PROJECT ON GREEN INDUSTRIES

PART II

DETAILED FEASIBILITY ANALYSIS OF RECYCLING OF PAPER WASTE – PULP MOLDED PRODUCTS

For

DEPARTMENT OF INDUSTRY
MINISTRY OF ECONOMIC AFFAIRS
ROYAL GOVERNMENT OF BHUTAN

By

IDRG CONSULTANCY SERVICES
In Association with Druk Associates
November 2011

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CONTENTS

CHAPTER 1 - PROJECT AT A GLANCE

1. Project concept – Detailed feasibility analysis of **pulp molded products** based on recycling of paper**.** The project envisages the manufacture of various types of pulp molded products viz egg trays, apple trays, packaging for handicrafts, industrial and consumer packaging items by recycling of paper waste.

2. Location - Location of the proposed unit should preferably in the vicinity of the major cities of Bhutan viz Thimphu, Phuentsholing, Punakha, Gelephu, Samdrup and Paro which happen to be the main source of availability of waste paper, the major raw material for the project. Another inputs required would be power and water which would also be easily available at the sites. The vicinity of the project to major cities shall help in cutting down the cost of transport of waste paper from the supply sources to project site. The market for the egg trays would be dispersed all over the country, however, the major centers of consumption would be the poultry farms which are invariably located in the vicinity of cities. As regards the fruit trays, the market would be mainly at the sites of orchards viz west and east central regions of Bhutan comprising of Trashiyangtse, Mongar, Lhatse, Pemagatshel and Samdrup. Besides, there could be substantial exports to adjoining areas of India since the cost of production of egg trays and fruit trays in Bhutan is likely to be highly competitive in Indian market due to lower input cost in terms of power and raw material. Keeping in view, the various parameters, these sites have been shortlisted in the order preference.

Location	**Overall rating**
Thimphu	46
Phuentsholing	43
Gelephu	41
Paro	41
Samdrup	41
Punakha	41

It is recommended that the project be setup at Bjemina Industrial Estate near Thimphu.

3. Markets - In Bhutan, there is no commercial production of egg trays, fruit trays or any other pulp molded package. The entire local demand is presently being met through imports from neighboring Indian markets. The project aims at meeting the local market demand of packaging material mainly egg tray & fruit trays and also aims at export of these packaging products to neighboring Indian markets. There is substantial export of fruits viz Mandarin and Apple to India and Bangladesh and use of fruit trays in packaging will further add value to Bhutanese exports. The alternative competing material for packaging of eggs and fruits is EPS. However, there is no production of EPS or EPS based packaging material in Bhutan and the entire demand is likely to be met by PMP only. Moreover, the use of EPS and other plastic packaging materials may not be permitted in Bhutan on account of environmental considerations. Accordingly, Orchard owners, fruit traders, fruit exporters, poultry farms in Bhutan and adjoining markets of India would be the main consumers for fruit trays and egg trays. The areas having concentration of orchards and main cities having poultries would constitute the target markets.

4. Annual production Capacity Recommended -

Items	Capacity (in numbers)
Egg trays	26, 00,000
Apple trays	26, 00,000

5. Land and Building Requirement

Plot area	6000 sq. Meters
Built up area	200 sq. Meters
Industrial shed	1000 sq. Meters

6. Power Requirement 750 KWH

7. Main machinery
Pulp preparation unit
Forming unit – Rotary molding unit
Drying unit – Hot air electrical drier
Miscellaneous service equipments

8. Man power Requirement	Manager		1
	Plant supervisor		1
	Office staff		3
	Machine operators		4
	Unskilled workers		3
9. Total project Cost			Nu. 254.14 lacs
10. Project Implementation Period			10-11 months
11. Means of Finance	Debt -		Nu. 177.90 lacs (70%)
	Equity -		Nu. 76.24 lacs (30%)
12. Break up of Cost of project	Machinery	-	Nu. 154.25 lacs
	Construction cost	-	Nu. 55.00 lacs
	Misc. fixed assets	-	Nu. 3.00 lacs
	Preoperative exp.	-	Nu. 5.00 lacs
	Training expenses	-	Nu. 1.54 lacs
	Interest		-Nu. 26.26 lacs
	Working capital	-	Nu. 9.09 lacs
	Total	-	**Nu. 254.14 lacs**
13. Annual sales Turnover	Nu. 197.60 lacs		
14. Financial Analysis	IRR – 34% on equity		
	IRR – 19.98% on investment		
	NPV – Nu. 99.88 lacs (12% discount rate)		
	Pay back period – 4 Years		
	Project break-even – 44%		

CHAPTER 2 – JUSTIFICATION OF THE PROJECT

2.1 Project Concept

The project is for carrying out detailed feasibility analysis for setting up a manufacturing unit in Bhutan for the production of pulp molded products based on recycling of paper waste.

2.2 Project Justification

2.2.1 Solution to solid waste management

The project will provide a part solution to management of urban solid waste. Like any other urban areas, the cities of Bhutan are also facing the problem of solid urban waste management. The problem gets more complex in the context of Bhutan in view of the limited availabilities of plain areas required for land-filling. According to City Corporation, Thimphu, paper waste in Bhutan constitutes 17.2% of the total municipal waste. In addition to this, sufficient quantity of paper waste is generated in the form of newspaper waste, packaging cartons, exercise books, etc. There are no significant facilities for recycling of paper and major portion of paper waste is exported to India. A system for collection and sorting of waste paper exists in Bhutan as presently this is being collected and exported to India.

In view of the above, it is all the more desirable that a systematic recycling of waste paper need to be considered. The experience world over demonstrates that a systematic recycling of paper creates job opportunities, reduces the load on the landfill, increases material efficiency and reduces the dependency on imports. This would ensure a better flow of revenues inside Bhutan and serve as a catalyst for economic growth based on available resources. Prof. Gunter Pauli in their report has also suggested for setting up the facilities in Bhutan for recycling of waste paper.

Setting up of production facilities for recycling of paper would help in management of substantial portion of solid urban waste, add value to the paper waste, provides employment to the local population and make available the much needed green products for poultry, horticulture, handicrafts and many other industrial and agricultural product sectors. Keeping in view, the availability of waste paper in Bhutan, the rigid environment considerations and emphasis on green packaging in various sectors, the project has been drawn for the production of pulp molded products from recycled paper.

2.2.2 Manufacturing process – Highly energy intensive

The manufacturing process for molded pulp products is highly energy intensive. The following table depicts the cost structure of molded pulp products in different countries.

Cost structure ranges by region (% of total manufacturing cost)

	UK	Western Europe	USA	China
Variable costs excl. energy	3-10%	5-10%	5-12%	15-20%
Energy	30-40%	30-40%	25-40%	40-55%
Labour	25-35%	25-35%	22-25%	5-7%
Transport	10%	8-13%	10%	5%
Margin (% of net sales)	12-30%	10-15%	10-15%	15-30%

N.B. Estimates by PendlePace
Manufacturing costs excludes sales, administration and general costs

In the production of molded pulp products, **energy is used primarily in drying and molding and it represents the single largest component of the cost of production at 30 to 40%** followed by labour at 25% to 35%. The raw material cost is a relatively modest proportion of production cost at approximately 5-6%, but does represent a potential cost reduction opportunity by sourcing cheaper paper grades. As the cost of energy (electric power) is relatively lower in Bhutan and the continuous supply is assured the project is considered quite suitable for development in Bhutan.

2.2.3 Production of bio-degradable and green packaging material

During the last decade, there has been substantial growth in the production in various sectors of economy in Bhutan especially horticulture, poultry, processed food products, handicrafts, organic food items, etc. Horticulture products viz oranges, apples and handicrafts items are also being exported to neighboring countries. There has been a felt need for suitable packaging material to meet the requirements of these sectors. Keeping in view, the objectives and guidelines set out in various policy documents emphasizing on promoting industrial development without any adverse impact on environment, it is imperative that only the bio-degradable products and products could be used in Bhutan. The project envisages the production of completely recyclable, bio-degradable & green products and products to meet the needs of horticulture, poultry, handicrafts and various other sectors of economy.

As would be seen from the above, the project on pulp molded products would serve the following objectives.

- Help in part management of urban solid waste add value to the waste paper presently being sold in adjoining Indian markets and help in accelerating economic activities in Bhutan.

- Ensure supply of green packaging material to horticulture product sector, poultry industry, handicrafts and many other sector of economy. The package is being completely bio-degradable and reprocess-able shall help in sustainability of resources and environment protection.
- The energy content accounting for 30-40% in the cost of production, the cost of energy is being lower in Bhutan, the pulp molded package manufacturing in Bhutan are likely to be quite competitive both in the local market as well as in the adjoining markets.

CHAPTER 3 – PRODUCT DESCRIPTION AND PRODUCT MIX

3.1 Definition of pulp molded products:

Pulp Molded products have traditionally and predominantly been manufactured from recycled fiber, normally containing high percentages of newsprint. The recycled fiber is pulped in conventional papermaking equipment, cleaned and then diluted prior to passing to the wet end of the mould-forming machine. Selected concentrations of fiber, with additives, are formed on a mould or die that uses a screened surface, which extracts by vacuum, the water from the fiber to form the desired geometric shape. After the shape has been formed, and whilst still containing a very high percentage of water, it passes to the drying stage where the water is removed. This occurs in an oven, hot press or in the mould, and results in the dried shape and surface finish of the molded pulp product.

Molded pulp products can be used in numerous applications, historically served by cardboard, wood, polystyrene foam and other plastic products. Among these are **egg boxes and trays, fruit trays, carry out trays for fast food, flower pots, packaging products for electronic equipment and other electronic and industrial applications.**

3.2 Definitions of pulp molded products according to IMPEPA

IMPEPA (International Molded Pulp Environmental Packaging Association) has segmented the different types of molded pulp products into four categories, in order to assist manufacturers, end-users and others identify which type of molded pulp product is suitable for their requirements and specifications.

The four types of molded pulp products defined by IMPEPA are as follows:

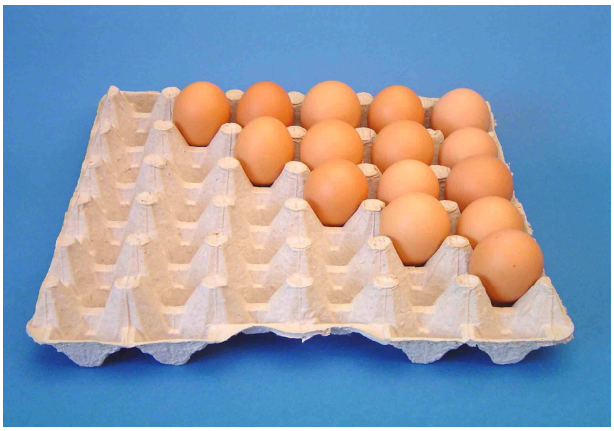
- Thick-wall
- Transfer molded
- Thermoformed products
- Processed products

3.3 Product Range

A large variety of products items in different designs and shades can be manufactured in the project by using the suitable type of mold. The most important items in the context of Bhutan would be egg trays, fruit trays for apple and orange packaging, products for handicraft items. A brief description of some of the pulp molded products including both disposable & consumables are as under:

3.3.1 Egg trays

Egg Trays are often called filler trays and usually have 30 pockets i.e., they hold 30 eggs. Eggs are either sold uncovered in the tray or wrapped with plastic film. The most important outlets for eggs in trays are in the food services industry viz provisional stores, restaurants, hotels, institutions, etc. The eggs trays can be tailor made to customer's specifications by using the specific mould in the manufacturing process.



3.3.2 Apple tray

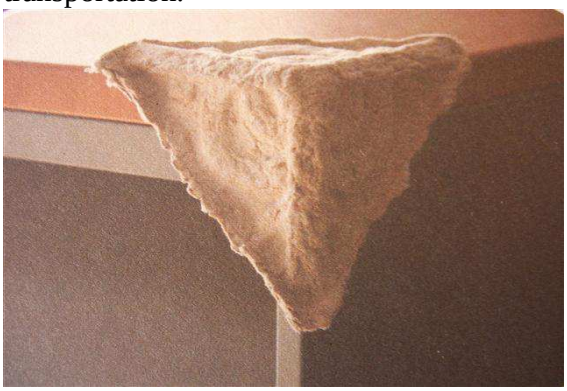
Apple Trays of different varieties have been developed with 20, 25, 30, 35, cavities. Trays with different number and size of cavities suiting to the packaging requirements are manufactured by using standard set of moulds.

3.3.3 Egg Cartons

New flat-top, egg carton in attractive colors and designs has been developed. It is an innovative product. Egg cartons can be produced for packing 6 eggs, 12 eggs, 18 eggs or 24 eggs.

3.3.4 Corner Protectors

Pulp Molded Corner Protectors helps to avoid product damages in handling and transportation.



3.3.5 Food service trays Pulp Moulds & Tools

3.3.6 Bio degradable plant pots

3.3.7 Seed pots

3.3.8 HOSPITAL DISPOSABLE PRODUCTS

Molded Paper Pulp Hospital Disposable Products made of 100% natural fiber have been developed for medical and health care organizations. These products have ease of use, water resistant properties and easy disposal without any adverse effect on environment. Some of the important products include:

- Kidney trays

- Bed pans

- Medical / Surgical disposal trays

3.3.9 Industrial

Pulp molded products for industrial applications. These products are made from recycled paper and can be formed into almost any three-dimensional shape for a variety of different applications like glass bottles, consumer electronics, mobile phones, computers, home appliance and shipping containers.

3.4 Advantages of Pulp Molded Products

- Paper pulp is soft material. Pulp molded products viz trays being an integrated structure have suitable rigidity, good flexibility and stiffness which makes it a suitable package for shockproof performance.
- Pulp molded trays have good air-permeability and hygroscopic ability. This is very important for eggs storage.
- The addition of water proof additives to the pulp imparts the waterproofing characteristics in the pulp molding products.
- Paper trays have antistatic characteristics. This makes them suitable for packaging of electronic spare parts.
- There is no waste water or other waste substance during the production process of paper pulp product.
- Because the pulp molded products are made of waste paper pulp, it can easily decompose in natural condition and will not pollute environment. Furthermore, it also is very easy for recycling the damaged the pulp molded products.

3.5 Standards and Quality Control

3.5.1 Basic performance characteristics of PMP

Pulp Molded package provide cushioning effect to be packaged products. The molded pulp material itself is porous and has different degrees of density and characteristics depending on the raw material and method of manufacture. A molded pulp cushion is not a solid piece of material, but is a shell like structure. Additionally, the raw materials used for PMP manufacture are inconsistent and as such create variations in the finished molded pulp product.

When a packaged product experiences an external physical force such as shock, impact or vibration, the force is transmitted to the molded pulp shape. These forces cause the molded pulp shape to deform, and absorb the mechanical energy. The amount of energy absorbed by the deflection of molded pulp depends on the fibrous raw materials, geometric design and shape. The higher the energy absorbed by the molded pulp cushion, the less energy is transmitted to the packaged product; thereby reducing potential damage to the product.

3.5.2 Product Performance specifications

Traditionally, eggs trays have been the main product of PMP industry and not much attention has been devoted to strict adherence to product and performance specifications. However, with the introduction of industrial packaging products, PMP manufacturing industry appears to be slowly embracing a more scientific approach to the testing of its packaging products.

As the PMP products have to compete both in terms of performance and price with EPS, certain tests need to be propagated throughout the PMP industry; as a means to develop a more sophisticated / technical approach to the sales and marketing of pulp molded products.

The main tests to be highlighted are as follows:

- Drop tests
- Vibration tests
- Crush tests

3.5.3 BIS specifications for pulp molded package

There are no IS standards on pulp molded products. However, Bureau of Indian Standards have specified the following standards for paper and pulp based packaging materials and the test methods given in these specifications could be used for determining the performance parameters of pulp molded packages.

IS 4006: Part 1 (1985) – Methods of test and pulp based packaging materials
IS 4006: Part 2 (1985) - Methods of test for paper and pulp based packaging materials
IS 4006: Part 3 (1985) - Methods for test for paper and pulp based packaging materials
IS 4261 (2001) – Glossary of terms relating to paper and pulp based packaging materials
IS 4664 (1986) – Pulp board
IS 7028: Part 4 (1987) – Performance tests for complete, filled transport packages, vertical impact drop test
IS 15763 (2008) – Packaging – complete, filled transport packages and unit loads – vertical random vibration test

CHAPTER 4 – MARKET ANALYSIS

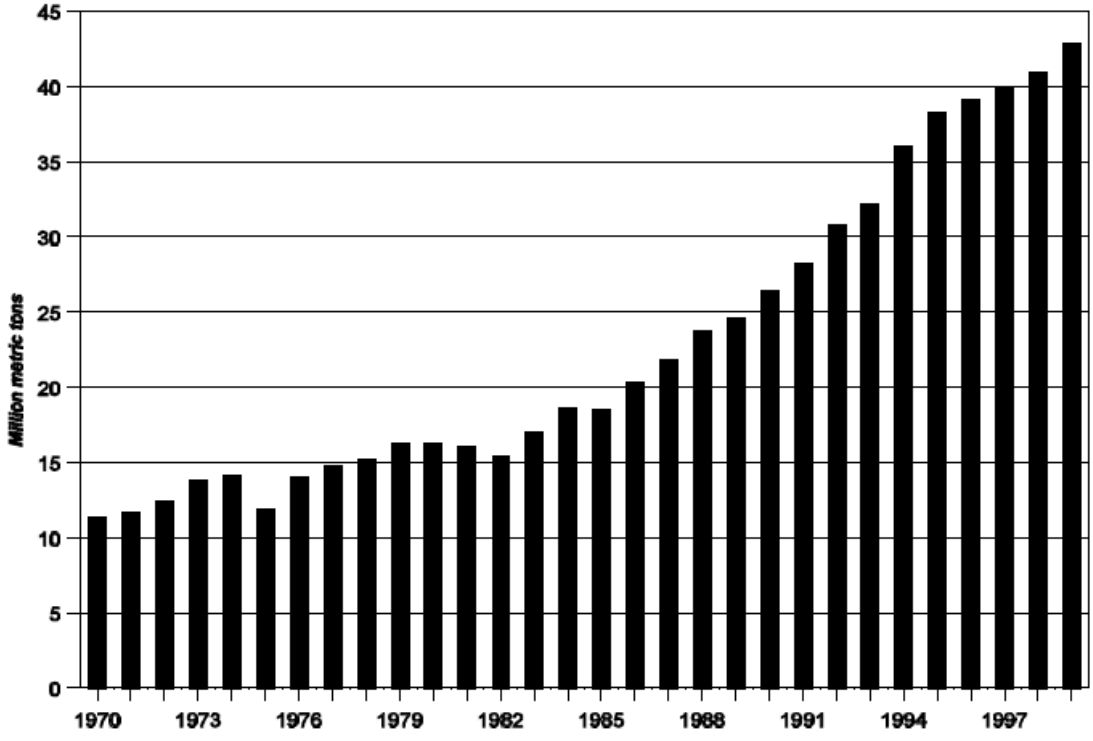
4.1 Structure of Industry and market scenario for pulp molded products in USA

Wood pulp is the fibrous material that results when wood is separated into its constituent fibers by chemical or mechanical means. Waste paper is composed of previously discarded paper or paperboard products. Both contain cellulose fiber that can be subsequently combined with other inputs to manufacture paper, paperboard, or other wood-fiber-based products. In 2000, the U.S. industry produced 57 million metric tons of wood pulp and recovered over 44.9 million metric tons of waste paper.

In 1999, wood pulp supplied 63 percent of the total fiber consumption in U.S. paper and paperboard mills. Waste paper supplied most of the rest. In recent years the usage of waste paper has increased dramatically. For most applications pulp made from waste paper is combined with virgin wood pulp during the manufacture of a final product. However, some products viz paperboard, containerboard, and tissue can be manufactured entirely from recycled pulp, and recent advances in papermaking technology have greatly improved the quality of paper manufactured from 100 percent recycled pulp.

Waste paper is all manner of previously discarded paper or paperboard products and is the largest component of Municipal Solid Waste (MSW) in the United States. In 1998, the United States generated 76 million metric tons of waste paper being 38% weight of all MSW. Amid growing difficulties associated with traditional disposal methods, Environmental Protection Agency (EPA) established a national goal to recycle 25 percent of all solid waste by 1992 and 50 percent by 2008 and Federal, State, and municipal governments enacted various legislation to encourage recycling. During the 1970's recoveries increased by 3.6 percent annually. Since 1980, however, recoveries have increased on average 4.9 percent annually. Figure given below illustrates the increase in U.S. annual recoveries of waste paper, which began in the early 1980's.

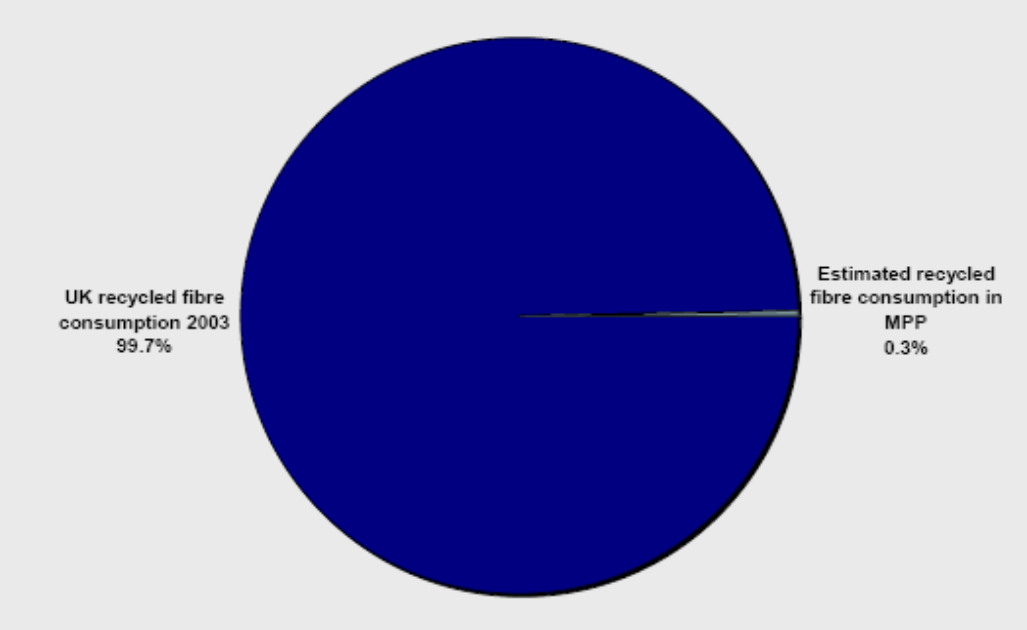
U.S. annual recovery of waste paper, 1970-99



Source: American Forest & Paper Association, *2000 Statistics* , (Oct. 2000), p. 56.

4.2 Industry structure and market scenario in Europe

As mentioned above, the major portion (99 percent) of pulp based on waste paper in USA is consumed by the paper industry and only around 1% is used for production of pulp molded products. Similarly, in the case of UK also, even though the PMP industry is highly dependent on waste paper as its main raw material, its share of the recycled fiber consumption in the UK is very small. The following figure depicts to the percentage consumption of recycled fiber by PMP industry.



Share of recycle fiber consumption in UK

It is estimate that the consumption of PMP in the UK was 54,800 tonnes in the year 2004. The estimates for Europe are based on the assumption of PMP per capita consumption of 0.7 kg and the population in Western Europe in 2004. That gives a consumption level of about 270,000 tonnes. These figures have been verified by calculating the production of PMP in Western Europe, which is estimate to be 310,000 tonnes. This estimate is based on the production numbers (available and estimated) for European plants divided by the estimated number of plants in Western Europe. The average production per plant is then 10,296 tonnes, which gives a total Western European production of 308,870 tonnes on the assumption that the number of PMP plants in Western Europe is 30.

UK sector segmentation and analysis for pulp molded products have been estimated for all key areas of application. The four biggest being

- Egg packaging - 28,000Tpa
- Medical applications - 8,000Tpa
- Industrial uses - 8,600Tpa
- Food/fruit packaging - 4,200Tpa

4.3 Industry structure and market scenario in India

In India, pulp molded products are mainly used for production of egg trays and fruit trays. Historically, the pulp molded egg trays were being produced in India by using conventional pulp molding techniques mainly by small and cottage industry. However,

with the modernization and technological up-gradation in the poultry industry and the expanding dimensions of the distribution system, the egg tray industry has undergone technological transformation. The traditional egg trays manufacturing units have to a very large extent been replaced by pulp molding medium and large units employing rotary pulp molding machines with high production capacity. The output of egg trays varies from 1000 number of trays per hour to 3000 or more number of trays.

The table eggs and broiler meat are the major end products of the poultry sector in India. Presently production of eggs is estimated to number over 50 billion. Based on these figures, it is estimated that the requirement of egg trays with 30 pockets is around 1.6 billion numbers accounting for around 40,000-50,000 metric tonnes consumption of pulp based on recycled paper in the form of egg trays considering two to three life cycles of an egg tray.

Besides egg trays, fruit trays happen to be another important product of pulp molding industry. With a view to ensure safe packaging and retention of natural freshness of fruits, the use of fruit trays in packaging of horticultural product is growing at a very fast pace in India. A number of pulp molding units have been setup in Northern India viz Punjab and Himachal Pradesh for the manufacture of fruit trays particularly for packaging of apples. These units are mostly based on rotary pulp molding machine. The current production level of apples in India being around 2 million metric tonnes, this application of pulp molded package offers a vast potential for future development.

4.4 Per capita consumption of pulp molded products

Surveys and reports have attempted to estimate the PMP per capital consumption in the UK, selected Western European countries and North America based on the apparent consumption for each country and the population in 2004. As the consumption statistics in Western Europe vary considerably in reliability, the PMP consumption per capita levels should be seen as indicative only. These may vary for several reasons like different consumption patterns of materials viz the share for PMP in egg packaging is higher in Northern Europe as compared to Southern Europe where EPS and plastic egg packaging has a higher share. Further, a varying pattern of production is emerging in European countries viz the production of consumer goods is decreasing in Northern Europe, but increasing in Southern Europe. The following table depicts the estimated per capita consumption of PMP in various European countries and North America.

Region/country	Estimated MPP consumption[1] (tonnes)	Population (millions)[2]	MPP (kg per capita)
United Kingdom	54,800	60.3	0.91
France	54,561	60.4	0.90
Finland (2003)	3,772	5.2	0.72
Sweden (2002)	4,920	9.0	0.55
Belgium (2003)	3,933	10.3	0.38
Austria (2003)	4,190	8.2	0.51
Italy (2002)	41,683	58.1	0.72
Spain (2002)	35,259	40.3	0.88
North America	450,000	325.5	1.38

[1] *Source: Statistics Sweden and estimates by PendlePace*
[2] *Source: CIA*

Estimated consumption per capita in selected Western European countries and North America

As would be seen from the table above, the UK has one of the higher MPP per capita consumption levels in Western Europe with an estimate of 0.91 kg. The Western European levels vary between 0.38 kg and 0.91 kg, and the average is about 0.7 kg. North America has a per capita consumption of 1.38 kg which is much higher than the European countries.

4.5 Competitive Strength of pulp molded products

The main competitive alternative materials to pulp molded products are expanded polystyrene (EPS), plastic and corrugated die-cut inners. In terms of price, time-to-market, aesthetics and physical strength characteristics, EPS has a slight edge over other materials, although its poor environmental credentials make it vulnerable on bio-degradability and sustainability considerations. This provides replacement and alternative opportunities to pulp molded products.

The project mainly aims at the production of egg trays, fruit trays and packaging for handicraft items in Bhutan. As there is no production of EPS in Bhutan, the Pulp molded products would find easy acceptance in the market.

4.6 Market scenario for pulp molded products in Bhutan

The project for setting up a pulp molded products mainly packaging items in Bhutan has been conceived mainly on the following considerations:

- Value addition to paper waste available in Bhutan in the form of Municipal solid waste and used newspaper, paperboard cartons and other paper products
- Supply of green and bio-degradable packaging material for packaging of eggs, packaging of fruits, packaging of handicraft and other products
- Initiation of economic activity in generation of employment based on utilization of waste material, protection of environment and production of environment friendly products

4.6.1 Demand for green packaging material in Bhutan

The project primarily aims to cater to the packaging needs of poultry industry and horticulture produce. By employing suitable moulds, the package for handicrafts, liquor and processed food products could also be developed. Pulp molded products find extensive applications in the packaging of eggs. In Bhutan, the poultry farming has been traditionally a household operation and not much statistics are available about the current level of production. However, the poultry industry in Bhutan is now in the process of development and poultry farming is being adopted on modern commercial lines. Therefore, substantial quantity of pulp molded egg trays would be needed in Bhutan mainly in the urban areas. Besides, as the cost of raw material viz paper waste and power which together constitute about 40-45% of the cost of production of PMP, being relatively lower in Bhutan, the egg trays produced in Bhutan could be quite competitive in the adjoining markets of India and Bangladesh.

During last few years, the use of pulp molded fruit trays is growing at a very fast pace in India for packaging of fruits mainly apple and oranges. An identified market exists in Bhutan for pulp molded fruit trays for packaging of fruits for the local and export markets. The pulp molded fruit trays being completely bio-degradable shall add value to the exports of fruits from Bhutan. The following table depicts the export of mandarin and apples from Bhutan to India and Bangladesh during 2001-09.

4.6.2 Export of Mandarin from Bhutan (2001-09)

S.NO	YEAR	BANGLADESH IN MT	Amount in US$	INDIA in MT	Amount in US$	TOTAL	Total amount in US$
1	2001	14544.38	1672603.7	320.052	59209.62	14864.432	1731813.32
2	2002	10960.11	1260412.65	3237.46	598929.36	14197.57	1859342.01
3	2003	18359.43	4755092.37	1375.16	356165.66	19734.59	5111258.03
4	2004	15968.87	4135937.33	2608.79	675677.65	18577.66	4811614.98
5	2005	20613.26	5338834.34	2670.42	691639.56	23283.68	6030473.9
6	2006	13142.75	3403972.25	5442.08	1409498.72	18584.83	4813470.97
7	2007	20426.87	5290559.33	3518.24	911222.87	23945.11	6201782.2
8	2008	23198.08	6866630.5	4296.47	1271755.42	27494.55	8138385.91
9	2009	20422.05	6044926.8	2200.25	651274	22622.3	6696200.8

Source : Import-Export statistics Govt. of Bhutan

4.6.3 Export of Apples from Bhutan (2001-10)

S.NO	YEAR	BANGLADESH IN MT	Amount in US$	INDIA in MT	Amount in US$	TOTAL	Total amount in US$
1	2001	1323.97	463,388.80	1,617.59	566,157.90	2,941.56	1,029,546.70
2	2002	807.2	282,518.60	1,778.38	622,433.00	2,585.58	904951.6
3	2003	1865.43	746,170.40	1,950.15	780,058.80	3,815.57	1,526,229.20
4	2004	1930.72	772,287.20	508.64	203,457.60	2,439.36	975,744.80
5	2005	3677.4	1,654,829.55	1,066.07	479,729.25	4,743.46	2,134,558.80
6	2006	1646.62	740,979.45	2,192.11	986,449.50	3,838.73	1,727,428.95
7	2007	842.65	379,190.70	2,255.05	1,014,774.30	3,097.70	1,393,965.00
8	2008	1216.15	608,076.50	2,669.25	1,334,624.00	3,885.40	1,942,700.50
9	2009	1422.16	782,188.00	1,039.58	571,769.00	2,461.74	1,353,957.00
10	2010	2657.4	1,594,440.00				

Source : Import-Export statistics Govt. of Bhutan

4.7 Demand supply gap

In Bhutan, there is no commercial production of egg trays, fruit trays or any other pulp molded package. The entire local demand is presently being met through imports from neighboring Indian markets. The project aims at meeting the local market demand of packaging material mainly egg tray & fruit trays and also aims at export of these packaging products to neighboring Indian markets. There is substantial export of fruits viz Mandarin and Apple to India and Bangladesh and use of fruit trays in packaging will further add value to Bhutanese exports. The alternative competing material for packaging of eggs and fruits is EPS. However, there is no production of EPS or EPS based packaging material in Bhutan and the entire demand is likely to be met by PMP only. Moreover, the use of EPS and other plastic packaging materials may not be permitted in Bhutan on account of environmental considerations.

4.8 Competitive strength of PMP produced in Bhutan

Energy constitutes 30-40% of the cost of production in the manufacturing of pulp molded packages and the raw material account for another 5-6% of the costs. It can be safely assumed that both energy and raw material together on an average would account for over 40% contribution in the cost of production. As compared to India and other neighboring markets, the input cost of power in Bhutan is less than 50%. Further, at present, there is no commercial utilization of paper waste in Bhutan. Based on the rates of current sales of paper waste in Indian markets, the price of waste paper in Bhutan is also expected to be much less than 50% as compared to India. Accordingly, it can be safely assumed that the cost of production of paper molded products in Bhutan would be lower by a minimum factor of 20-25% as compared to India. Therefore, the pulp molded packaging products viz egg trays and fruit trays manufactured in the project would be quite competitive viz a viz products imported from neighboring markets in India. Based on the financial analysis in the detailed feasibility report for Bhutan, the selling price of egg tray and apple tray works out to be Nu. 2.5/- and Nu.5.5/- respectively. In Indian market, these prices are in the range of Nu.3/- and Nu.7/- respectively.

Accordingly, it can be safely assumed that the pulp molded products from Bhutan project would be highly competitive in Indian market also.

4.9 Exports prospects

The pulp molded products viz egg trays and fruit trays are used for packaging of eggs and fruits. The main consumers include the poultry industry and the orchards and fruits traders. Besides, local market in Bhutan, there exists a huge market for these products in adjoining Indian and other markets. As stated earlier, the cost of production of pulp molded products in Bhutan is likely to be lower as compared to Indian conditions. This would provide an excellent opportunity for the Bhutanese project to succeed in Indian market for pulp molded packages. This margin is considered sufficient to offset the additional cost (5-7%) of transport of PMP products from Bhutan to Indian markets. It can therefore be concluded that the export of pulp molded products from Bhutan would be quite competitive in adjoining Indian and other markets.

4.10 Future market projections

The global emphasis on increased awareness of sustainability and resource efficiency will only result in increase in the demand for pulp molded packages in future. Therefore, the inherent environmental strength of pulp molded products should provide a significant advantage, particularly over plastic packaging in this part of the world. In case of Bhutan, prima facie, there are no indigenously produced competing materials viz plastics for meeting the packaging needs. Moreover, the pulp molded package fulfills the objectives laid out for environmental protection and sustainability and therefore, the production unit(s) should not face any problem in marketing of their produce to various sectors of economy in Bhutan and also cater to the demand of green packaging materials in the overseas markets.

4.11 Target market and marketing strategy

Orchard owners, fruit traders, fruit exporters, poultry farms in Bhutan and adjoining markets of India viz. Assam and North Bengal would be the main consumers for fruit trays and egg trays. The areas having concentration of orchards and main cities having poultries would constitute the target markets. As this is a new product, initially, the project management has to approach the consumers directly and convince them about the utility and benefits of using these trays especially in case of apple packaging for exports. At a later stage, dealers / suppliers could be appointed to meet the demand in a specific area. Apple trays are being widely used in India for packaging of apples and orchards in Bhutan could further add the value to their domestic supplies and exports by adopting the apple tray packaging. At present, there being no other manufacturer in Bhutan and the expected growth in demand level, prima facie, the unit should not face any problem in marketing of their products. The unit needs to adopt the following strategy for better access to the market.

- Direct sales to orchards, fruit traders and poultry farms
- Annual contract with orchards and poultry farms
- Sales of trays through dealers / suppliers
- Export to neighboring Indian markets

CHAPTER 5 – RESOURCES

5.1 Main resources

The main resources for the production of pulp molded products include the following:

- Land and building
- Plant and machinery
- Raw material viz paper waste
- Power
- Water
- Skilled and non-skilled workers

5.2 Land and building

It has been envisaged in the project that the land for setting up manufacturing unit would be available from Government of Bhutan on lease basis. The building and the shed for housing the machinery and equipment and the offices has to be constructed as per requirement. The manufacturing section shall be shed construction. The godowns, offices shall be accommodated in constructed building. The total land requirement for setting up of the project would be 6000 sq. meters. The requirement of total built up area and other constructions would be as under:

• Total land requirement	-	6000 sq. meter.
• Constructed area for godowns, offices and Testing laboratory	-	200 sq. meter.
• Two Industrial sheds of 500 sq. mt each for Installations of machines	-	1000 sq. meter.

5.3 Plant & Machinery requirements

The details of plant and machinery have been given in subsequent chapters.

5.4 Raw materials and consumables

The main raw material required for the production of pulp molded product is paper waste which would broadly include the following:

- Waste paper collected as municipal solid waste
- Waste newspaper
- Used corrugated board and other paper board cartons
- Waste from used stationary products viz exercise books, registers, etc

Small quantities of other raw materials viz rosin, wax, alum, etc and other specialty chemicals are required to impart a specific and properties to pulp molded products.

5.4.1 Availability of raw materials

There has a remarkable increase in print media in Bhutan, expanding from one newspaper to six in the span of a few years only. The print media uses quality paper much better than the standard newsprint. Besides, a lot of paper waste is generated from paper bags, books, exercise books and other paper stationery items. The use of plastic bags has been prohibited in Bhutan leading to extensive use of paper bags which would further increase the availability of waste paper. Based on the latest available trade statistics, the current level of import of newsprint and various other types of paper in Bhutan is around 5000 metric tonnes per annum.

- → Total imports from India under Section 10 Chapter 48 & 49 relating to paper – 4849 MT
- → Total imports from countries other than India – 900 MT approx

Accordingly, it is estimated that the availability of waste paper for the paper recycling project would be around 5000 MT per annum. These estimates are based on the following statistics of import and export for Bhutan for the year 2009 (Bhutan Trade Statistics, Department of Revenue and Custom, Ministry of Finance, 2009). These figures relate to the year 2009 and it is expected that the current figures would be still higher. With the restriction on use of polythene bags leading to use of paper bags, this quantity of import is likely to further expand. The fast pace of urbanization will further boost the requirement of all types of paper leading to emergence of still high quantum of paper waste.

In addition to above, there would be substantial quantity of paper packaging material viz cartons, boxes and other packages coming to Bhutan with other commodities imported from India and other countries. It may further be mentioned that as per trade statistics, there is an export of over 5112 tonnes of unsorted paper waste and scrap to India in the year 2009. Accordingly, it is estimated that at a minimum of 5000 tonnes of waste would be annually available and it could sustain a recycling plant of 15 metric tonnes per day. The addresses of the manufacturers / suppliers of other raw materials viz rosin, wax and alum have been given in the annexure.

5.4.2 Recommended sources of raw materials

It has been observed that there exists system in Bhutan for collection of paper waste, majority of which is transported and sold in adjoining Indian market for further processing. The existing waste collection system could be used by the unit for procuring the paper waste raw material through scrap traders.

5.4.3 Annual requirement of raw material

Waste paper would be the main raw material required for the project. Rosin, alum and wax, etc would also be required in small quantities. The annual requirement of raw materials would be as under:

- Waste paper – 600 MT per annum
- Rosin, wax and alum, etc – 0.60 MT per annum

5.5 Comparative analysis of sources and prices of critical inputs & consumables

Presently, there is no commercial utilization of paper waste in Bhutan and almost entire quantity is collected and sold in the adjoining Indian markets. As compared to India, the prices of waste paper in Bhutan are relatively lower and this would be an added advantage to the project. At a later stage, part of the requirement of the waste paper could also be procured from adjoining Indian markets. The current collection price of the waste paper viz newspaper waste is around Nu. 3000/- per metric tonne. However, taking into consideration, the collection & transport charges, the margins of the waste dealer's and the estimated escalation in the prices over a year, the raw material prices have been taken as Nu. 5000/- per metric tone. In India, the current price level for waste paper is Rs. 12,000/- per metric tonne.

5.6 Energy and Fuel Requirement

Production of pulp molded product is basically an energy intensive project. Energy is required for pulp preparation, molding operations and drying of the finished product. For pulp preparation unit and molding units, electric power is used. Normally, the driers are heated by alternative sources of energy viz diesel or gas. In case of this project, dryer unit has also been based on electrical heating. The details of power requirement viz connected load are as under:

• Power requirement for production machines		- 200 KWH
• Power requirement for dryer unit		- 525 KWH
• Power requirement for general purpose with lighting of stores Offices and production unit		- 25 KWH
Total	-	**750 KWH**

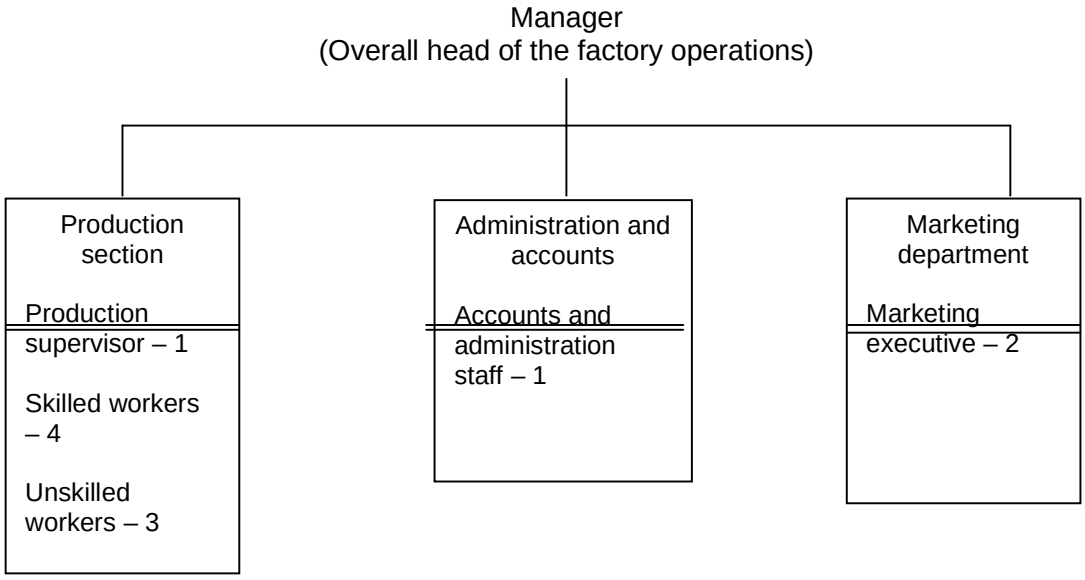
5.7 Manpower requirement

Persons having sufficient experience in the production of pulp molded products have to be employed as supervisors so as to ensure the production of quality goods. The machine operators would be trained by the machine manufacturers at the site of the

factory during installation and commissioning of the production machines. The details of manpower requirement would be as under:

- Manager - 1
- Plant supervisor - 1
- Marketing / sales / office staff - 3
- Machine operators - 4
- Unskilled workers - 3

5.7.1 Organization chart



The project has a good employment potential for skilled and unskilled workers, which would be employed in the production unit. Beside the project would generate employment potential in marketing & sales of its produce, transport of raw materials and finished products. The project would thus create opportunities both for direct & indirect employment.

CHAPTER 6 – THE PLANT AND SELECTION OF TECHNOLOGY

6.1 Pulp molded product – Manufacturing technology

With the increasing use and varieties of designs in pulp molded products, production equipment and techniques have also progressively evolved. New techniques for producing smooth surfaces, precise shapes and dimensions have been developed by the introduction of the in-mould thermoforming process.

Traditionally, the process for the manufacture of molded pulp products consists of the following sequential stages:

- Pulping – Stock preparation
- Molding – wet end
- Drying
- Finishing and packaging

6.2 Selection of technology

6.2.1 Factors influencing the choice of technology

A number of factors need to be taken into considerations while deciding the choice of favour of a process technology. These factors mainly include

- Factors inputs
- Market findings viz. size of market and recurrence of repeat demand
- Purchasing power of consumers and prevailing price spectrum
- Future projections of market demand
- Availability of skilled manpower and support facilities
- Availability of infrastructure and transport facilities
- Environmental considerations

6.2.2 Comparison of forming process techniques

A number of forming process techniques and machine based on these technologies are used for the production of pulp molded products. The following illustrates the advantages and disadvantages of various process technologies in vogue.

Forming process	Advantages	Disadvantages
Vertical reciprocating	Suitable for most types of MPP Different types of moulds can be used at the same time Flexible process and low cost of moulds Can produce high wall products	The dimension of the forming platform restricts the number of the mould Mould base is needed when the height of different product is not the same
Swing movement	Output rates are higher than the vertical forming as a twin-headed forming process is used	Height of the products is limited
Rotary forming	Ideal for commodity production for specific products High production efficiency Automatic operation	Height of the products is limited High initial mould cost
Combined moulds	Designed for bottle shape type products with narrow neck opening	Limited product range High mould cost High maintenance cost
Compression forming	Precise shape and dimension Smooth surface product Superior nesting properties Automatic operation	High mould cost

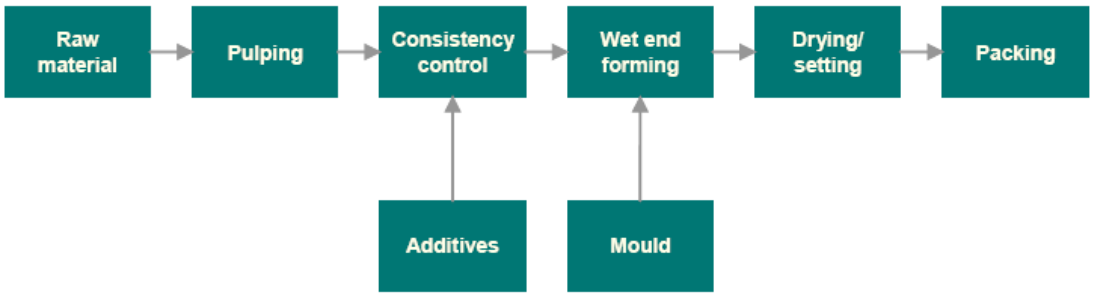
Rotary forming is the most common European production method – seven out of ten, as it is much faster than in-mould drying. Egg packaging trays are always made with rotary forming machines, while industrial packaging is normally made by reciprocating machines. The main reason for use of rotary machines for production of egg trays is the minimum order size, which is usually in excess of 100,000 units.

6.3 Technology recommended

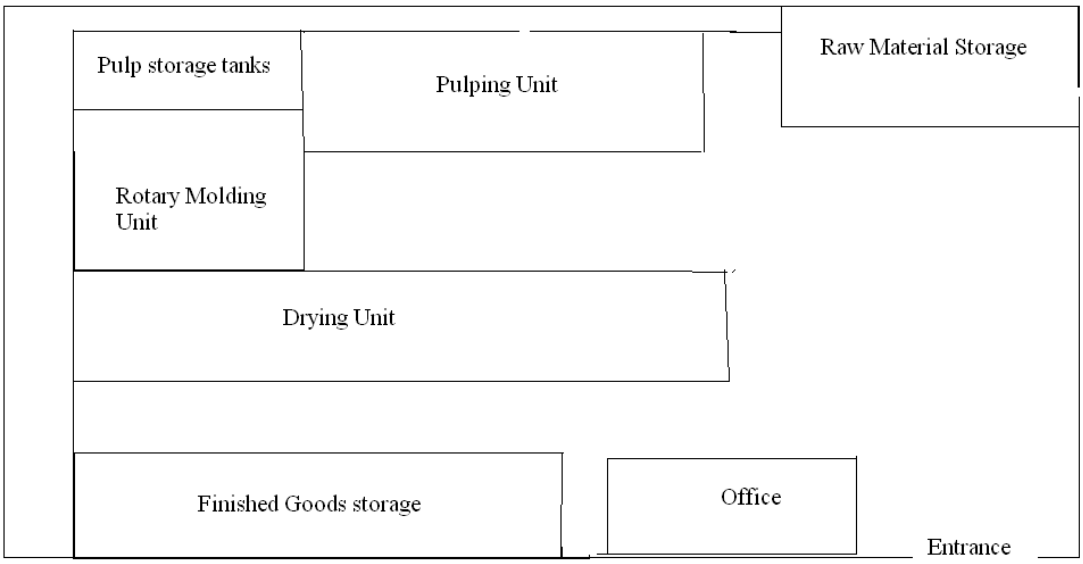
As mentioned above, the rotary molding machines are used for the production of specific products required in high volumes. As the egg trays, fruit trays and disposable service trays account for a major share of PMP production, the rotary molding machines are extensively used world over for production of these items. As the product mix for the proposed project in Bhutan mainly comprises of egg trays and fruit trays, rotary molding machines have been selected.

6.3.1 Schematic diagram of the pulp molding process

The schematic diagram based on wet end forming by using rotary molding machine is as given under:



6.3.2 Plant Layout



6.4 Technical know-how

The production of pulp molded products basically involves preparation of pulp stock molding of pulp products followed by drying of molded products. The process steps are relatively simple and the molding operation is carried out by the automatic machines. The technical assistance for production of good quality items could be made available by the machine manufacturers. Alternatively, the project could be setup on turnkey basis by a machine / product manufacturing unit in India. In the early phases of the project, experienced production supervisor and operators need to be employed by the project. The detailed consultancy for implementing the project could be provided by the machine manufacturers also. **The Machine manufacturers also undertake turnkey projects**.

6.5 Production capacity

A wide range of pulp molded product could be manufactured in the project by employing suitable moulds in rotary molding machine. Keeping in view the market conditions, the project at this stage envisages the production of apple trays and fruit trays. Based on single shift operation, the unit has installed capacity for production of 14,400 apple trays or 28,800 egg trays. Based on 90% efficiency, the production capacity would be 13,000 apple trays and 26,000 egg trays per shift of 8 hours. For the purpose of financial analysis, a product mix of apple trays and egg trays has been taken into consideration on the basis of single shift working for 300 days in a year. Two hundred days production has been taken for the manufacturer of apple trays and 100 days production has been considered for the manufacturer of egg trays. Accordingly, the annual production capacity on single shift operation would be as under:

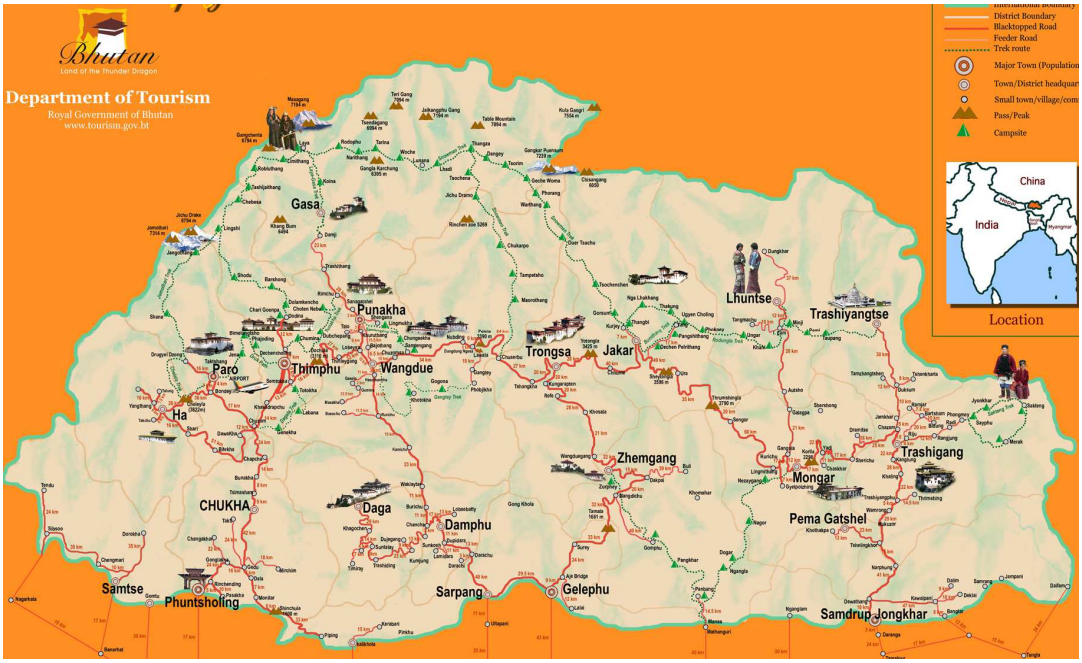
Apple-Trays	-	26, 00,000 nos
Egg Trays	-	26, 00,000 nos

Considering 300 working days and 200 days allotted to the production of apple trays and 100 days for the production of egg trays, the production capacity.

CHAPTER 7 – PLANT LOCATION AND INFRASTRUCTURE

7.1 Potential Locations

Location of the proposed unit should preferably in the vicinity of the major cities of Bhutan viz. Thimphu, Phuentsholing, Punakha, Gelephu, Samdrup and Paro which happen to be the main source of availability of waste paper, the major raw material for the project. Another main inputs required would be power and water which would also be easily available at the sites. The vicinity of the project to major cities shall help in cutting down the cost of transport of waste paper from the supply sources to project site. The market for the egg trays would be dispersed all over the country, however, the major centers of consumption would be the poultry farms which are invariably located in the vicinity of cities. As regards the fruit trays, the market would be mainly at the sites of orchards viz west and east central regions of Bhutan comprising of Trashiyangtse, Mongar, Lhatse, Pemagatshel and Samdrup. Besides, there could be substantial exports to adjoining areas of India since the cost of production of egg trays and fruit trays in Bhutan is likely to be highly competitive in Indian market due to lower input cost in terms of power and raw material.



7.2 Selection of suitable locations

In order to select the suitable location for the manufacturing plant, various parameters viz availability of land, vicinity to raw material sources, vicinity to markets, investments considerations, operational logistics, future development possibility, socio-economic factors including availability of services like transport and communication facilities etc. have been taken into consideration for ranking the locations. The table below shows the ranking of locations:

Ranking of possible locations based on various parameters

		Weightage of location related parameters						
S. No.	Locations	Land Access conditions	Vicinity to raw material sources	Vicinity to markets	Investment considerations	Operational logistics	Future development possibilities	Overall Rating
1	Thimphu	7	8	7	9	8	7	**46**
2	Phuentsholing	6	8	7	8	7	7	**43**
3	Gelephu	7	7	6	7	7	7	41
4	Paro	7	7	6	7	7	7	41
5	Samdrup	7	7	6	7	7	7	41
6	Punakha	7	7	6	7	7	7	41

It is therefore proposed that the unit be located near Thimphu. The requisite infrastructure viz land, power, road transport and communication facilities required for the proposed unit are available in and around Thimphu. The project has been conceptualized in totality and all the manufacturing operations are proposed to be carried out in the unit itself. The project has an inbuilt provision for spare parts, components & tools and the cost for the same has been incorporated. There may be some requirement of minor mechanical or electrical repairs which could be taken care of by the skilled workers of the unit. Alternatively, the assistance could be taken of from the existing mechanical and electrical repair workshops.

It is therefore proposed that the unit be established in Bjemina Industrial Estate near Thimphu. The proposed project at Thimphu could utilize waste paper from Thimphu as well as Paro and help in commercial utilization of a part of urban solid waste. The requirement of raw material viz waste paper for the proposed unit would be around 1.5 metric tonnes per day on single shift operation basics. In case, the waste paper collection system is able to procure more waste paper, the unit could be operated on two / three shift basis. The surplus production, if any, left from the local market could be exported to border areas of India. Initially, it is proposed that the project may concentrate on production of egg trays & fruit trays and the demand at different locations including fruit trays could be met by Thimphu project. At a later stage, depending on the assessment of market demand and availability of raw materials at economical rates, fruit trays units could be setup at near to the site of orchards.

CHAPTER 8 – ENVIRONMENTAL IMPACT

8.1 Environmental aspect of manufacturing process

Manufacture of pulp molded products basically involves two stage production process, the first being preparation of pulp from waste paper and the second being the molding of pulp products and their drying. Besides waste paper, a small quantity of rosin, wax and alum is used as raw materials. The entire quantity of pulp including small fiber pulp is retained for molding and no fibrous materials are left in the water. Majority of the water used in the process is recycled. Very small quantity of solid contamination like plastic film or fiber mixed with the paper waste could be recovered during pulping process. However, the quantity would be very small. Some water would be left for discharge to the drain; however, this would not have any contaminants and no water treatment facilities would be needed. As such practically, there are no solid, liquid or gaseous effluents during the production process of pulp molded products.

In fact, as stated earlier also, the project would be extremely beneficial for economic disposal of solid urban waste (waste paper). The project would add value to the urban solid waste and other waste paper, generate employment, and help in production of green packaging material and initiate economic activities.

8.2 Waste generated and mitigation measures

In the manufacturing process of pulp molded products, no solid, liquid or gaseous wastes are generated. However, as mentioned above, during preparation of pulp, a small quantity of fibrous and plastic material may be recovered. However, the quantity of waste generated would be very small as compared to the waste paper used in the process. Further, the plastic and fibrous waste would be recovered from the waste paper received as solid urban waste as the newspaper waste would not help any such contamination. The quantity of waste generated may be only 0.1-0.2% of the raw materials used or even less and as such can be easily disposed off.

8.2.1 Waste generated during construction phase

Besides, there would be some waste of metal scrap, wooden scrap, broken bricks, stone aggregates, etc during construction phase of the project. The waste generated during construction phase is mainly used for earth filling & flooring. The details of the waste generated during construction phase and project operation phase along with mitigation measures are given below in subsequent paras.

The details of the waste generated during construction phase and the mitigation measures are as under: -

S. No.	Type of waste / scrap	Quantity	Mitigation measures	Impact on Environment
1.	Metal scrap	Around 2-3 % of the steel used in construction	Sold to trade channels for reprocessing.	No adverse impact
2.	Wooden scrap	Around 5-7% of the wood used in construction.	Used as fuel.	No adverse impact
3.	Clay stones, mounds	Depending upon on the topography of the construction site.	Used for earth filling.	No adverse impact.
4.	Brick stone cement aggregate	5% of the quantity used	Used for flooring and earth filling.	No adverse impact

8.2.2 Waste generated during project operation phase

The details of the waste generated and the mitigation measures are as under:

S. No.	Type of waste	Quantity	Mitigation measures	Impact on environment
1.	Liquid effluents	Nil	Not applicable	No adverse impact
2.	Gaseous effluents	Nil	Not applicable	No adverse impact
3.	Solid effluents or waste * Some solid waste would be generated in the form of plastics & fibrous materials which are attached to the waste paper used as raw material.	Very small quantity, 5-7 kgs per day maximum	Quantity being very small, this can be disposed off along with urban solid waste for earth filling.	No adverse impact

CHAPTER 9

IMPLEMENTATION SCHEDULE

9.1 Implementation schedule for Manufacture of pulp molded products

The project implementation schedule has been prepared keeping in mind.

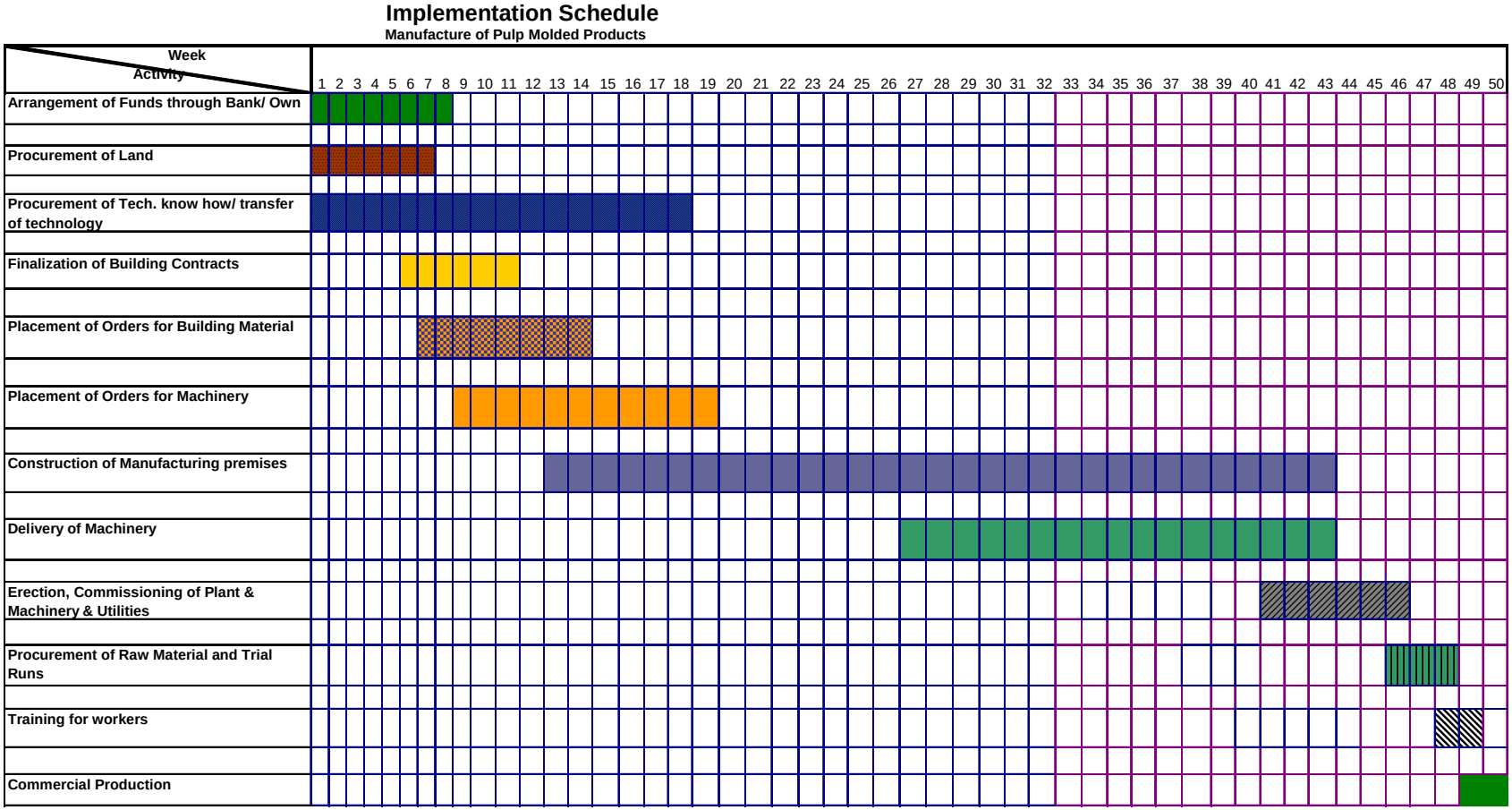
a) Optimal utilization of time and resources
b) Scheduling of activities in parallel to reduce the time required from inception to production
c) Skill transfer for staff involved in production and maintenance.

The implementation schedule has been divided into weeks. The following would be the sequence and duration of different activities at the initiation of the project.

1. **Arrangement of funds** for the project. A time period of 8 weeks has been earmarked for the same.
2. Along with arrangement of funds, **procurement of land** needs to be initiated for the project. A period of 7 weeks has been allocated for this activity.
3. Discussions for **Procurement of Technology and know how/transfer of technology** have to be started along with the initiation of the project. A total of 18 weeks have been earmarked for this.
4. After arrangement of funds and procurement of land and **contracts for building construction** need to be placed. Depending on the arrangement of funds this activity can commence as soon as arrangement of funds is completed and a period of 5 weeks has been earmarked for the same.
5. After finalization of contract for building construction the **order for building material** have to be placed. A total of 7 weeks has been allocated to the same.
6. It is planned that by this time the discussions with the technology vendor would be complete and the **orders for placement of machinery** would commence by the 9^{th} week and be completed by the 19^{th} week depending on the progress of construction.
7. It is expected that the **construction of manufacturing premises** will take approximately 30 weeks.
8. Regular review of the construction premises will help plan **delivery of machines** which can start by the 27^{th} week and end by the time the construction is completed.
9. The **erection, commissioning of plant maintenance and utilities** can commence by the 41^{st} week keeping in mind the progress of construction and finishing of the premises. Some of the erection work may need to be initiated as they may require bottling, grouting to the shop-floor.
10. The **procurement of raw material** should be initiated while the commissioning is about to be completed and **trial runs** started. For this project this is expected to be in the 46^{th} week from the commencement of project.

11. The **staff training** will commence along with the trial runs.
12. It is envisaged that the **commercial production** should start in the 49th week after initiation of the project.

Implementation Schedule – Graphic view



CHAPTER 10 – COST PRESENTATION

10.1 Capital costs

10.1.1 Cost of Land and building

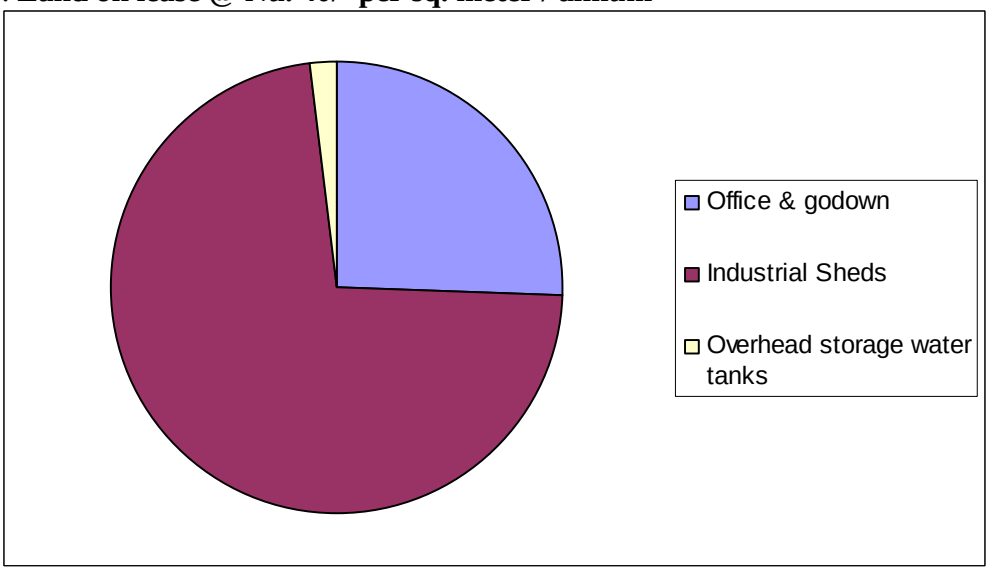
A). **Plot and built up area**

- Total land requirement	-6000 sq. meter
- Constructed area for godown, offices and Testinglaboratory	- 200 sq. meter
- Two Industrial sheds of 500 sq. meter each for installations of machines	-1000 sq. meter
- Overhead water tank, 10 kilo-liter capacity	-2 nos

B). **Cost of construction**

- Office and godown (200 X 7000)	-	Nu. 14, 00,000/-
- Industrial sheds (500 X 4000 X 2)	-	Nu. 40, 00,000/-
- Overhead storage water tanks	-	Nu. 1, 00,000/-
Sub-total	-	**Nu. 55, 00,000/-**

C). **Land on lease @ Nu. 40/- per sq. meter / annum**



10.1.2 Cost of Machines and Equipments

S. No.	Particulars of Machine	Nos	Amount (Nu)
	A. PULP PREPARATION SYSTEM		
1	**Hydro-pulper** – Heavy duty Mild Steel construction, rust preventive coating, stainless steel cutter impeller fitted with motor.	1	
2	**Agitator**	1	
3	**Vibrator Screen**	1	
4	**Vacuum pump with motor, water separator tank & water pump –** Fitted with suitable AC motor.	1	
5	**Pulp lifting pump**	2	
6	**Valves and piping**	1	
	FORMING SECTION		
7	**Molding machine –** Rotary molding machine complete with pulp tank and AC Motor, PLC controlled, user-friendly control panel	1	
8	**One standard size multi-cavity apple tray mould set consisting of 12 forming moulds and 3 transfer moulds**	1	
9	**Automatic mould cleaning arrangement**	1	
10	**Automatic product washing arrangement**	1	
	DRYING SECTION		
11	**On-line drier electrical heated** –with control panel and fully insulated walls	1	
12	**Finished product delivery conveyor**	1	
	Sub-Total		**1,06,00,000/-**

Miscellaneous service equipments

S. No	Particulars	Nos.	Amount
2.	**Platform scale (weighing balance)** – 1000 kgs & 50 kgs	2	1,00,000/-
3.	**Water lifting pump** – 3 KW, 50mm Outlet water pump	1	25,000/-
4.	**Pulp storage tank, SS construction** – 5 kilo liters	3	4,00,000/-
5.	**Water storage tank –** 5 kilo liters	1	1,50,000/-
6.	**Air compressor –** 20 HP capacity, 76.9 CFM @ 10 bar pressure	1	5,00,000/-
	Sub-Total		11,75,000/-
	Total cost of machinery		**1,17,75,000/-**

10.1.4 Miscellaneous Fixed Assets - Nu. 3 lacs

10.1.5 Pre-operative expenses - Nu. 5 lacs

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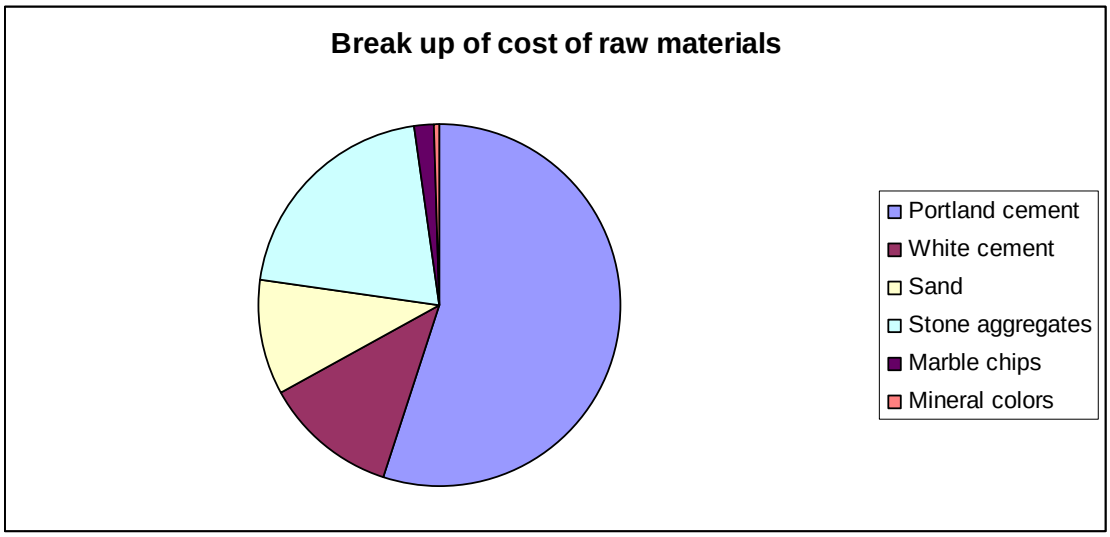
10.2 OPERATING COSTS:

10.2.1 Cost of Raw Materials

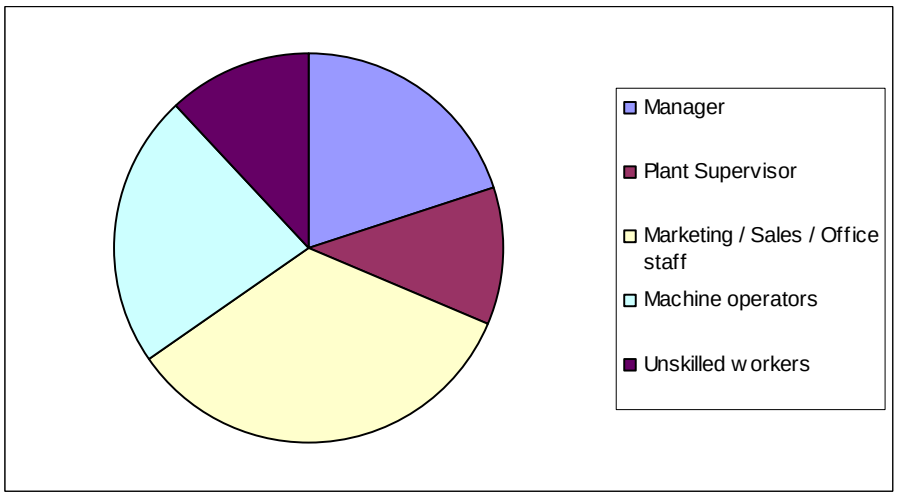
Raw material (PM)	Quantity	Price per unit	Total amount (Nu.) PM
Waste paper	50 MT	Nu. 5000/-	2,50,000/-
Additives i.e. rosin, alum & wax etc.	0.5 MT total quantity	LS cost	50,000/-
	Sub-total		**3,00,000/-**
	Wastage allowance 5%		15,000/-
	Total (PM)		**3,15,000/-**

Total annual cost of raw material per annum -Nu. 37, 80,000/-



10.2.2 Salary and wages

Manager	1	35,000	35,000/-
Plant supervisor	1	20,000	20,000/-
Marketing / sales / office staff	3	20,000	60,000/-
Machine operators	4	10,000	40,000/-
Unskilled workers	3	7,000	21,000/-
	Total		**1,76,000/-**

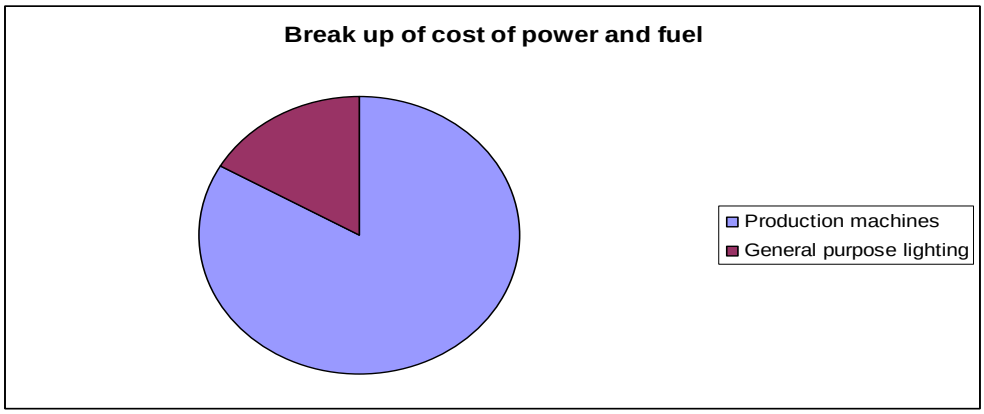


Salary and wages per annum = Nu. 21, 12,000/-

10.2.3 Cost of Power and Fuel

Power requirement for production machines	-	200 KWH
Power requirement for electrical heater for drying system	-	525 KWH
Power requirement for general purpose with lighting Of stores, offices and production unit	-	25 KWH
Total	-	**750 KWH**
Annual cost of power	-	**Nu. 28, 80,000/-**

80% of 750 = 600
600 * 8 * 2 = 9600
9600 * 25 = 2, 40,000 * 12 = 28, 80,000/-



10.3 Annual Turnover

Total turnover (per annum)			**Per unit**	**Total amount**
Egg trays	With 38 eggs cavities, weight 65 gms	26,00,000 num.	Nu. 2.50/-	65,00,000/-
Apple trays	With 30 apples cavities, weight 115 gms	26,00,000 num.	Nu. 5.50/-	1,43,00,000/-
Total				**2,08,00,000/-**
Wastage @ 5%				**10,40,000/-**
Total				**1,97,60,000/-**

Chapter 11

11.1 Project Assumptions

Assumptions at a Glance		
S. No.	**Particulars**	**Rate/Amount**
1	Total Project Cost	254.14
2	Debt	70%
3	Equity	30%
4	Rate of Interest	12%
5	Depreciation (Building)	SLM 10 yrs
6	Depreciation (Machinery)	SLM 20 yrs
7	Tax	30%
8	Construction Cost (Building) per sq.m.	7000
9	Construction Cost (Shed) per sq.m.	4000
10	Repayment period of Debt	8 yrs
11	Moratorium period	1 yr.
12	Installed Capacity (no. in lacs)	65
13	Capacity Utilization	80%
14	Working Capital Cycle	1 month

11.2 Total project cost

Total Project cost (Nu)		
1	Machinery	154.25
2	Construction Cost	55.00
3	Miscellaneous Fixed Assets *	3.00
4	Pre operating Expenses	5.00
5	Training Expense	1.54
6	Interest	26.26
7	Working Capital	9.11
	Total Project Cost	**254.16**

***** A provision has been made for Nu. 3.00 lacs in the project cost on account of miscellaneous fixed assets, which include office furniture, computers and communication equipments. The lump sum figure of Nu.3.00 lac is considered reasonable for this project.

11.3 Means of finance

Means of Finance		
Debt	177.92	70%
Equity	76.25	30%
Total	**254.16**	**100%**

11.4 Investment on machinery and equipments

	M1	
	M2	
	M3	
	M4	
	M5	
	M6	
	M7	
	M8	
	M9	
	M10	
	M11	
	M12	
	M13	
	Total	**11,775,000**
Add	Packaging,Forwarding,Transport and Insurance @ 11%	1295250
Add	Installation,Erection and Comissioning @ 5%	588750
Add	Duty and Taxes @ 10%	1177500
Add	Spare Parts @ 5%	588750
	TOTAL	**15425250**

11.5 Cost of construction

Construction Cost

Office and Godown (200 Sq. mtr. @ 7000per Sq. mtr.)	1400000
Industrial Shed (2 X 500 Sq. mtr. @ 4000 per Sq mtr.)	4000000
Overhead storage water tanks	100000
Total	**5500000**

Cost of construction @ Nu. 7000/sq meter and cost of shed @ Nu 4000/- sq meter has been taken based on prevailing market costs.

11.6 Cost break up

Particulars	Amount (Nu. In lacs)
Raw materials & consumables	37.80
Utilities & fuel	30.00
Wages & salaries	24.29
Indirect expenses	56.81

The details of the cost of raw material are as given in table no. 11.8. The Requirement of various raw materials per unit of product is as given in Chapter 4. The indirect expenses include factory / general overhead, lease rent, selling expenses, interest and depreciation as given in table 11.10.

11.7 Expenses incurred (Cost break up)

			Expenses (in Nu.)		
1	Salary and Wages				
	Type of Employees	No. of Employees	Per month	Per Annum	Total (Nu. Lac)
	Manager	1	35000	420000	4.20
	Plant Supervisor	1	20000	240000	2.40
	Marketing / sales / office staff	3	20000	240000	7.20
	Machine operators	4	10000	120000	4.80
	Unskilled workers	3	7000	84000	2.52
	Sub Total				21.12
	Other Benefits @ 15%				3.17
	Total				24.29
2	Training and Development Cost (1% of Machinery)				1.54
3	Power (750@80%,8hrs/day,25days/month)	Rate=2/unit			28.80
4	Water and Diesel	Nu. 10000 pm			1.20
5	Selling Expenses (Publicity and Marketing Expense)	5% of Sales			9.88
	Total (in Nu. Lac)				65.71

11.8 Cost of raw materials

Raw Material Cost (Per Unit)

Raw material (PM)	Quantity	Price per unit	Total amount (Rs.)
Waste paper	50 MT	Rs. 5000/-	250000
Additives i.e. rosin, alum & wax etc.	0.5 MT total quantity	LS cost	50000
	Sub-total		300000
	Wastage allowance 5%		15000
Total Cost (Monthly)			315000
Total Cost (Annual)			**3780000.00**

11.9 Annual turnover

Turnover

Total turnover (per annum)		Quantity (in Nos.)	Per unit (Nu.)	Total
Egg trays	With 38 eggs cavities, weight 65 gms.	2600000	2.5	6500000
Apple trays	With 30 apples cavities, weight 115 gms.	2600000	5.5	14300000
Total				20800000
Wastage @ 5%				1040000
TOTAL		**5200000**		**19760000**

11.10 Income Statement

Income Statement

Operating years		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Capacity											
Installed Capacity (no. in lacs)		65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00
Capacity Utilization		80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
PRODUCTION		52	52	52	52	52	52	52	52	52	52
Sales Revenue		197.60	197.60	197.60	197.60	197.60	197.60	197.60	197.60	197.60	197.60
Raw Material & Consumables		37.80	37.80	37.80	37.80	37.80	37.80	37.80	37.80	37.80	37.80
Utilities & Fuels											
Power		28.80	28.80	28.80	28.80	28.80	28.80	28.80	28.80	28.80	28.80
Water, Diesel, etc		1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Sub Total		30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Wages & Salaries		24.29	24.29	24.29	24.29	24.29	24.29	24.29	24.29	24.29	24.29
Factory Overheads		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
General Overheads		2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Lease											
Land		2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
Estimated Cost of Production		99.49	99.49	99.49	99.49	99.49	99.49	99.49	99.49	99.49	99.49
Selling Expenses		9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88
Cost of Sales		109.37	109.37	109.37	109.37	109.37	109.37	109.37	109.37	109.37	109.37
EBITDA		88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23
Interest		21.35	18.68	16.01	13.34	10.67	8.01	5.34	2.67	0.00	0.00
Depreciation		18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18	18.18
PBT		48.71	51.38	54.04	56.71	59.38	62.05	64.72	67.39	70.06	70.06
Taxation		14.61	15.41	16.21	17.01	17.81	18.62	19.42	20.22	21.02	21.02
PAT		34.09	35.96	37.83	39.70	41.57	43.44	45.30	47.17	49.04	49.04

11.11 Repayment of Interest schedule

Repayment and Interest Schedule for Loans

									254.16	177.92	22.24
Operating Years	1	2	3	4	5	6	7	8	9	10	
Rate of Interest	12%										
Loan (Outstanding)	177.92	155.68	133.44	111.20	88.96	66.72	44.48	22.24	0.00	0.00	
Interest	21.35	18.68	16.01	13.34	10.67	8.01	5.34	2.67	0	0	
Moratorium											
Repayment	22.24	22.24	22.24	22.24	22.24	22.24	22.24	22.24	0	0	
Closing Balance	155.68	133.44	111.20	88.96	66.72	44.48	22.24	0.00	0.00	0.00	

Repayment and Interest Schedule for Loans

									254.16	177.92	22.24
Operating Years	1	2	3	4	5	6	7	8	9	10	
Rate of Interest	12%										
Loan (Outstanding)	177.92	155.68	133.44	111.20	88.96	66.72	44.48	22.24	0.00	0.00	
Interest	21.35	18.68	16.01	13.34	10.67	8.01	5.34	2.67	0	0	
Moratorium											
Repayment	22.24	22.24	22.24	22.24	22.24	22.24	22.24	22.24	0	0	
Closing Balance	155.68	133.44	111.20	88.96	66.72	44.48	22.24	0.00	0.00	0.00	

11.12 Depreciation

Depreciation

Operating Years		1	2	3	4	5	6	7	8	9	10
Machinery @ 10%		15.43	15.43	15.43	15.43	15.43	15.43	15.43	15.43	15.43	15.43
Construction Cost @ 5%		2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
Total		**18.18**	**18.18**	**18.18**	**18.18**	**18.18**	**18.18**	**18.18**	**18.18**	**18.18**	**18.18**

11.13 Projected fund flow statement

Projected Funds Flow Statement

		Construction Period	**Operation period**									
Years		1	1	2	3	4	5	6	7	8	9	10
SOURCES OF FUNDS												
Equity		76.25										
Debt		177.92										
PBDIT			88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23
Total Sources	A	254.16	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23	88.23
APPLICATION OF FUNDS												
Fixed Assets Purchase		242.05										
Miscellaneous Fixed Assets		3.00										
Increase in Current Assets		9.11										
Repayment of Loan Payment			22.24	22.24	22.24	22.24	22.24	22.24	22.24	22.24	0.00	0.00
Payment of Interest on Term Loan			21.35	18.68	16.01	13.34	10.67	8.01	5.34	2.67	0.00	0.00

Taxation		14.61	15.41	16.21	17.01	17.81	18.62	19.42	20.22	21.02	21.02
Total Application **B**	254.16	58.20	56.33	54.47	52.60	50.73	48.86	46.99	45.12	21.02	21.02
SURPLUS/(DEFICIT) A-B	0.00	30.03	31.90	33.77	35.64	37.50	39.37	41.24	43.11	67.21	67.21
OPENING CASH & BANK BALANCES		0.00	30.03	61.93	95.70	131.33	168.83	208.21	249.45	292.55	359.77
CLOSING CASH & BANK BALANCES	0.00	30.03	61.93	95.70	131.33	168.83	208.21	249.45	292.55	359.77	426.98

11.14 Discounted Cash flow

Discounted cash flow techniques: The DCF techniques of capital budgeting – especially the internal of return method, and the net present value method – are rapidly gaining acceptance and are eventually replacing the less accurate methods (such as the payback and average rate of return) of evaluating the investment proposals of a firm.

The net Present Value method (NPV): Belonging to the category of time adjusted (Discounted cash flow) techniques; NPV represents a sophisticated method of evaluating the profitable investment opportunities of a firm. Here first of all the cash inflows and outflows are calculated. These cash flows are expressed in terms of the present values by discounting at a cut off rate (cost of capital) The important steps in the calculation of NVP are as follows:

1. Cash inflows after tax (but before depreciation) are to be calculated).
2. Cash inflow at the end of the year should include the salvage value of the project, if any.
3. Working capital, if any at the end of the project's life should be include in cash flow.
4. Calculate all cash outflows. If all cash outflows are made in the initial year, there present value will be equal to the amount of cash actually spent.
5. Select an appropriate (rate cut off rate / cost of capital) of interest to discount the cash flows.

NPV is calculated by using the following formula;

$$NPV = \quad + \frac{A}{(1+k)} + \frac{A}{(1+k)^2} + \frac{A}{(1+k)^3} + ..+ \frac{A}{(1+k)^n}$$

$$NPV = \sum_{t=1}^{n} \frac{At}{(1+K)^t} - C$$

Legends: A= Cash flow amount; k = Rate of Interest; n = Time period in Years;

NPV method is defined as 'the scientific process of calculating the present value of cash flows- both inflows and outflows –of an investment proposal using a discount rate (generally the overall cost of capital) and subtracting the present value of outflows to find the net present value.

Acceptance rule: If NPV > 0, a project may be accepted, and
If NPV < 0, a project may be rejected.

When the NPV is zero, the firm becomes indifferent between accepting or rejecting the project.

For Pulp Molded Project:

Cash Outflow in Construction period (2 Yrs.) = 254.16
Net Cash Inflow in Operation Period (10 yrs) = 728.47
NPV of cumulative cash flows @ 12% = 99.88

Conclusion: Since NPV > 0, the project is acceptable.

Internal Rate of Return: Another sophisticated discounted cash flow technique is the internal rate of return. Joel Dean is credited with introducing this concept. Also known by various names such as time-adjusted rate of return, marginal efficiency of capital and rate of return over cost the internal rate of return is defined as "the discount rate, which makes the net present value of a project 'zero'. In other words IRR is the rate, which equates the present value of cash inflows with the present value of outflows. Instead of discounting the cash flows at cost of capital (cut off rate) to determine the net present value of a project, we are answering the question "what rate of return does the project earn' this rate (IRR) can be calculated by the following formula:

$$C = \sum_{t=1}^{n} \frac{A_t}{(1+r)^t}$$

Legends: C = Discounted Cash flow amount; r = rate of interest; n= Time period in years; A = Cash flow amount.

For Pulp Molded Project:

Investment **= 254.16**
Net Cash flow (Investment) = 474.31
(Over construction period + 10 years)
IRR on Investment = 19.98% say 20%

Equity (During construction period) **= 76.25**

(Share Capital + General Reserves)
Net cash flow (Equity) = 378.23
(over construction period + 10 years)
IRR on Equity = 34 %

Conclusion: Against Cost of Capital of 12%, the IRR on Investment is coming to 20% and IRR on Equity is coming to 34%, which is very healthy.

`	**Discounted Cash flow statement (Total Investment)**											
	Construction Period		**Operation Period**									
Years	t=0	t=1	1	2	3	4	5	6	7	8	9	10
Inflows												
Net Cash Accruals After Interest & Tax			52.27	54.14	56.01	57.87	59.74	61.61	63.48	65.35	67.21	67.21
Less: Change in Working Capital			0	0	0	0	0	0	0	0	0	0
Add back financial Expenses			21.35	18.68	16.01	13.34	10.67	8.01	5.34	2.67	0.00	0.00
Terminal value												27.5
Total inflow			73.62	72.82	72.02	71.22	70.42	69.62	68.82	68.02	67.21	94.71
Outflows												
Investment	245.05	9.11										
Bridge Loan	0	0										
Total outflow	245.05	9.11										
Net Cash flow	-245.05	-9.11	73.62	72.82	72.02	71.22	70.42	69.62	68.82	68.02	67.21	94.71
IRR on Investment (%)	19.98%											
NPV (12% Discount Rate)	Nu. 99.88											
Pay Back Period	4 Years											
	Discounted Cash flow Statement (Equity)											
Years	t=o	t=1	1	2	3	4	5	6	7	8	9	10
Inflows												
Net Cash Accruals After Interest & Tax			52.27	54.14	56.01	57.87	59.74	61.61	63.48	65.35	67.21	67.21
Less: Change in Working Capital			0	0	0	0	0	0	0	0	0	0
Less: Loan Repayment			22.24	22.24	22.24	22.24	22.24	22.24	22.24	22.24	0.00	0.00
Terminal Value												27.50
Total Inflow			30.03	31.90	33.77	35.64	37.50	39.37	41.24	43.11	67.21	94.71
Outflows												
Equity	73.52	2.73										
Total Outflow	73.52	2.73										
Net Cash Flow	-73.52	-2.73	30.03	31.90	33.77	35.64	37.50	39.37	41.24	43.11	67.21	94.71
IRR on Equity	34%											

11.15 Projected Balance Sheet

	Projected Balance Sheet											
S.No.	**Description**	**Construction Period**	**Operati0on Period**									
		1	1	2	3	4	5	6	7	8	9	10
1.1	Equity	76.25	76.25	76.25	76.25	76.25	76.25	76.25	76.25	76.25	76.25	76.25
1.2	General Reserves		34.09	70.06	107.89	147.59	189.16	232.59	277.89	325.07	374.11	423.15
1.3	Debt	177.92	155.68	133.44	111.20	88.96	66.72	44.48	22.24	0.00	0.00	0.00
	Total Liabilities	**254.16**	**266.02**	**279.74**	**295.34**	**312.79**	**332.12**	**353.32**	**376.38**	**401.32**	**450.35**	**499.39**
2	**Assets**											
2.1	Gross Fixed Assets	245.05	245.05	245.05	245.05	245.05	245.05	245.05	245.05	245.05	245.05	245.05
2.2	Accumulated Depreciation		18.18	36.35	54.53	72.70	90.88	109.05	127.23	145.40	163.58	181.75
2.3	Net Fixed Assets	245.05	226.88	208.70	190.52	172.35	154.17	136.00	117.82	99.65	81.47	63.30
2.4	Working Capital Assets	9.11	9.11	9.11	9.11	9.11	9.11	9.11	9.11	9.11	9.11	9.11
2.5	Cash & Bank Balances	0	30.03	61.93	95.70	131.33	168.83	208.21	249.45	292.55	359.77	426.98
	Total Assets	**254.16**	**266.02**	**279.74**	**295.34**	**312.79**	**332.12**	**353.32**	**376.38**	**401.32**	**450.35**	**499.39**

11.16 Break Even Point and Sensitivity Analysis

Break even point can be determined algebraically or graphically.

(i) Algebraic method: Break even point is calculated by dividing the fixed costs by the contribution per unit. Contribution per unit is the difference between the selling price and variable cost per unit. Break even level of sales is obtained by multiplying the break even point of output with the selling price. The various terms used are defined in the following fashion:

Contribution = Sale price – Variable cost per unit
Profit = Contribution – Fixed cost

$$\text{Break–even point of output (Unit)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$\text{Break even point of sales (Nu.)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} \times \text{Selling price}$$

$$\text{or Break–even point} = \frac{\text{Total Fixed cost}}{\text{Total Contribution}} \times \text{Sales}$$

$$\text{or BEP} = \frac{\text{Fixed cost}}{\text{1-Variable cost per unit / Selling price per unit}}.$$

$$\text{or BEP} = \frac{\text{Fixed cost}}{\text{P /V ratio}}$$

Break Even Point And Sensitivity Analysis					
	Normal	**Case1**	**Case2**	**Case3**	**Case4**
Variable Cost (Nu. Lacs)					
Raw material & Consumable Stores	37.80	41.58	37.80	37.80	41.58
Utilities	30.00	33.00	30.00	30.00	33.00
Total Variable Cost	67.80	74.58	67.80	67.80	74.58
Average Variable Cost (per piece)	1.30	1.43	1.30	1.30	1.43
Fixed Cost (Nu. Lacs)					
Wages & Salaries	24.29	24.29	26.72	24.29	25.50
Repairs & Maintenance	3.00	3.00	3.30	3.00	3.15
General Overheads	2.00	2.00	2.20	2.00	2.10
Lease charges	2.40	2.40	2.64	2.40	2.52
Financial Expenses	21.35	21.35	23.48	23.48	24.66
Depreciation	18.18	18.18	19.99	19.99	20.99
Total Fixed Cost (Nu. Lacs)	71.21	71.21	78.33	75.17	78.92
Average Fixed Cost (Nu. per piece)	1.37	1.37	1.51	1.45	1.52
Average Selling Price	3.80	3.80	3.80	3.80	3.61
Project Break Even Point (No. lac)	28.53	30.10	31.38	30.11	36.27
Project Break Even	44%	46%	48%	46%	56%
Cash Break Even Point	21.25	22.42	23.37	22.10	26.63
Cash Break Even	33%	34%	36%	34%	41%

`

Case 1 - 10% Increase in Variable Cost

Case 2 - 10% Increase in fixed Cost

Case 3 - 10% Increase in Project Cost

Case 4 - 10% Increase in Variable Cost and Fixed Cost

5% Increase in Fixed Cost

5% Decrease in Selling Price

Under Case-1: Assuming a 10% increase in variable cost (like raw materials, consumables & utilities) and keeping all other costs as constant, the Project BEP level increases from 44% in Normal to 46% and cash BEP level increases from 33% to 34%.

Under Case-2: Assuming a 10% increase in Fixed cost (like wages & salaries, repairs & maintenance, general overheads, depreciation & lease charges) and keeping all other costs as constant, the Project BEP level increase from 44% in Normal to 48% and cash BEP level increase from 33% to 36%.

Under Case-3: Assuming a 10% level increase in Project cost (i.e. Financial Expenses), the Project BEP level increase from 44% in Normal to 46% and cash BEP level increases from 33% to 34%.

Under Case-4: Assuming a 10% increase in Variable cost, 5% in fixed cost and 5% decrease in selling price, the Project BEP level increases from 44% to 56% and cash BEP increase from 33% to 41%.

The project break even in normal case is 44% i.e. after achieving 44% of the projected turnover the unit would be in the profit zone.

11.17 Ratio analysis

This is an important ratio for companies deciding whether or not to initiate a new project. The basis of this ratio is that if a company is going to start a project they expect to earn a return on it, ROA is the return they would receive. Simply put, if ROA is above the rate that the company borrows at then the project should be accepted, if not then it is rejected.

Return On Assets - ROA

$$\frac{\text{Net Income + Interest Expense}}{\text{Total Assets}}$$

For RECYCLING OF PAPER WASTE – PULP MOLDED PRODUCTS Project:

Description	Operation Period									
Year	1	2	3	4	5	6	7	8	9	10
Return On Assets - ROA ROA= (PBIT/Total Assets) x 100	20.84%	19.53%	18.23%	16.96%	15.73%	14.56%	13.45%	12.42%	10.89%	9.82%

Conclusion: The ROA is varying from 21% in Yr-1 to 10% in Yr 10, which is quite healthy. There is steady decline from Yr 1 to Yr 10, in view of steady increase in Total Assets from Yr-1 to Yr –10

Return on Equity Analysis:

Sometimes ROE is referred to as Stockholder's return on investment, it tells the rate that shareholders are earning on their shares. But ROE is often misunderstood, for example if the return on equity is 10% then ten cents of assets are created for each dollar that was originally invested. Companies that generate high returns relative to their shareholder's equity are companies that pay their shareholders off handsomely, creating substantial assets for each dollar invested. These businesses are more than likely self-funding companies that require no additional debt or equity investments.

Return on Equity – ROE

$$= \frac{\textbf{Net Income}}{\textbf{Shareholder's Equity}}$$

Description	Operation Period									
Year	1	2	3	4	5	6	7	8	9	10
Return On Equity – ROE	30.90%	24.58%	20.54%	17.74%	15.66%	14.06%	12.79%	11.75%	10.89%	9.82%
PAT	34.09	35.96	37.83	39.70	41.57	43.44	45.30	47.17	49.04	49.04

Conclusion: The ROE is varying from 31% in Yr-1 to 10% in Yr 10, which is quite healthy. There is steady decline from Yr 1 to Yr 10, in view of steady increase in General Reserves from Yr-1 to Yr –10

Debt Equity Ratio:

Total long term debt / total long term fund

This reveals the percentage of funds being financed through borrowings

This shows the extent of trading in equity. An optimum capital structure has to be maintained, if a firm wants to survive.

Description	Operation Period									
Year	1	2	3	4	5	6	7	8	9	10
Debt Equity Ratio	2.04	1.75	1.46	1.17	0.88	0.58	0.29	-	-	-

11.18 Foreign exchange implications

The foreign exchange requirement for the project would be mainly on two accounts viz.

- For the import of machines, equipments and accessories at a value of around Nu. 154 lacs during setting up of the project.
- Approximately, Nu. 10 lacs worth of foreign exchange would be required for incidental expenses such as training, travel, etc in the first year.

Thus, the total foreign exchange requirement for a period of 5 years would be around Nu.164 lacs. Against this, the foreign exchange earning from the export and foreign exchange saving due to import substitution is envisaged at Nu. 955 Lacs.

CHAPTER 12 – ECONOMIC ANALYSIS

12.1 Economic Rate of Return (ERR)

Economic Rate of Return is the interest rate at which the cost and benefits of a project, discounted over its life, and equal. ERR differs from Financial Rate of Return in that it takes into account the effects of factors such as Price Controls, Subsidies and Tax breaks from local government, to compute the actual cost of the project to the economy.

The economic rate of return also includes indirect benefits to the economy that are likely to be ploughed back to the investors, people, government and other government or non-government agencies, over a longer period of time.

12.2 Relevance of ERR to the project

This concept of ERR is more relevant for big projects involving large capital deployment. For small projects, like the project under consideration, there may not be significant difference between Financial Rate of Return and Economic Rate of Return, as, while formulating the project, factors like Price Controls, Subsidies and Tax breaks from local government and also socio-economic benefits have not been taken into account.

12.3 Socio-economic impact of the project

As state above, the concept of ERR is not quite relevant for this project and the impact of the proposed unit would not be quite significant on the overall economic scenario of Bhutan. However, over a long time horizon and setting up of a number of similar units would result into following socio-economic benefits for the country.

- Setting up of the project for production of pulp molded products would help in adding value to paper waste available in Bhutan from Municipal Solid Waste and other paper waste viz newspaper waste and packaging waste.
- Indigenous production of Pulp molded products viz egg trays and apple trays would lead to self-reliance for these items in the field of poultry farming, horticulture and many other product areas.
- Local production of egg trays, apple trays and other packages would lead to **import substitution** which would result in saving of foreign exchange. Setting up of more units to meet the packaging requirement of poultry farming, horticulture, handicrafts and other product areas would have a multiplier effect on foreign exchange saving.
- The use of pulp molded packages being a green packaging material would add value to the products from Bhutan mainly in the export market. The use of apple trays in packaging of apples from Bhutan would lead to higher level of acceptability and price realization in export markets.

- There are possibilities of export of the egg trays and apple trays to eastern and north-eastern parts of India and other neighboring markets. This would lead to earning to foreign exchange for the country.
- There are not many medium and small-scale units manufacturing units in Bhutan. Setting up of this unit would have a catalytic effect on growth of entrepreneurship in medium and small-scale sector.
- The setting up of the project would lead to generation of direct and indirect employment, both for skilled and unskilled workers which would result into economic up-liftment of local population. This would also lead to up-gradation of skills.
- There are employment opportunities in the project for persons with managerial, technical, financial and marketing capabilities. The employment of such people in the local industry would provide them an option to have an employment in private sector in Bhutan and also reduce the migration of qualified manpower.
- There would be revenue generation for the local government by way of excise, sales tax/VAT and income tax from the unit as well as from its promoters.
- Finally, the project would lead to enhancement of economic activities in the field of construction, transport of raw materials and finished goods, marketing and trade, repairs and maintenance, etc.

It is important here to mention that above benefits can only be listed but these cannot be quantified based on a single unit with small investment. However, as mentioned above, if a number of such units in green packaging sector or any other sector of economy are setup, these would have a significant impact on overall economy of Bhutan.

ANNEXURES

Annexure I

List of pulp molded machine manufacturers:

1) M/s KU Sodalamuthu & Co Pvt. Ltd
428 Meltapalayam Road
Coimbatore
641043
Email: sales@sodaltech.com
Phone: 91-422-4242100

2) M/s K U Sodalamuthu& Co P Ltd
18/112 basement
Vikram Vihar, Lajpat Nagar-4
N Delhi-110024
Behind Hotel Vikram, Near Moolchand (metro railway station) and fly over
India Mobiles: 9810555577 and 9582151514
Email rao.vithal@gmail.com
rao_vithal@yahoo.com

3) M/s Mechanical Assembly Systems
Mayathara Market
Pincode – 688539
Mob: 09846033138
Email: masindia@md2.vsnl.net.in

4) M/s Southern Pulp Machinery (Pty) Ltd
50 Erika Way, Somerset
West Business Park
Somerset West
PO Box 2350, Somerset West 7129

5) M/s Pacific Pulp Molding
11285, Forestview Lane
San Diego, CA 92131

6) M/s Khandagiri Pulp Pvt. Ltd
74 Bhagbanpur Industrial Estate
Bhubneshwar – 751019
Ph: 0674-2111452
Fax: 0674-2475376
Email id: info@khandagiripulp.com

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Machine Manufacturer Listed at S. No. 1, 2 and 6 above could also undertake turn key projects

Annexure II

List of raw material suppliers

1) M/s Tashi Resin & Turpentine Factory
Samdrup Jongkhar
Bhutan

2) M/s Excel Internation
B-10, Super Shopping Complex, Dr. Dalvi Road
Near Vyas Classes, Kandivali (West), Mumbai,
Maharashtra - 400 067, India
Phone: +(91)-(22)-28622204/65232393
Fax: +(91)-(22)-28622204
Mobile / Cell Phone: +(91)-9769094794/9322242840
Website: http://www.industrial-paraffin-wax.com/

3) M/s Essar International
Address: 405, Monarch Chambers, Marol Maroshi Road,
Andheri East, Mumbai, Maharashtra - 400 059
Phone: (22)-66926051 / 66926052
Fax: (22)-66935887 / 25151684
Mobile: 9892524215 / 9892524217
Website: http://www.paintsrawmaterials.com/

4) M/s Vaghani Inc.
No. 304, Mandvi Navjivan Building, No. 121-7, Kazi Sayed Street, Mumbai,
Maharashtra - 400 003, India
Phone: +91-(22)-23422497 / 40784001
Fax: +91-(22)-22186595
Mobile: + 919867890009
Website: http://www.indiamart.com/vaghani-inc/

Annexure III

ABBREVIATIONS

PMP – Pulp molded Products
IMPEPA – International Molded Pulp Environmental Packaging Association
EPS – Expandable poly styrene
ISTA – International Safe Transit Association
EPA – Environmental Protection Agency
MSW – Municipal Solid Waste
TPA – Tones per annum
ONP – Old newspapers
OCC – Old corrugated containers
DLK – double-lined Kraft cuttings
OMG – Old magazines
MXD – Mixed paper