh is deducted to arrive at the total project cost.

#### 11. Total Project Cost

The estimated total project of 20,000 tonnes / annum particle board plant based on eucalyptus wood works out to be Rs. 325,745,000 and will be spent in two years 60% and 40%.

#### 12. Means of Finance

The capital structure of 2:1 (debt: equity) is suggested.

Equity Rs. 117,582,000

Debt Rs. 235,164,000

Exhibit : 1 ESTIMATES OF PROJECT COST

Sl No.	PARTICULARS	AMOUNT IN Rs. THOUSAND
<b>1. LAND AND SITE DEVELOPMENT</b>		
a)	Cost of land 5.00 acres @ R. 30,000/acre	150
b)	Development Charges @ R.120,000/ acre	620
c)	Internal Roads	460
d)	Fencing	70
e)	Drainage	146
f)	Gate	110
	Sub Total	1555
<b>2. BUILDING AND CIVIL WORK</b>		
a)	Factory Building	3592
b)	Non-Factory Building	1971
c)	Auxiliary Services	2387
d)	Equipment Foundation	1590
	Sub Total	9540
<b>3. PLANT AND MACHINERY</b>		
a)	Imported Equipments	
i)	F. O.B. Value	122834
ii)	Duty, Transport, Insurance, Loading, Non-loading, etc. @ 100%	
b)	Indigenous Equipment	23126

c) Spares	
- Imported @ 2% on equipment	3418
- indigenous @ 1.5% ib equipment	347
d) Erection Charges	7008
Sub Total	279567

#### 4. TECHNICAL FEES

#### 5. MISCELLANEOUS FIXED ASSETS

a) Furniture	60
b) Office Machinery & Equipment	84
c) Cars	300
d) Cost of equipment and installation for Distribution of Power	7200
e) Cost of equipment and laying pipe for Distribution of water	60
f) Piping Cost for fighting system	180
g) Miscellaneous Tools & Equipments	36
h) Laboratory Equipment	24
Sub Totals	7944

#### 6. PRELIMINARY AND CAPITAL ISSUE EXPENSES 30

#### 7. PRE - OPERATIVE EXPENSES

A) Establishment	1893
B) Rent, Rates & Taxes	23
C) Travelling Expenses	231
D) Miscellaneous Expenses	146
E) Interest and Commitment Charges	28690
F) Insurance during construction @ 0.5% of fixed assets	1089
G) Mortgage Expenses	73

H) Start-up Expenses	213
I) EXPENSES FOR RM CONTRACT	2000
	34358
8. PROVISION FOR CONTINGENCY	16824
9. MARGIN MONEY FOR WORKING CAPITAL	3277
LESS CENTRAL SUBSIDY	2500
-----	
TOTAL ESTIMATED PROJECT COST	352745
-----	

Exhibit 2 : COMPUTATION OF START UP EXPENSES

	Amount in Rs. Thousand
-----	
A) EXPENSES	
1. One month's cost of raw material and chemicals at 40% capacity	2557
2. One months cost of utilities at 40% capacity	333
3. Packaging Expenses for one months production at 40% capacity	73
Total Expenses	2963
B) RETURNS	
15 Days Sales Realization at 40% capacity and at 60% of the price	2750
C) NET START-UP EXPENSES (A-B)	213
-----	

Exhibit 3 : Margin Money for Working Capital

Sl No	Item	Period 1 of in Margin		0 40 (Capacity)			0 401			1 601		
		Months	Money	Amount	Margin Money	Bank Loan	Amount	Margin Money	Bank Loan	Amount	Margin Money	Bank Loan
1.	Raw Materials & Chemicals	0.5	25	1278	320	959	1278	320	959	1918	479	1438
2.	Power	1	100	333	333		333	333		499	499	
3.	Salary & Wages	1	100	428	428		449	449		471	471	
4.	Repairs & Other paint Overheads	1	100	249	249		482	482		482	482	
5.	Packaging	1	25	73	18	55	73	18	55	110	28	83
6.	Stock of Finished goods at cost	0.5	25	3459	865	2594	3592	898	2694	4367	1092	3275
7.	Sales Expenses	1	100	92	92		92	92		138	138	
8.	Work in Progress	0.033	25	228	57	171	237	59	178	288	72	216
9.	Outstanding Debtors	1	10	9167	917	8250	9167	917	8250	13750	1375	12375
	Total			15306	3277	12029	15702	3567	12135	22022	4635	1787

Margin Money for working capital (Contd...)							
Sl No.	Item	1 751			1 902		
		Amount	Margin Money	Bank Loan	Amount	Margin Money	Bank Loan
1	Raw Materials & Chemicals	2397	599	1798	2876	719	2157
2	Power	624	624		749	749	
3	Salary & Wages	495	495		520	520	
4	Repairs & Other Plant Overheads	482	482		482	482	
5	Packaging	138	34	103	165	41	124
6	Stock of Finished Goods at Cost	4951	1238	3713	5536	1384	4152
7	Sales Expenses	172	172		206	206	
8	Workd in Progress	327	82	245	365	91	274
9	Outstanding Debtors	17188	1719	15469	20625	2063	18563
	Total	26772	5444	21328	31524	6255	25270

**Exhibit 4 ESTIMATES OF PRODUCTION COST AT DIFFERENT CAPACITY**

Amount in Rs. Thousand

	CAPACITY 40%	40%	60%	75%	90%	
<b>1.</b>	<b>RAW MATERIALS &amp; CHEMICALS</b>					
	a) Eucalyptus Wood	14400	14400	21600	27000	324000
	b) Chemicals (Binding Agents)	16280	16280	24420	30525	36630
<b>2.</b>	<b>UTILITIES</b>					
	a) Power	2800	2800	4200	5250	6300
	b) Coal	1195	1195	1793	2241	2689
<b>3.</b>	<b>LABOUR, ADMINISTRATION &amp; OVERHEADS</b>					
	a) Salary, Benefits & Allowances	5130	5387	5656	5939	6236
	b) Repairs & Maintenance	2985	5780	5780	5780	5780
	c) Insurance @ 0.50% of fixed assets	1089	1089	1089	1089	1089
	d) Contingency 5% of B&C	204	343	343	343	343
	e) Administrative Expenses @ Rs.	132	132	132	132	132
<b>4.</b>	<b>PACKAGING EXPENSES</b>	880	880	1320	1650	1980
<b>5.</b>	<b>SALES EXPENSES @ 1% OF SALES</b>	1100	1100	1650	2663	2475
<b>6.</b>	<b>DEPRECIATION (ST. LINE)</b>	36813	36813	36813	36813	36813
	<b>TOTAL PRODUCTION COST = Rs.</b>	<b>83008</b>	<b>86200</b>	<b>104797</b>	<b>118825</b>	<b>132868</b>
	<b>TOTAL PDM. IN TONS</b>	<b>8000</b>	<b>8000</b>	<b>12000</b>	<b>15000</b>	<b>18000</b>
	<b>COST PER TON in Rs</b>	<b>10376</b>	<b>10775</b>	<b>8733</b>	<b>7922</b>	<b>7382</b>

**EXHIBIT 5 : STRAIGHT LINE DEPRECIATION**

SL NO	ITEM	BASE COST	ALLOCATED CONTINGENCY	DEPRECIABLE TOTAL COST	ST. LINE RATE IN %	DEPRECIATION
1.	Factory Building	7568	926	8494	3.34	284
2.	Non-Factory Building	3376	413	3790	1.63	62
3.	Plant & Machinery , Other Miscellaneous fixed assets	287067	35115	322182	11.31	36439
4.	Furnitures, fittings Office equipments	144	18	162	3.34	5
5.	Cars	300	37	337	7.07	24
	<b>Total</b>	<b>298456</b>	<b>36508</b>	<b>334964</b>		<b>36813</b>

**V OPERATING REQUIREMENTS AND COST**

The operating requirements and costs are mentioned below:

1. Raw Material: Eucalyptus and binding agents are the main raw materials. Their consumption norms and price are given in Exhibit 6.
2. Utilities: Power requirement is 280 kwh/tonne and their cost, requirement are given in Exhibit 6.
3. Salaries and Wages: They are put under two headings Factory and non factory. The salary of factory people is R. 201,000/- month and that of non factory R. 84,000/ month. 50% of this cost will be benefits. Every year a 5% increases in salaries and wages is considered.
4. Repair and Maintenance: Repair and maintenance expenses are considered as 1% of cost of Road, drainage, fencing, gates, building, civil work, plant and machinery and miscellaneous fixed assets in the first year. 2% is considered for plant and machinery and miscellaneous fixed assets from the 2nd year as they are expected to have more wear and tear. For other items 1% of their cost will be continued.
5. Insurance: 0.5% of fixed asset, is considered as Insurance cost.
6. Administrative expenses of R. 11,000/ month is estimated.
7. Contingency: 0.5% contingency on repairs, maintenance and insurance is account for.
8. Packaging: R. 110/ tonne is estimated as packaging expense.
9. Depreciation: Straight line depreciation as mentioned in Exhibit 6 is estimated at R. 36,813, 000/ year.

**EXHIBIT 6 : ESTIMATED COST OF MANUFACTURE**

Amt. in Rs. Thousand

	1	2	3	4	5	6	7	8	9	10
<b>1. RAW MATERIALS &amp; CHEMICALS</b>										
a) Eucalyptus wood	14400	14400	21600	27000	32400	32400	32400	32400	32400	32400
b) Binding Agent	16280	16280	24420	30525	36630	36630	36630	36630	36630	36630
<b>Total "1"</b>	<b>30680</b>	<b>30680</b>	<b>46020</b>	<b>57525</b>	<b>69030</b>	<b>69030</b>	<b>69030</b>	<b>69030</b>	<b>69030</b>	<b>69030</b>
<b>2. UTILITIES</b>										
a) Power	2800	2800	4200	5250	6300	6300	6300	6300	6300	6300
b) Coal	1195	1195	1793	2241	2689	2689	2689	2689	2689	2689
<b>Total "2"</b>	<b>3995</b>	<b>3995</b>	<b>5993</b>	<b>7491</b>	<b>8989</b>	<b>8989</b>	<b>8989</b>	<b>8989</b>	<b>8989</b>	<b>8989</b>
<b>3. PACKAGING</b>	<b>800</b>	<b>800</b>	<b>1320</b>	<b>1650</b>	<b>1980</b>	<b>1980</b>	<b>1980</b>	<b>1980</b>	<b>1980</b>	<b>1980</b>
<b>4. SALARIES &amp; WAGES OF PLANT AND LABOUR</b>	<b>3618</b>	<b>3799</b>	<b>3789</b>	<b>4188</b>	<b>4398</b>	<b>4618</b>	<b>4848</b>	<b>5091</b>	<b>5345</b>	<b>5613</b>
<b>5. FACTORY OVERHEADS</b>										
a) Repairs & Maintenance	2985	5780	5780	5780	5780	5780	5780	5780	5780	5780
b) Insurance	1089	1089	1089	1089	1089	1089	1089	1089	1089	1089
c) Contingency										
@ 5% of (a)	204	343	343	343	343	343	343	343	343	343
<b>Total "5"</b>	<b>4277</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>	<b>7213</b>
<b>6. ESTIMATED COST OF MANUFACTURE</b>										
(1+2+3+4+5)	43450	46567	64534	78067	91610	91829	92060	92303	92557	92825

## VI FINANCIAL ANALYSIS

### A. OPERATING PERFORMANCE:

#### Profit Performance

The manufactures cost at the decided capacity utilization is given in Exhibit 7 for first 10 years.

The operating performance for the first 10 years is given in exhibit 7. Here for the purpose of tax depreciation is calculated based on WDV method exhibit 8. The calculation of tax is shown in exhibit 9. The pre-operative expenses are written off as and when the profit is positive, so that tax payment will be minimized in the initial years thus helping the cash flow exhibit 9.

#### Loan Repayment

The term loan will be paid in 9 equal installments beginning from second year. The term loan repayment schedule and the interest in each of the years at 12% is given in Exhibit 10.

#### Working Capital Borrowing:

The working capital schedule with details about borrowing in a particular year, repayment, outstanding bank balance and the interest cost at 18% for each of the 10 years is given in Exhibit 11. It is decided not to borrow when enough cash is available with the company keeping a reserve of R. 50 lakh.

#### Cash flow statement

The cash flow statement for 10 years is given in exhibit 12. This also incorporates the sales tax different offered by State government.

### Break-even analysis:

The breakeven point is given in exhibit 12. i.e. about 42%.

## B. FINANCIAL VIABILITY

### 1. Net Present Value and FIRR

A stream of cash flows are given in exhibit 12. The investment is considered in two years (60% in 1st year, 40% in 2nd year). The subsidy of R. 25 lakh is not a cost to the entrepreneur. The cash flows are taken from the operating performance after adjusting for depreciation, dividend, interest cost on long term loan.

Sales tax different upto 90% of fixed asset is considered at 10% sales tax. The payment will be in six equal installments after sales tax collection reaches 90% of fixed asset or 14 years period whichever is earlier. To account this, the analysis is extended upto 20 years for the sales tax collection and repayment purpose only keeping other flows restricted to only 10 years. At the end of 10th year a national inflow for working capital and salvage value is considered.

Debt is taken at 12% and equity at 15%. The weighted average cost of capital after adjusting the cost of debt for 40% tax rate will be

$$\frac{2}{3} \times (.12 \times .6) + \frac{1}{3} \times .15 = 9.8\%$$

This is used discount rate for NPV.

The NPV calculated is 227,791,000 And FIRR is 23%.

### 2. Pay Back Period :

The pay back period is given by exhibit 14 i.e. 5 years.

All these things suggest that the project is financially viable.

### 3. Sensitivity Analysis:

To account for any uncertainties, the sensitivity analysis is carried out with variations in three of the main variables. i.e. Raw material cost, foreign exchange rate and sales price. Even then the project is financially viable in worst assumed situation of sales price Rs. 10000 / tonne ; Foreign Exchange rate R. 13/DM ; and Eucalyptus Rs. 1200 / tonne exhibit 15.

### VII ECONOMIC ANALYSIS

Any analysis is incomplete without carrying out its impact on society at large, though project itself is viable financially. Because several individual viable projects can have severe impact on society in terms of pollution etc. If their cumulative effect is considered.

It is with this rationale that economic analysis is carried out. It is principally similar to that of financial analysis with adjustments made for transfer payment, foreign exchange and shadow prices for revenue and costs.

The results of economic analysis are given in Exhibit 15. The differential treatment (when compared to FA) given to different headings are given below.

a) Transfer payments, like central subsidy, sales tax, deferment, customs duty, insurance interest are excluded.

b) Shadow pricing:

- For imported equipments 1.25 to account for foreign exchange scarcity.
- Labour 0.8 to account for unemployment in non skilled labour segment.

EXHIBIT 7 : PROJECTED PROFIT & LOSS STATEMENT											
Particulars/Years	I	II	III	IV	V	VI	VII	VIII	IX	X	
A. Cost of Manufacture	43450	46567	64534	78067	91610	91829	92060	92383	92557	92825	
<b>B. Administrative expenses</b>											
a) Administrative Salary With benefits	1512	1588	1667	1750	1838	1930	2026	2128	2234	2346	
b) Misc Admin expenses	132	132	132	132	132	132	132	132	132	132	
Total "B"	1644	1720	1799	1882	1970	2062	2158	2260	2366	2478	
C. Sales exp	1100	1100	1630	2063	2475	2475	2475	2475	2475	2475	
B. Total Cost of Production (A+B+C)	46194	49386	67983	82012	96054	96366	96694	97037	97398	97777	
E. Expected sales	110000	110000	165000	206250	247500	247500	247500	247500	247500	247500	
F. Gross profit before interest (E-B)	63806	60614	97017	124238	151446	151134	150806	150463	150102	149723	
<b>G. Financial Expenses</b>											
i. Interest on Term Loan	28220	25084	21949	18813	15678	12542	9407	6271	3136	0	
ii. Interest on Bank Borrowings	2165	0	0	0	0	0	0	0	0	0	
Total "G"	30385	25084	21949	18813	15678	12542	9407	6271	3136	0	
H. Depreciation	36813	36813	36813	36813	36813	36813	36813	36813	36813	36813	
I. Operating Expenses written off	-3393	-1284	38255	68612	98955	101778	104586	107378	110153	112909	
J. Other Income	0	0	0	0	0	0	0	0	0	0	
K. Preliminary Expenses Written off	3	3	3	3	3	3	3	3	3	3	
L. Profit/Loss Before Tax (I+J-K)	-3396	-1287	38252	68609	98952	101775	104583	107375	110150	112906	
M. Provision for Taxation	0	0	0	0	38100	50155	52981	55238	57112	58729	
N. Profit after tax (L-M)	-3396	-1287	38252	68609	60851	51621	51603	52138	53038	54178	
O. Less Dividend on Equity @ 15%	0	17637	17637	17637	17637	17637	17637	17637	17637	17637	
P. Retained Profit	-3396	-18924	20614	50971	43214	33983	33965	34500	35400	36540	
ADD Depreciation	36813	36813	36813	36813	36813	36813	36813	36813	36813	36813	
Pre-expenses Written off	3	3	3	3	3	3	3	3	3	3	
Net Cash	33421	17892	57431	87788	80030	78800	70762	71317	72217	73357	
Additional Interest on Term Loan @ Dividend	28220	25084	21949	18813	15678	12542	9407	6271	3136	0	
Cash For NPV Purpose	61640	60614	97017	124238	113345	100979	97826	95225	92990	90994	

EXHIBIT 8 : DEPRECIATION BY MDV METHOD													
Sl No	ITEM	DEPRECIATION COST	RATE %	YEARS									
				I	II	III	IV	V	VI	VII	VIII	IX	X
1	Factory Building	7569	10	757	681	613	552	497	447	402	362	326	293
2	Non-factory Building	3376	5	169	160	152	145	138	131	124	118	112	106
3	Plant & Machinery Other Miscellaneous	287067	33	95679	63789	42526	28354	18903	12603	8402	5602	3735	2490
4	Furnitures, Fittings office equipments	144	10	14	13	12	10	9	9	8	7	6	6
5	Cars	300	33	100	67	44	30	20	13	9	6	4	3
	Total	298456		96719	64711	43350	29090	19567	13202	8945	6094	4183	2898

EXHIBIT 9 : INCOME TAX CALCULATIONS											
	Particulars	I	II	III	IV	V	VI	VII	VIII	IX	X
1	Profit Before Depreciation and Tax	33418	35526	75065	105422	135765	138589	141397	144189	146963	149720
2	Depreciation by MDV Method	96719	64711	43350	29090	19567	13202	8945	6094	4183	2898
3	Profit/Loss after Depreciation Before Tax (1-2)	-63302	-29184	31715	76332	116198	125387	132452	138094	142781	146822
4	Carry forward of Unabsorbed Depreciation	63302	29184	0	0	0	0	0	0	0	0
	Accumulated unabs depre	63302	92486	92486	60771	0	0	0	0	0	0
5	Pre Incentive Profit(3-4)	0	0	0	15561	116198	125387	132452	138094	142781	146822
6	Preoperative expenses Amortised	0	0	0	15561	20947	0	0	0	0	0
7	Amortisable Preoperative Expenses	36508	36508	36508	20947	0	0	0	0	0	0
7a	Taxable Profit	0	0	0	0	95251	125387	132452	138094	142781	146822
8	Income tax at 0.40%	0	0	0	0	95251	125387	132452	138094	142781	146822

Amount in Rs. Thousand										
	Years									
	1	2	3	4	5	6	7	8	9	10
	235164	209034	1829034	156776	130646	104517	78388	52259	26129	0
Payment	0	26129	26129	26129	26129	26129	26129	26129	26129	26129
Interest /	28220	25084	21949	18813	15678	12542	9407	6271	3136	0

EXHIBIT 11 : WORKING CAPITAL AND INTEREST @ 18% PER ANNUM ON BANK BORROWINGS										
Years	Amount in Rs. Thousand									
	1	2	3	4	5	6	7	8	9	10
AMOUNT OF BANK BORROWER (THIS YR)	12029	0	0	0	0	0	0	0	0	0
BB BGN. YR	12029	0	0	0	0	0	0	0	0	0
PAID BB YR END	12029	0	0	0	0	0	0	0	0	0
BANK BORROWER YR END	0	0	0	0	0	0	0	0	0	0
INTEREST @ 18%	2165	0	0	0	0	0	0	0	0	0

**EXHIBIT 12 : CASH FLOW STATEMENT**

PARTICULARS	CONSTR UC-- TION PERIOD	OPERATING YEARS									
		I	II	III	IV	V	VI	VII	VIII	IX	X
<b>SOURCE OF FUNDS</b>											
Equity Capital	117582										
Profit before tax with interest added back		26992	230800	60203	87425	114632	114320	113993	113649	113288	112909
SALES TAX RETAINED		11000	11000	16500	20625	24750	24750	24750	24750	24750	24750
Depreciation		36813	36813	36813	36813	36813	36813	36813	36813	36813	36813
Increase in Bank Borrowings		12029	0	0	0	0	0	0	0	0	0
SUBSIDY	2500										
Increase in Term loan	235164	0	0	0	0	0	0	0	0	0	0
Total "A"	355245	86835	71614	113517	144863	176196	175884	175556	175213	174852	174473
<b>USES OF FUNDS</b>											
Capital Expenditure for the project	351968	0	0	0	0	0	0	0	0	0	0
Increase in working capital		15306	396	6320	4750	4752	0	0	0	0	0
Sales Tax Required		0	0	0	0	0	0	0	0	0	0
Decrease in Term Loan		0	26129	26129	26129	26129	26129	26129	26129	26129	26129
Decrease in Term Loan		12029	0	0	0	0	0	0	0	0	0
Interest in term Loan		28220	25084	21949	18913	15678	12542	9407	6271	3136	0
Interest On Bank Borrowings		2165	0	0	0	0	0	0	0	0	0
Taxation		0	0	0	0	38100	50155	52981	55238	57112	58729
Dividends		0	17637	17637	17637	17637	17637	17637	17637	17637	17637
Total "B"		57720	69247	72035	67330	102297	106463	106154	105275	104014	102495
Net Surplus/Deficit (A-B)		29115	2367	41482	77533	73899	69421	69403	69937	70837	71977
Opening Balance of Cash in hand and at Bank		3277	32392	34759	76240	153773	227672	297093	366496	436433	507270
Closing Balance of Cash in hand and at Bank	3277	32392	34759	76240	153773	227672	297093	366496	436433	507270	579248

EXHIBIT 13 : BREAK EVEN POINT		
1	Gross Sales Realisation (ISR)	275000
2	Variable Cost (VC)	
	i) Raw Materials & Chemicals	76700
	ii) Utilities	9900
	iii) packaging	2200
	Total *VC*	88800
3	Fixed Cost (FC)	
i	Salary and Wages	5130
ii)	Repairs & Maintenance	2042
iii)	Insurance	1121
iv)	Contingency	150
v)	Administration Expenses	132
vi)	Depreciation	36813
vii)	Sales Expenses	2750
viii)	Interest on Term Loan	28220
ix)	Interest on Bank Borrowings	2165
	Total *FC*	78531
$BEP = (FC / (ISR - VC)) = 42.201$		

EXHIBIT 14 : PAY BACK PERIOD										
Amount in Rs. Thousand										
YEAR	1	2	3	4	5	6	7	8	9	10
PROFIT AFTER TAX AND DEPRECIATION	33421	35529	75068	105425	97668	88437	88954	88954	87854	90994
CUMULATIVE AMOUNT	33421	68950	144018	249443	347111	435548	523967	612921	702775	793769
INVEST	352745									
PAY BACK PERIOD 5 YEARS										

EXHIBIT 15: SENSITIVITY ANALYSIS			
SALES VALUE	FOREIGN RATE	EUCALYPTUS PRICE	
		Rs. 1000	Rs. 1200
Rs. 13750	Rs. 11.5	NPV 227794 EIRR 23% FIRR 42% BE 42%	
Rs. 12500	Rs. 11.5	NPV 170117 FIRR 21% EIRR 39% BE 46%	
Rs. 13750	Rs. 13	NPV 210990 FIRR 21% EIRR 39% BE 46%	
Rs. 12500	Rs. 13		NPV 137695 FIRR 17% EIRR 32% BE 55%
Rs. 1000	Rs. 13		NPV 31634 FIRR 11% EIRR 21% BE 81%

EXHIBIT 16 : ECONOMICAL VIABILITY OF THE PROJECT												
												Amount in Rs. Thousand
1.	Years	0	1	2	3	4	5	6	7	8	9	10
2a.	Investments	234733	0	0	0	0	0	0	0	0	0	0
2b.	Other Expenses											
3a.	Revenue		69058	65902	104063	132615	161154	160886	160605	160316	160000	159674
3b.	Other Income											
4.	(Inflows-out flows) (2-3)	-234733	69058	65902	104063	132615	161154	160886	160310	160605	160000	159674
5.	Net Present Value	480702	480702									
6.	ERR 41.71%											

#### VIII. CONCLUSIONS AND RECOMMENDATIONS

The above analysis indicates that the project is financially viable and economically justifiable. The sensitivity analysis also indicates the financial viability of the project in case the assumptions go wrong.

## Chapter IX

### RECOMMENDATIONS

The analysis in this report was divided into two parts. Part I presented the conceptual framework and the analysis of existing agro based industries vis a vis other industries in Gujarat as against potential for such industries based on the data generated by the Agro Climatic Regional Planning Unit. Part II of the study presented two illustrative profiles and feasibility studies of project ideas to serve as a model for development of were such feasibility study.

It was observed that there is a vast potential for agro based (both agro food, agro non food) projects particularly with higher degree of value addition in Gujarat. This potential has to be tapped and the rate of growth of agro based industries needs to be accelerated. This requires the following steps by the Agro Climatic Regional Planning Unit and Industrial Promotion Organizations in the state, particularly INDEXTB.

1. The ASI data gives only aggregate pattern and does not present the unit wise or type wise industry wise performance of these units for various districts. It is, therefore, necessary to create the data base for various agro climatic zones and districts so that Entrepreneur can be assisted with background data on the performance of these units and constraints faced. This may help Entrepreneur to realistically assist the risk involved in agro based industries in a system framework from procurement of raw

material to process and marketing of finished products.

2. Although the data on infrastructure facilities available in various talukas of each districts in the state has been compiled and it is available from INDEXTb, this data was compiled in 1985. The data has to be updated and needs to be continuously compiled and presented to the Entrepreneurs.
3. The banking and funding agencies needs to be made aware about the possibilities of Agro based Industries (Agro Food and Agro Non Food Industries). In this context they need to be made aware of the peculiar feature of these industries in terms of seasonality, perishability and variability of raw material leading to year to year fluctuations in performance and the need for differential norms for the financing of working capital of their industries.
4. The small agro based industries often face problems in creating the brand awareness and development of new product for market for their products. This necessitates encouragement to joint ventures and equity participation from large and more experienced business houses who can handle not only the domestic marketing but also the export marketing. Recently some successful effort are being made through this role of joint ventures. Particular mention may be made for the efforts being made for the brackishwater potential by the Gujarat Fisheries Development Corporation and some private sector units and also Gujarat Agro Industries Corporation with some private sector units.

5. A network needs to be created between the Agro Climatic Regional Planning Unit and the Industrial Promotion Organizations of the state so that the data on resource and availability of raw material can be integrated with the industrial promotion activities and efforts.

