PROJECT PROFILE
PAPAIN ENZYME

1. INTRODUCTION

Papain is a proteolytic enzyme from the cysteine protein family. It is manufactured from the latex of raw papaya fruits as papaya is very rich in papain. A milky fluid known as latex containing papain oozes out of the green papaya. The greener the fruit, more active is the papain. Papaya is grown in large quantities in the Eastern region including West Bengal. Papain enzyme results in high value- addition . Hence this product can be manufactured in West Bengal. It is also possible to produce papain enzyme in many other states like Gujarat, Maharastra , U.P. AP etc. . Ideally, some progressive papaya grower should undertake this venture as a measure of forward integration.

2. OBJECTIVES

The objective of the profiles is to encourage and assist prospective entrepreneurs in MSME sector in and guiding making them aware of the opportunities of this sector. It is also being developed by the Directorate of the Food Processing Industries, Government of West Bengal to help entrepreneurs with knowledge about raw materials availability, knowledge of market, source of technology and plant and machinery suppliers. M/s ITV Agro & Food Technologies Pvt. Ltd., New Delhi has helped in developing the project profile.

3. RAW MATERIAL AVAILABILITY

The most important raw material will be raw or unripe and fully grown papaya which will be cultivated by the promoters . Papaya, after extraction of latex, is sold in the market. Price of papaya as input material will decide the viability of the project. Other material like potassium metabisulphate, lactose powder etc. shall be required in

small quantity. Plastic containers and corrugated boxes shall be required for packing of finished product. Production of papaya in West Bengal is estimated at 3.31 lacs MT / year.

4. MARKET OPPORTUNITIES

Papain is used in many industries for variety of reasons. Some of the end-users are breweries, pharmaceuticals, food, leather, detergents, meat and fish processing etc. Thus, the end use segments are many. Most of these industries are growing . Good quality papain has export demand as well. In spite of very good domestic as well as export demand, papain manufacturing has not picked up in West Bengal and hence there are good prospects for new entrants.

5. PROJECT DESCRIPTION

a) Product & Its uses

Dry powder made from the latex of raw papaya is commonly known as crude papain. Dried papain is stored in powder or flakes form. They are diluted with lactose powder to get BPC grade papain. There is a market for raw as well as BPC grade papain. This note considers production of BPC grade papain.

b) Capacity

The proposed capacity of the plant is to process 20MT / annum of papaya.

c) Manufacturing process

White milky latex of green and fully grown papaya fruits is collected in the early morning by making deep longitudinal cuts by stainless steel or wooden sharp knives. Latex is collected in stainless steel trays while latex coagulated in the surface of the fruits is scrapped and collected in the trays. A fruit is tapped about 6 times in the course of 16 days. This latex is passed through 50 mesh sieves to remove dirt and then it is mixed with potassium metabisulphate and spread on trays and dried in a vacuum shield drier at a temperature of about 55° C for 4-5 hours. The dried product is packed

in air-tight containers and stored in a cool, dry place. It should be kept in flake form as powdering decreases the stability of the product during storage. Dried flakes are powdered and diluted with lactose powder to get BPC grade papain. Plastic containers should be used to pack crude papain flakes or powder as metal containers would result in loss of enzyme activity. Transportation is also very critical as papain has to be kept below 20° C temperature or else its shelf life is reduced. With proper storage and handling, its shelf life is 5-6 months. Recovery of BPC grade papain is in the range of 25% to 30 %. In other words, 100 kgs. of good quality latex is required to produce 25-30 kgs. of BPC grade papain.

6. PROJECT COMPONENTS & COST

a) Land & Building

As indicated earlier, this project should preferably be started by or with the help of existing papaya grower. For production capacity of 6 tonnes of BPC grade papain every year, about 66 kgs. of latex would be required every day considering 30 % recovery and 300 working days every year. For 66 kgs.. of latex every day, there is a need for cultivation on 30 -32 acres of land. This land has to be divided into 3 sections and plantation is done in one section at a time in a cycle of 3-4 months to ensure availability of papaya round the year. If the promoters are not papaya growers then they should have adequate agricultural land on which papaya cultivation could be started instead of some other item. Or else land can be taken on long term lease. But buying of 30-32 acres of land for this project would be an economically unviable proposition.

Total constructed area would be around 150 sq. mtrs. which has to be in the same farm. Main processing area would be around 50 sq. mtrs. Laboratory, office and packing area can be accommodated in the balance 40 sq. mtrs.

It is envisaged that the processing will be done in the farm itself . Even then for a piece of land of about 250 sq. mtrs. on which factory building shall be constructed, price is

taken @ Rs. 500/ sq. mtr. to arrive at a realistic picture. Thus cost of land is taken at Rs. 1.25 lacs whereas construction cost is assumed to be Rs. 9.00 lacs.

b) Plant & Machinery

For processing around 20 tons of papaya per year (300 working days) the following machines will be required.

Item	**Qty**	**Price (Rs. in lacs)**
Aluminium and SS trays, Weighing Scales & Measuring cans, knives, sieves etc.	-	1.80
5 HP Pumps-set with hose pipe	2	5.00
Vacuum Shield Drier	1	6.50
De-humidifier	1	1.60
Hammer Mill	1	2.10
Blender	1	1.60
Laboratory Equipments	-	1.00
Packing machine	1	0.70
	Total	**15.80**

c) Miscellaneous Assets

Some other assets like furniture and fixtures, working tables, storage racks and bins etc. would cost about Rs. 2.00 lacs.

d) Utilities

Power requirement shall be 30 HP whereas per day water requirement for processing and potable and sanitation purpose will be 5000 litres. Annual cost of utilities at 100% utilization will be Rs. 2.80 lacs.

e) Prel. & Pre Operative Expenses

There will be many pre-production expenses like registration, establishment & administrative & travelling expenses, interest during implementation, trial run expenses, etc for which a provision of Rs. 2.20 lacs is made.

f) Working Capital Assessment

Capacity utilization in the first year is expected to be 60% for which working capital needs would be as under **:**

(Rs. in lacs)

Particulars	**Period**	**Margin**	**Total**	**Bank**	**Promoters**
Stock of Finished Goods	½ month	25%	0.95	0.71	0.24
Receivable	½ month	25%	1.20	0.90	0.30
Raw material	½ month	25%	0.28	0.21	0.07
Total			2.43	1.82	0.61

f) Project cost & Means of finance

Item	**Amount (Rs. in lacs)**
Land and Building	10.25
Plant and Machinery	15.80
Miscellaneous Assets	2.00
P & P Expenses	2.20
Contingencies @ 10% on Building and plant and machinery	2.48
Working capital margin	0.61
Total	**33.34**

Means of Finance	
Promoters' contribution	13.34
Term loan from Bank FI	20.00
Total	**33.34**
Debt Equity Ratio	1.5:1
Promoters contribution	40%

Financial assistance in the form of grant is available from the Ministry of Food Processing Industries, Govt. of India, towards expenditure on technical civil works and plant and machinery for eligible projects subject to certain terms and conditions.

7) PROJECTED PROFITABILITY

a) Production Capacity

As against the rated production capacity of 20 tons per year, actual utilization is expected to be 60 % in the first year and 75% thereafter.

b) Sales Revenue at 100%

Assuming selling price of Rs.10.00 lacs per ton, total sales income of 6 tonnes would be Rs. 60.00 lacs.

c) Raw and packing Material Required at 100%

Requirement of various raw material is as under :

(Rs. in lacs)

Product	**Qty (Tonnes)**	**Rate (Rs./ Ton)**	**Value**
Raw / Unripe papaya	20	30,000	6.00
Chemicals	-		3.20
Packing /materials	-		1.80
Total			**11.00**

d) Profitability statements

(Rs. in lacs)

S. No.	Particulars	1st year	2nd year
A.	**Installed capacity**	**20 Tonnes**	
	Capacity Utilisation	60%	75%
	Sales Realisation	36.80	45.0
B.	**Cost of Production**		
	Raw & Packing Materials	6.60	8.25
	Utilities	1.68	2.10
	Salaries	7.32	8.05
	Stores and Spares	1.20	1.50
	Repairs and Maintenance	1.50	1.87
	Selling Expenses @ 25%	2.88	3.60
	Administrative Expenses	1.50	1.87
	Total	**22.68**	**27.24**
C.	**Profit before Interest & Depreciation**	**13.32**	**17.76**
	Interest on Term Loan	2.00	1.60
	Interest on Working Capital	0.22	0.28
	Depreciation.	2.48	2.23
	Profit before Tax	8.62	13.65
	Cash Accruals	11.10	15.88
	Repayment of Term Loan	Nil	4.0

e) Break Even Point Analysis

(Rs. in lacs)

S. No.	Particulars	Amount	
(A)	**Sales**		**45**
(B)	**Variable Costs**		
	Raw & packing material	8.25	
	Utilities(70%)	1.36	
	Salaries (60%)	6.03	
	Stores and Spares	1.50	
	Selling and Distribution Exps (70%)	2.52	
	Admn Expenses (50%)	0.93	
	Interest on WC	0.28	20.87
(C)	**Contribution (A) – (B)**		**24.13**
(D)	**Fixed Costs**		**8.44**
(E)	**Break Even Point**		**35%**

f) Debt Service Coverage Ratio (DSCR) *(Rs. in lacs)*

Particulars	1st year	2nd year	3rd year
Cash Accruals	11.10	15.88	19.00
Interest on TL	2.0	1.68	1.20
Total (A)	13.10	17.58	20.20
Interest on TL	2.0	1.68	1.20
Repayment of TL	-	4.00	4.00
Total (B)	2.0	5.68	5.20
DSCR (A) / (B)	6.55	3.09	3.88
Average DSCR	4.50		

g) Internal Rate of Return (IRR)

Cost of the project is Rs. 33.34 lacs

Year	**Cash Accruals**	**8%**
1	11.10	8.65
2	15.88	9.68
3	19.00	8.93
4	19.00	7.08
5	19.00	5.50
5		**39.84**

The IRR is around 29%

h) Manpower requirement

Particulars	**Nos.**	**Monthly**	**Total Monthly Salary (Rs.)**
Skilled workers	2	7500	15,000
Helper	2	5000	30,000
Laboratory chemist	1	8000	8,000
Salesman	1	8,000	8,000
		Total	**61,000**

8. ASSUMPTIONS

- The plant will work for 300 days in a year. :
- The operating capacity is 60% , 75%, 90 % during 1st year , 2nd year and 3rd year respectively.
- The interest on term loan is taken at 10% per annum and on working capital it is 12% per annum.
- Price of raw material and selling price of finished products is taken at Rs. 30,000 / ton and Rs. 10,00,000 lacs / ton respectively.

9. SOURCES OF TECHNOLOGY

CFTRI, Mysore, has successfully developed the technical know-how for the product. BIS has laid down the quality standards. The compliance under FSSAI act is a must.

10. PLANT & MACHINERY SUPPLIERS

1. Nova Chernauxi (India) Ltd.
   RZ -390-9/21, Tugalakabad Extn.
   New Delhi – 110019
   Ph. 011 -29992944

2. Central Food Technological Research Institute
   Mysore -570020 (Karnataka)
   Ph. 0821-2514760
   www. cftri.com