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# Pre-Feasibility Study

## POTATO STARCH MANUFACTURING UNIT



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**Government of Pakistan**  
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## 1 DISCLAIMER

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### ***Document Control***

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## 2 EXECUTIVE SUMMARY

Potato Starch Manufacturing Unit is proposed to be located keeping in view the easy availability of the raw material (fresh Potatoes). As per current agricultural practices, Okara is the largest producer of Potatoes not only in Punjab but in Pakistan, hence the proposed unit may be installed near district Okara in Punjab.

The proposed unit will produce Potato Starch from fresh harvested potatoes. Potato Starch is used in retail mashed potato products, as ingredients in snacks, and also used by the food industry to bind meat mixtures and thicken gravies and soups.

The installed production capacity of potato starch unit is 1.5 tons per hour which adds up to producing 6,480 tons of potato starch per annum based on 180 working days (24 hours a day). However, the capacity utilization during the first year of operations is assumed to be 75% i.e. 4,860 tons of potato starch. The proposed unit comprises a total investment of 189.86 million rupees with fixed investment of Rs. 171.84 million and working capital of Rs. 18.02 million. The Net Present Value (NPV) of the project is Rs. 98.08 million with an Internal Rate of Return (IRR) of 26% and a payback period of 4.53 years.

The project will provide employment opportunities to 42 people. Apart from this, additional labor will be hired on daily wages during the peak production season. Higher return on investment and a steady growth of business is expected with the entrepreneur having some prior experience or education in the related field of business.

## 3 INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectorial research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives.

Preparation and dissemination of prefeasibility studies in key areas of investment has been a successful hallmark of SME facilitation by SMEDA.

Concurrent to the prefeasibility studies, a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of experts and consultants and delivery of need based capacity building programs of different types in addition to business guidance through help desk services.

## 4 PURPOSE OF THE DOCUMENT

The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management.

The purpose of this document is to facilitate potential investors in **Potato Starch Manufacturing Unit** by providing them with a general understanding of the business with the intention of supporting potential investors in crucial investment decisions.

The need to come up with pre-feasibility reports for undocumented or minimally documented sectors attains greater imminence as the research that precedes such reports reveal certain thumb rules; best practices developed by existing enterprises by trial and error, and certain industrial norms that become a guiding source regarding various aspects of business set-up and its successful management.

Apart from carefully studying the whole document one must consider critical aspects provided later on, which form basis of any investment decision.

## 5 BRIEF DESCRIPTION OF PROJECT & PRODUCT

Potatoes are not only used as a vegetable for consumption at home but also at restaurants. Global consumption of potato as a food item has seen a shift from fresh potatoes to value-added products. It is estimated that a little less than 50 percent of potatoes grown worldwide are consumed fresh. The remaining are processed into potato food products and food ingredients like animal feed, processed into starch for industry, and re-used as seed for growing next season's potato crop.

Worldwide there is increase in production and trading of potato starch. On average, each year the import of potato starch is increasing at a rate of 6.73% worldwide and 20% in Pakistan. Pakistan has abundance of unprocessed

potatoes, especially in Punjab province. However, many companies in Pakistan are importing potato starch to meet their demand due to lack of potato processing facilities in Pakistan. In 2015, Pakistan imported 6,019 tons of potato starch worth 4.27 million dollars from the world (i.e Denmark, France, Germany, etc.)<sup>1</sup>. The proposed unit having capacity to produce 6,480 tons of potato starch a year based on 180 days, can meet the local demand and enter into global market for export.

Although it is not recommended to use cold storage potatoes for producing potato starch, a dedicated cold storage facility maintaining an ideal temperature (e.g. 8°C) with appropriate maintenance levels may yield quality potato starch. However, this pre-feasibility study proposes use of fresh potatoes as raw material for producing potato starch.

Potato Starch is a fine, powdery thickener consisting of starch extracted from potatoes. It looks, feels and acts a great deal like corn starch. Potato starch is made from the dried starch component of peeled potatoes. It has no potato flavor so works well in most recipes. As part of the starch component of a gluten-free flour blend, potato starch lends a light, fluffy texture to baked goods.

As a dehydrated vegetable, Potato Starch can be used in a wide variety of industries including: food production, textile, chemical, paper, pharmaceutical, agriculture / animal feed, and various other industries. It can be used as:

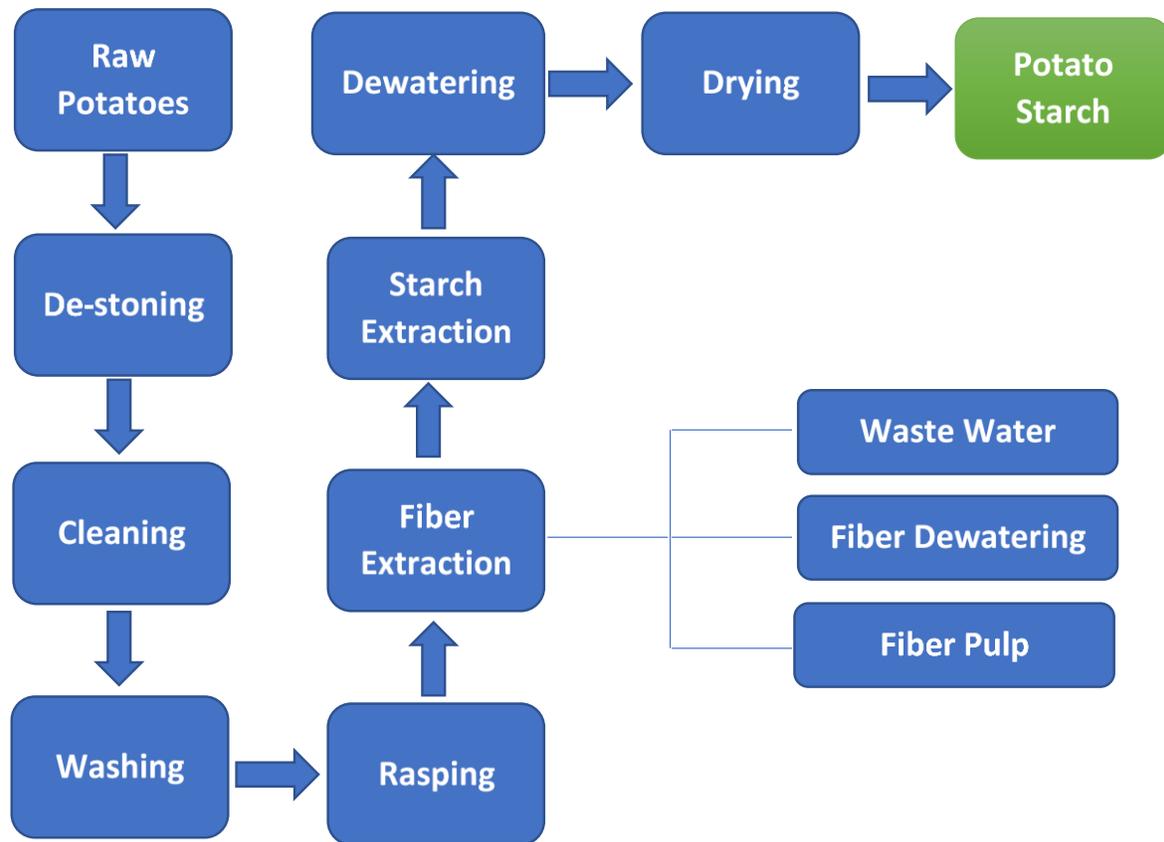
- Additive for food processing, food starches are typically used as thickeners and stabilizers in foods such as puddings, custards, soups, sauces, gravies, pie fillings, and salad dressings, and to make noodles and pastas
- Finishing fabrics and starch fabrics especially dyeing, weaving and wrap sizing
- It is also used in technical applications as wallpaper adhesive
- Antibiotics in pharmaceutical industry
- Nutritional supplement in food production
- Bread improver in baking
- Breading for fried foods; frozen fried chicken and seafood products
- Thickening agent; used in soup mixes sauces and baby foods
- Base material for many snack foods including potato-chip like fried products

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<sup>1</sup> Source: Trade map (Product: HS 110813 Potato starch)

## 5.1 Production Process Flow

Production Process of Potato Starch is given below in detail;



### I. Weighing / Transporting / De-stoning

The potatoes will be stored in the day storage after weighed. From the day storage the potatoes will be transported by water stream through a trough into a set of potato pumps which transport the potatoes to the de-stoner as well as washing without damage. Unloading of potatoes could be done in two ways:

1. dry - using elevators and tippers,
2. wet - using strong jet of water.

The potatoes will be transported by potato pumps through a trough into the gravity de-stoner where present stones and other heavy particles will be separated.

Then the potatoes will be transported to dewatering grid, where the potatoes are separated from the washing water containing a lot of impurities and dirty. The

washing water is discharged into the water treatment pool through gutter; the potatoes are transported to first stage washer by water stream.

## **II. Cleaning**

The potatoes will be transported by water stream further into the drum washer. Coarsely cleaning of potatoes takes place during the transport of potatoes to the scrubber by channel. In addition, before the scrubber, straw and stones separators are installed. Course particles as leaves, branches, wood and others will be sieved off on a screen (in front of water treatment pool).

The main cleaning is conducted in scrubber (different kinds of high specialized machines are used). The remaining stones, sludge and light wastes are removed at this step. Water used for washing is then purified and recycled back into the process.

The washed potatoes will be taken up by an inclined belt conveyor, which transports them into the rasping storage hopper.

## **III. Washing**

The potatoes will be transported by water stream further into the drum washer. This drum works at a low water level and takes care of an intensive cleaning of the potatoes. The potatoes rub and impact each other via the rotating drum to get cleaned. The fresh water is fed into the outlet of washer and washes the potatoes counter-currently. Then the impure wash water is discharged from the drain of potato inlet of the washer. The wash water stream will work completely in counter current.

Course particles as leaves, branches, wood and others will be sieved off on a screen (in front of water treatment pool). The used washing water is discharged into the water treatment pool. After the impurities are separated as sediment, the water is reused as transporting water in water transporting section. The washed potatoes will be taken up by an inclined belt conveyor, which transports them into the rasping storage hopper.

## **IV. Rasping of the Tubers**

The special designed Stainless Steel rasper is easy to operate. The most effective but simple clamping system guarantees an optimal position of the rasper blades and the clamping working. Demounting and mounting can be done by unskilled labour. The Stainless Steel sieve plate is one part and can be replaced without tools which ensure optimal efficiency and high starch yields.

The purpose of this stage is disruption of cell walls, which therefore release the starch. In practice, potato cells are not entirely destroyed and part of the starch remains in the mash.

## **V. De-Sanding / Fiber Extraction**

After rasping the obtained potato slurry will be pumped by a centrifugal pump into a de-sanding cyclone unit. In this unit sand will be collected into the collecting vessel and can be discharged periodically automatically by means of two automatic operating discharge valves.

From the de-sanding unit the potato slurry enters into the extraction unit consisting of 3 conical rotary sieves with integrated fiber and starch slurry pumps. By this 3-step sieving the fibers are washed out counter currently by fruit water from the multicyclone unit. The washed fibers will be pumped into the dewatering sieve, where they will be dewatered. This pulp can be sold as feed.

## **VI. Starch Extraction**

The washed-out starch slurry from the extraction unit will be pumped into the multi-stage concentration and starch milk washing unit. The overflow of the concentration is partly used in the washing of the fibers in the extraction unit and will partly leave the installation as effluent. The overflow from the concentration part is almost starch free. The concentrated starch milk from the last stage will enter the washing unit. Here the starch is washed in countercurrent with clean wash water. The overflow from the first washing stage is send to the fine fiber sieving unit and is, after sieving, pumped back to the washing unit. The collected fibers are pumped to the final pulp dewatering in the extraction unit. The fibers are washed with clean water.

## **VII. Dewatering of Refined Starch Milk and Starch Drying**

It is a suspension of starch in water, which needs dewatering up to 20% of moisture. This is equivalent to the moisture content of commercial starch when stored. High temperatures cannot be used in this process because of the danger of starch gelatinization which destroys granular structure. It may result in significant changes of the functional starch properties. Therefore, removal of excess water from milk shall be done only under conditions that prevent the gelatinization of starch.

The final starch milk is collected in a tank with agitator. From this tank the starch milk is pumped to the filter trough of the rotary vacuum filter. The starch milk is

diluted with water. The vacuum is created by a watering vacuum pump. The starch is sucked against the surface of the rotating drum and is scraped off by a fixed scraper device.

### **VIII. Drying / Bagging**

After dewatering of the starch milk, the starch cake is transported by belt conveyors to the feed hopper from where it is forced into the hot air stream inside of the drying duct. The hot air is created by a steam-heated heat exchanger. The starch is heated by the hot air and the present water will be evaporated. After the drying, the starch is separated from the air by a set of cyclones, at the bottom side closed by a rotating airlock. The humid air is leaving the cyclone through the overflow and will be blown by the ventilator into the atmosphere. The collected dried starch is transported by a set of screw conveyors to a vibrating sieve unit, where the eventual coarse materials will be separated from the fine starch. After sieving, the starch is transported into a starch silo, where the starch is cooled by retention time. From the silo the starch is extracted by the bagging installation, where the starch is bagged into 25kg bags.

### **IX. Waste / Bi Products**

Potato juice is a liquid waste product separated from the potatoes pulp after the rasping, using centrifuges or decanters. It contains about 5% of dry substance, including about 2% valuable protein of the potato of high nutritional value, minerals, vitamins and other. Modern starch plants separate the juice from the mash.

Potato protein can be extracted from the juice by coagulation with heat at low pH. About 600 kg of coagulated protein from each 1000 kg of potato protein can be recovered this way. The coagulated protein product contains about 80% protein (with the digestibility of about 90%), 2.5% minerals, 1.5% fat, 6% nitrogen-free substances and 10% water. Because of the full range of the exogenic amino acids the formulation is a valuable protein feed. The remaining potato Juice is used as fertilizer.

Potato pulp is a side product of washing the starch from the mash. It contains all non-starchy substances insoluble in water (fragments of wall of cells) fibers and bounded starch which cannot be mechanically separated from the blended parties of potato. The dry substance of the pulp contains 30% of starch, which makes it a good source for animal feed. The pulp contains a lot of water, dry solids about 16%, which is inconvenient in transportation and storage. That's why it is really often dried and dehydrated.

Juicy water is a liquid side product obtained after refining of starch milk. It is ten times diluted potato juice. As it is a sludge and it cannot be discharged to open water. It must be treated as waste water or is used as fertilizer

## 5.2 Installed and Operational Capacities

The proposed Potato Starch Manufacturing Unit have capacity to produce 6,480 tons of Potato Starch annually. As the Potatoes are a seasonal commodity, therefore, Plant will be operational for 6 months (January ~ June). One of the reasons to operate this plant in these months is low prices of the Potatoes due to its harvesting season in Punjab.

Capacity utilization during first year of operations is assumed to be 75% with an annual growth rate of 5% up to maximum level of 100% capacity utilization in 6th year of operation. This production capacity is estimated to be economically viable and justifies the capital as well as operational costs of the project.

Details of operational and installed capacity is given in the table below:

**Table 1: Installed and Operational Capacities**

Description	Operational Hours during Season / Day	Production Capacity Per hour (tons)	Production Capacity (Tons)	Operational Capacity 75% - in tons (Year 1)
Potato Starch	24	1.5	6,480	4,860

## 6 CRITICAL FACTORS

Following principles need to be pursued for the best productivity of Potato Starch:

- ⇒ Prices of Potatoes are volatile, so due care and diligence should be taken while procuring fresh potatoes. An experienced procurement officer having good knowledge and understanding of potatoes quality and price fluctuation should be permanently hired for the facility.
- ⇒ Potatoes with high solid contents and low sugar are best to produce dehydrated products. These types of potatoes are widely available in Pakistan.
- ⇒ Quality raw (potato) material and adaptive research & development is necessary for the project.
- ⇒ Storage management and quality improvement is needed.

- ⇒ Policy intervention and government support is required.
- ⇒ Enhance the skill of the contract farmers and the process relevant staff and management should be ensured.
- ⇒ Capacity building of the farmers, company staff and the management are lacking as this is a newly ventured sector, infusion of technical services & appropriate know-how are always a catalyst for the better performance.
- ⇒ Run project on 3 shifts in peak season of potatoes harvesting as the raw material will be available at cheap price and the quality of Potato Starch will be of high standards, while, it will save cost of storage.
- ⇒ Genetic modification of the potato plant is a key aspect of the potato starch market. The development of potatoes that contain only amylopectin, which is the majorly used ingredient, is an active area of research and is touted to greatly increase efficiency and profitability for the starch manufacturers.

## 7 GEOGRAPHICAL POTENTIAL FOR INVESTMENT

The unit can be installed anywhere in Pakistan where the raw material (fresh potatoes) is easily accessible. As per current agricultural practices, Okara is the largest producer of Potatoes not only in Punjab Province but Pakistan. In 2014-15, Okara district produced 1.4 million tons of Potatoes which is 37% of the production of Punjab and 34% of the Pakistan's total Potato Production<sup>2</sup>. Total production of Potatoes in Pakistan during 2014-15 was 4.16 million tons out of which Punjab province is producing 97% of the potatoes production<sup>3</sup>.

Keeping in view the above statistics and availability of raw material (fresh potatoes), the proposed unit will be installed near district Okara in Punjab. Potato Starch imports may be reduced by installation of such units.

## 8 POTENTIAL TARGET CUSTOMERS / MARKETS

The targeted customers for these products are food production, textile, chemical, paper, pharmaceutical, agriculture / animal feed, and various other industries. The main export markets for Pakistani processed Potatoes are Middle East, Far East, China, Malaysia, and neighbouring countries.

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<sup>2</sup> Agriculture Department Punjab

<sup>3</sup> Ministry of National Food Security & Research, Government of Pakistan

## 9 PROJECT COST SUMMARY

### 9.1 Project Economics

All the figures in this financial model have been calculated for estimated production of 4,860 tons in the year one. The capacity utilization during year one is worked out at 75% with 5% increase in subsequent years up to the maximum capacity utilization of 100%.

The following table shows internal rate of return, payback period and net present value of the proposed unit.

**Table 2: Project Economics**

Description	Details
Internal Rate of Return (IRR)	26%
Payback Period (Yrs.)	4.53
Net Present Value	Rs. 98,081,622

### 9.2 Project Financing

Following table provides details of the equity required and variables related to bank loan:

**Table 3: Project Financing**

Description	Details
Total Equity (50%)	Rs. 94,930,835
Bank Loan (50%)	Rs. 94,930,835
Annual Markup to the Borrower– Long Term Loan	14%
Tenure of the Loan (Years)	5
Annual Markup to the Borrower – Short Term Debt	15%

### 9.3 Project Cost

Following fixed and working capital requirements have been identified for operations of the proposed business.

**Table 4: Project Cost**

Description	Amount Rs.
Land	12,000,000
Building / Infrastructure	54,538,949

Machinery & Equipment	89,941,860
Furniture & Fixtures	1,514,700
Office Vehicles	2,632,875
Office Equipment	1,893,100
Pre-Operating Costs	8,616,186
Training Costs	700,000
<b>Total Capital Costs</b>	<b>171,837,670</b>
<b>Working Capital</b>	
Equipment Spare Part Inventory	324,000
Raw Material Inventory	16,200,000
Cash	1,500,000
<b>Total Working Capital</b>	<b>18,024,000</b>
<b>Total Investment</b>	<b>189,861,670</b>

#### 9.4 Space Requirement

Approximately 1 acres of land would be required for establishment of proposed unit, it is recommended that required land should be procured in the industrial estates of identified city / area. The cost of land is estimated at the rate of Rs. 12 million per acre.

The infrastructural requirements of the project mainly comprise the construction of Management Building, Sorting, Processing Hall, Store and other facilities. The cost of construction of building for the proposed unit is provided in the table below:

**Table 5: Space Requirement**

Description	Area (Sq.ft.)	Unit Cost (Rs.)	Total Cost (Rs.)
Management Office	1,500	2,500	3,750,000
Processing Area	25,667	1,600	41,067,200
Laboratory	500	2,500	1,250,000
Meeting Room	600	3,500	2,100,000
Shed	1,000	800	800,000
Dining Area	500	1,800	900,000
Toilets	300	400	120,000
Change Room	300	1,000	300,000
Guard Room	120	1,800	216,000
Pavement / Driveway	4,000	200	800,000
Open Grounds	3,000	50	150,000
Raw Material Store	500	1,500	750,000

External Development			1,000,000
Boundary Wall (Run. Feet)	835	1,600	1,335,749
<b>Total Infrastructure</b>			<b>54,538,949</b>

## 9.5 Machinery & Equipment Requirement

Plant, machinery and equipment required for the proposed project are stated below:

**Table 6: Machinery & Equipment Requirement**

Sr. No	Machine Name	Quantity	Cost/Rate	Amount (Rs.)
<b>1</b>	<b>Reception and Washing Unit</b>			
1.1	Hopper	1		
1.2	Belt Conveyor	1		
1.3	Trough	1		
1.4	Hook	4		
1.5	De-stoner	1		
1.6	Dewater Grid	1		
1.7	Washer	1		
1.8	Belt Conveyor	1		
<b>2</b>	<b>Rasping Unit</b>			
2.1	Hopper	1		
2.2	Frequency Controlled Screw Conveyor	1		
2.3	Rasper	2		
2.4	Mono Pump	1		
2.5	Agent Tank	1		
2.6	Agitator	1		
2.7	Valve	2		
<b>3</b>	<b>De-sanding Unit</b>			
3.1	De-sanding Unit	1		
3.2	Sand Collector	1		
3.3	Valve	2		
3.4	Frame	1		
<b>4</b>	<b>Extraction Unit</b>			

4.1	Extraction Centrasieve	1		
4.2	Extraction Centrasieve	3		
4.3	De-foaming Pump	1		
4.4	De-foaming Pump	3		
4.5	Fiber Pump	3		
4.6	Screw Conveyor	1		
<b>5</b>	<b>Refining Unit</b>			
5.1	Recovery Cyclone	2		
5.2	Concentration Cyclone	1		
5.3	Washing Cyclone	13		
5.4	Starch Pump	1		
5.5	Starch Pump	1		
5.6	Starch Pump	1		
5.7	Starch Pump	13		
5.8	Pipe , Frame and Valves	1		
<b>6</b>	<b>Vacuum Dewatering Unit</b>	1		
6.1	Vacuum Filter	1		
6.2	Agitator	1		
6.3	Tank	1		
6.4	Belt Conveyor	1		
6.5	Vacuum Pump	1		
6.6	Filtration Pump	1		
<b>7</b>	<b>Tank Unit</b>			
7.1	Process Water Tank	1		
7.2	Starch Slurry Tank	1		
7.3	Agitator for Water Tank	1		
7.4	Agitator for Starch Slurry Tank	1		
7.5	Process Water Pump	1		
7.6	High Pressure Water Pump	1		
7.7	Starch Slurry Pump	1		
<b>8</b>	<b>Drying Unit</b>			
8.1	Air Filter	1		
8.2	Heat Exchanger	1		
8.3	Feeder	1		
8.4	Mixer	1		
8.5	Raiser	1		

8.6	Pipe			
8.7	Cyclone Separator	4		
8.8	Screw Conveyor	2		
8.9	Sieve	1		
8.10	Hopper	1		
8.11	Level Feeder	1		
8.12	Semi-automatic Machine	1		
8.13	Blower	1		
8.14	Temperature Sensor	2		
<b>9</b>	<b>Online Control System</b>			
<b>10</b>	<b>Electric Control System</b>			
<b>11</b>	<b>Accessories</b>			
	Total (Ex-Shanghai Port)			58,104,000
	Freight for Karachi			108,000
	<b>Total CNF Karachi</b>			<b>58,212,000</b>
	Custom Duty (FoB)		5%	2,905,200
	Sales Tax (FoB)		17%	9,877,680
	Additional Sales Tax (FoB)		3%	1,743,120
	Clearance and Transportation Charges		0.50%	291,060
	<b>Price of Imported Plant</b>			<b>73,029,060</b>
	Supervision in Commissioning & Installing			1,252,800
	<b>Total Imported Machinery Cost</b>			<b>74,281,860</b>
	Boiler	1	2,000,000	2,000,000
	Generator 600 KW	1	8,000,000	8,000,000
	<b>Machinery &amp; Equipment Cost</b>			<b>84,281,860</b>
	Misc. Equipment (Water Pump, Reverse Osmosis plant, etc.)	1	2,000,000	2,000,000
	Fork Lifter 2 ton	1	1,800,000	1,800,000
	Laboratory Equipment - Microbiological and Analytical Lab	1	1,500,000	1,500,000
	Weighing Scale	3	120,000	360,000
	<b>Total Machinery &amp; Equipment Cost</b>			<b>89,941,860</b>

## 9.6 Furniture & Fixtures Requirement

Details of the furniture and fixture required for Potato Starch Manufacturing Unit is given below:

**Table 7: Furniture & Fixture Requirement**

Description	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
CEO Office Furniture	1	200,000	200,000
Managers Tables along with side tables	3	30,000	90,000
Manager / Officers Chairs	3	8,000	24,000
Visitor Chairs	6	8,000	48,000
Officers Tables along with Chairs	15	20,000	300,000
File Racks	10	15,000	150,000
Sofa Set	5	15,000	75,000
Split Air-conditioner 1.5 Ton	7	70,000	490,000
Misc. & Contingency		10%	137,700
<b>Total Furniture &amp; Fixtures</b>			<b>1,514,700</b>

## 9.7 Office Equipment Requirement

Following office equipment will be required for Potato Starch Manufacturing unit.

**Table 8: Office Equipment Requirement**

Description	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Laptop	4	100,000	400,000
Computers with LCD	11	60,000	660,000
Printer	3	20,000	60,000
Scanner	2	15,000	30,000
Networking Equipment & Accessories	1	150,000	150,000
Mini Telephone Exchange	1	100,000	100,000
Telephone Sets	10	1,500	15,000
Fax Machine	2	20,000	40,000
Photo Copy Machine	1	100,000	100,000
Water Dispenser	4	16,500	66,000
Refrigerator	1	50,000	50,000
Electric Water Cooler	2	25,000	50,000
Misc. & Contingency		10%	172,100
<b>Total Office Equipment</b>			<b>1,893,100</b>

## 9.8 Office Vehicle Requirement

Following office vehicles are required for Potato Starch Manufacturing Unit;

**Table 9: Office Vehicle Requirement**

Description	Quantity	Unit Cost (PKR)	Total Cost (PKR)
1300 CC Car (For CEO)	1	1,650,000	1,650,000
800 CC Carry	1	900,000	900,000
Registration fee		3.25%	82,875
<b>Total Office Vehicles cost</b>			<b>2,632,875</b>

## 9.9 Human Resource Requirement

To run operations of Potato Starch Manufacturing Unit smoothly, details of human resources required along with number of employees and monthly salary are recommended as under;

**Table 10: Human Resource Requirement**

Description	No. of Employees	Salary Per Month (Rs.)
CEO	1	125,000
Manager Marketing	1	75,000
Assistant Manager – Marketing	2	35,000
Plant Manger	1	70,000
Assistant Plant Manager	1	40,000
Plant Operator	3	22,000
Manager Finance & Admin	1	60,000
Accounts officer	1	20,000
Assistant to Admin & HR	1	20,000
Boiler Engineer	1	50,000
Boiler Operator	3	20,000
Procurement Officer	1	50,000
Asst. Procurement Officer	1	30,000
Quality Control Officer / Food Technologist	1	35,000
Assistant to Quality Assurance Officer	1	15,000
Mechanical Foreman	1	30,000
Electrical In-charge	1	30,000
Mechanic	2	18,000
Electrician	2	18,000
Shift Supervisors	3	20,000

Store Keeper	1	20,000
Office coordinator	1	15,000
Driver	2	15,000
Lifter Operator	1	16,000
Office Boy	2	15,000
Guard	4	18,000
Sweeper	2	15,000
<b>Total</b>	<b>42</b>	

Seasonal labor will be hired on daily wages. In year 1 the seasonal labor cost will be around PKR 6.08 million with 10% incremental effect each year.

### 9.10 Raw Material Requirement

Fresh potatoes are the main raw material for the proposed business, which will be procured either directly from the farms or from distributors of local vegetable market. Following table provides the details of seasonal requirements of fresh potatoes as a raw material:

**Table 11: Raw Material Requirement**

Description	Requirement for Producing 1 kg Starch	Requirement for Year-1 (Tons)	Cost Per Ton (Rs.)	Total Cost (Rs.)
Potatoes (Fresh)	6	29,160	5,800	169,128,000
Freight in for Potato		29,160	700	20,412,000
Other Material (Mon glyceride, Glycerol mono-Palmitate, antioxidants, sodium salts, SO <sub>2</sub> , etc.)		4,860	1,000	4,860,000
<b>Total Raw Material Cost</b>				<b>194,400,000</b>

### 9.11 Utilities and Other Costs

An essential cost to be borne by the project is the cost of electricity, gas and fuel for generator. The utility expenses are estimated to be around Rs. 3.01 million per month. Furthermore, promotional expenses are essential for marketing of this unit, and are estimated as 1% of revenue each year.

## 9.12 Revenue Generation

Based on the assumed capacity utilization for processing of, sales revenue during the first year of operations is estimated as under:

**Table 12: Revenue Generation – Year 1**

Description	Production (75% Capacity) in Tons	Sales Price Per Ton (Rs.)	Revenue (Rs.)
Potato Starch	4,860	65,261	317,167,521

## 10 USEFUL WEB LINKS

Small & Medium Enterprises Development Authority (SMEDA)	<a href="http://www.smeda.org.pk">www.smeda.org.pk</a>
Government of Pakistan	<a href="http://www.pakistan.gov.pk">www.pakistan.gov.pk</a>
Ministry of Industries & Production	<a href="http://www.moip.gov.pk">www.moip.gov.pk</a>
Ministry of Education, Training & Standards in Higher Education	<a href="http://moptt.gov.pk">http://moptt.gov.pk</a>
Government of Punjab	<a href="http://www.punjab.gov.pk">www.punjab.gov.pk</a>
Government of Sindh	<a href="http://www.sindh.gov.pk">www.sindh.gov.pk</a>
Government of Khyber Pakhtunkhwa	<a href="http://www.khyberpakhtunkhwa.gov.pk">www.khyberpakhtunkhwa.gov.pk</a>
Government of Balochistan	<a href="http://www.balochistan.gov.pk">www.balochistan.gov.pk</a>
Government of Gilgit Baltistan	<a href="http://www.gilgitbaltistan.gov.pk">www.gilgitbaltistan.gov.pk</a>
Government of Azad Jamu Kashmir	<a href="http://www.ajk.gov.pk">www.ajk.gov.pk</a>
Trade Development Authority of Pakistan (TDAP)	<a href="http://www.tdap.gov.pk">www.tdap.gov.pk</a>
Security Commission of Pakistan (SECP)	<a href="http://www.secp.gov.pk">www.secp.gov.pk</a>
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	<a href="http://www.fpcci.com.pk">www.fpcci.com.pk</a>
State Bank of Pakistan (SBP)	<a href="http://www.sbp.org.pk">www.sbp.org.pk</a>
Punjab Small Industries Corporation	<a href="http://www.psic.gop.pk">www.psic.gop.pk</a>
Sindh Small Industries Corporation	<a href="http://www.ssic.gos.pk">www.ssic.gos.pk</a>
Punjab Vocational Training Council (PVTC)	<a href="http://www.pvtc.gop.pk">www.pvtc.gop.pk</a>
Technical Education and Vocational Training Authority (TEVTA)	<a href="http://www.tevta.org">www.tevta.org</a>
Punjab Industrial Estates (PIE)	<a href="http://www.pie.com.pk">www.pie.com.pk</a>
Faisalabad Industrial Estate Development and Management Company (FIEDMC)	<a href="http://www.fiedmc.com.pk">www.fiedmc.com.pk</a>
Pakistan Horticulture Development Export	<a href="http://www.phdec.org">www.phdec.org</a>

Company (PHDEC)	
Ministry of National Food Security and Research (MNFSR)	<a href="http://www.mnsfr.gov.pk">www.mnsfr.gov.pk</a>
Pakistan Agriculture Research Council (PARC)	<a href="http://www.parc.gov.pk">www.parc.gov.pk</a>
National Agriculture Research Council (NARC)	<a href="http://www.narc.gov.pk">www.narc.gov.pk</a>
Agriculture University of Faisalabad (UAF)	<a href="http://www.uaf.edu.pk">www.uaf.edu.pk</a>
Agriculture Marketing Information Service	<a href="http://www.amis.pk">www.amis.pk</a>
Ayub Agricultural Research Institute (AARI), Faisalabad	<a href="http://www.aari.punjab.gov.pk">www.aari.punjab.gov.pk</a>

## 11 ANNEXURES

### 11.1 Income Statement

Calculations										SMEDA
Income Statement										Amount in PKR
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue	317,167,521	372,143,225	434,942,394	506,579,965	588,195,626	681,068,620	749,175,482	824,093,030	906,502,333	997,152,567
<i>Cost of sales</i>										
Fresh Potatoes Cost including Freight in	189,540,000	222,393,600	259,922,520	302,733,288	351,506,984	407,008,087	447,708,896	492,479,786	541,727,764	595,900,540
Other Material (Monoglyceride, Glycerol mono-Palmitate, antioxidants,)	4,860,000	5,702,400	6,664,680	7,762,392	9,013,000	10,436,105	11,479,715	12,627,687	13,890,455	15,279,501
Operation costs 1 (direct labor)	7,188,000	7,906,800	8,697,480	9,567,228	10,523,951	11,576,346	12,733,980	14,007,379	15,408,116	16,948,928
Operating costs 2 (machinery maintenance)	972,000	1,140,480	1,332,936	1,552,478	1,802,600	2,087,221	2,295,943	2,525,537	2,778,091	3,055,900
Direct electricity including Generator and Boiler expense	36,178,812	42,449,806	49,613,211	57,784,799	67,094,572	77,688,451	85,457,296	94,003,026	103,403,329	113,743,662
Packing Cost	3,888,000	4,561,920	5,331,744	6,209,914	7,210,400	8,348,884	9,183,772	10,102,149	11,112,364	12,223,601
Daily Wages	6,075,000	7,128,000	8,330,850	9,702,990	11,266,250	13,045,131	14,349,644	15,784,609	17,363,069	19,099,376
<b>Total cost of sales</b>	<b>248,701,812</b>	<b>291,283,006</b>	<b>339,893,421</b>	<b>395,313,089</b>	<b>458,417,756</b>	<b>530,190,225</b>	<b>583,209,248</b>	<b>641,530,172</b>	<b>705,683,190</b>	<b>776,251,508</b>
<b>Gross Profit</b>	<b>68,465,709</b>	<b>80,860,219</b>	<b>95,048,974</b>	<b>111,266,877</b>	<b>129,777,871</b>	<b>150,878,395</b>	<b>165,966,234</b>	<b>182,562,858</b>	<b>200,819,144</b>	<b>220,901,058</b>
<i>General administration &amp; selling expenses</i>										
Administration expense	7,104,000	7,814,400	8,595,840	9,455,424	10,400,966	11,441,063	12,585,169	13,843,686	15,228,055	16,750,860
Administration benefits expense	1,776,000	1,953,600	2,148,960	2,363,856	2,600,242	2,860,266	3,146,292	3,460,922	3,807,014	4,187,715
Electricity expense	1,226,880	1,349,568	1,484,525	1,632,977	1,796,275	1,975,903	2,173,493	2,390,842	2,629,926	2,892,919
Water expense	480,000	528,000	580,800	638,880	702,768	773,045	850,349	935,384	1,028,923	1,131,815
Travelling expense	1,776,000	1,953,600	2,148,960	2,363,856	2,600,242	2,860,266	3,146,292	3,460,922	3,807,014	4,187,715
Communications expense (phone, fax, mail, internet, etc.)	1,420,800	1,562,880	1,719,168	1,891,085	2,080,193	2,288,213	2,517,034	2,768,737	3,045,611	3,350,172
Office vehicles running expense	1,053,150	1,158,465	1,274,312	1,401,743	1,541,917	1,696,109	1,865,719	2,052,291	2,257,521	2,483,273
Office expenses (stationary, entertainment, janitorial services, etc.)	710,400	781,440	859,584	945,542	1,040,097	1,144,106	1,258,517	1,384,369	1,522,805	1,675,086
Promotional expense	3,171,675	3,721,432	4,349,424	5,065,800	5,881,956	6,810,686	7,491,755	8,240,930	9,065,023	9,971,526
Professional fees (legal, audit, consultants, etc.)	1,585,838	1,860,716	2,174,712	2,532,900	2,940,978	3,405,343	3,745,877	4,120,465	4,532,512	4,985,763
Depreciation expense	12,777,798	12,777,798	12,777,798	12,777,798	12,777,798	13,203,883	13,203,883	13,203,883	13,203,883	13,203,883
Amortization of pre-operating costs	1,723,237	1,723,237	1,723,237	1,723,237	1,723,237	-	-	-	-	-
Amortization of legal, licensing, and training costs	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
<b>Subtotal</b>	<b>34,875,778</b>	<b>37,255,137</b>	<b>39,907,320</b>	<b>42,863,098</b>	<b>46,156,669</b>	<b>48,528,882</b>	<b>52,054,382</b>	<b>55,932,432</b>	<b>60,198,287</b>	<b>64,890,727</b>
<b>Operating Income</b>	<b>33,589,931</b>	<b>43,605,082</b>	<b>55,141,654</b>	<b>68,403,779</b>	<b>83,621,201</b>	<b>102,349,513</b>	<b>113,911,852</b>	<b>126,630,426</b>	<b>140,620,857</b>	<b>156,010,331</b>
Gain / (loss) on sale of office equipment	-	-	-	-	757,240	-	-	-	-	-
Gain / (loss) on sale of office vehicles	-	-	-	-	1,053,150	-	-	-	-	-
<b>Earnings Before Interest &amp; Taxes</b>	<b>33,589,931</b>	<b>43,605,082</b>	<b>55,141,654</b>	<b>68,403,779</b>	<b>85,431,591</b>	<b>102,349,513</b>	<b>113,911,852</b>	<b>126,630,426</b>	<b>140,620,857</b>	<b>156,010,331</b>
Interest on short term debt	393,815	393,815	-	-	-	-	-	-	-	-
Interest expense on long term debt (Project Loan)	12,028,637	10,208,902	8,134,404	5,769,477	3,073,460	-	-	-	-	-
Interest expense on long term debt (Working Capital Loan)	697,938	-	-	-	-	-	-	-	-	-
<b>Subtotal</b>	<b>13,120,390</b>	<b>10,602,717</b>	<b>8,134,404</b>	<b>5,769,477</b>	<b>3,073,460</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>Earnings Before Tax</b>	<b>20,469,541</b>	<b>33,002,365</b>	<b>47,007,249</b>	<b>62,634,302</b>	<b>82,358,132</b>	<b>102,349,513</b>	<b>113,911,852</b>	<b>126,630,426</b>	<b>140,620,857</b>	<b>156,010,331</b>
Tax	6,386,839	10,773,327	15,675,037	21,144,505	28,047,845	35,044,829	39,091,648	43,543,148	48,439,799	53,826,115
<b>NET PROFIT/(LOSS) AFTER TAX</b>	<b>14,082,702</b>	<b>22,229,038</b>	<b>31,332,213</b>	<b>41,489,797</b>	<b>54,310,286</b>	<b>67,304,684</b>	<b>74,820,205</b>	<b>83,087,278</b>	<b>92,181,058</b>	<b>102,184,216</b>

## 11.2 Balance Sheet

Calculations											SMEDA
Balance Sheet											Amount in PKR
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>Assets</b>											
<i>Current assets</i>											
Cash & Bank	1,500,000	-	12,042,299	32,355,349	58,377,988	85,290,106	152,475,469	224,190,413	302,488,704	386,326,158	610,935,589
Accounts receivable		26,068,563	28,327,839	33,167,902	38,692,700	44,990,778	52,161,544	58,777,155	64,654,870	71,120,357	78,232,393
Equipment spare part inventory	324,000	399,168	489,854	599,063	730,357	887,961	1,025,594	1,184,562	1,368,169	1,580,235	-
Raw material inventory	16,200,000	20,908,800	26,880,876	34,439,146	43,986,442	56,024,837	67,790,053	82,025,964	99,251,417	120,094,214	-
<b>Total Current Assets</b>	<b>18,024,000</b>	<b>47,376,531</b>	<b>67,740,868</b>	<b>100,561,460</b>	<b>141,787,488</b>	<b>187,193,682</b>	<b>273,452,661</b>	<b>366,178,093</b>	<b>467,763,160</b>	<b>579,120,964</b>	<b>689,167,982</b>
<i>Fixed assets</i>											
Land	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000
Building/Infrastructure	54,538,949	51,812,001	49,085,054	46,358,106	43,631,159	40,904,212	38,177,264	35,450,317	32,723,369	29,996,422	27,269,474
Machinery & equipment	89,941,860	80,947,674	71,953,488	62,959,302	53,965,116	44,970,930	35,976,744	26,982,558	17,988,372	8,994,186	-
Furniture & fixtures	1,514,700	1,363,230	1,211,760	1,060,290	908,820	757,350	605,880	454,410	302,940	151,470	-
Office vehicles	2,632,875	2,106,300	1,579,725	1,053,150	526,575	4,240,272	3,392,217	2,544,163	1,696,109	848,054	-
Office equipment	1,893,100	1,514,480	1,135,860	757,240	378,620	2,416,129	1,932,903	1,449,677	966,451	483,226	-
<b>Total Fixed Assets</b>	<b>162,521,484</b>	<b>149,743,685</b>	<b>136,965,887</b>	<b>124,188,088</b>	<b>111,410,290</b>	<b>105,288,892</b>	<b>92,085,008</b>	<b>78,881,125</b>	<b>65,677,241</b>	<b>52,473,358</b>	<b>39,269,474</b>
<i>Intangible assets</i>											
Pre-operation costs	8,616,186	6,892,949	5,169,712	3,446,474	1,723,237	-	-	-	-	-	-
Legal, licensing, & training costs	700,000	630,000	560,000	490,000	420,000	350,000	280,000	210,000	140,000	70,000	-
<b>Total Intangible Assets</b>	<b>9,316,186</b>	<b>7,522,949</b>	<b>5,729,712</b>	<b>3,936,474</b>	<b>2,143,237</b>	<b>350,000</b>	<b>280,000</b>	<b>210,000</b>	<b>140,000</b>	<b>70,000</b>	<b>-</b>
<b>TOTAL ASSETS</b>	<b>189,861,670</b>	<b>204,643,165</b>	<b>210,436,466</b>	<b>228,686,023</b>	<b>255,341,015</b>	<b>292,832,573</b>	<b>365,817,669</b>	<b>445,269,218</b>	<b>533,580,401</b>	<b>631,664,322</b>	<b>728,437,457</b>
<b>Liabilities &amp; Shareholders' Equity</b>											
<i>Current liabilities</i>											
Accounts payable		17,809,312	21,091,004	24,900,686	29,323,147	34,457,703	40,138,115	44,769,459	49,993,364	55,896,227	50,485,146
Short term debt	-	4,899,587	-	-	-	-	-	-	-	-	-
<i>Other liabilities</i>											
<b>Total Current Liabilities</b>	<b>-</b>	<b>22,708,900</b>	<b>21,091,004</b>	<b>24,900,686</b>	<b>29,323,147</b>	<b>34,457,703</b>	<b>40,138,115</b>	<b>44,769,459</b>	<b>49,993,364</b>	<b>55,896,227</b>	<b>50,485,146</b>
<i>Other liabilities</i>											
Long term debt (Project Loan)	85,918,835	72,920,729	58,102,888	41,210,549	21,953,283	-	-	-	-	-	-
Long term debt (Working Capital Loan)	9,012,000	-	-	-	-	-	-	-	-	-	-
<b>Total Long Term Liabilities</b>	<b>94,930,835</b>	<b>72,920,729</b>	<b>58,102,888</b>	<b>41,210,549</b>	<b>21,953,283</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<i>Shareholders' equity</i>											
Paid-up capital	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835	94,930,835
Retained earnings		14,082,702	36,311,740	67,643,953	109,133,750	163,444,036	230,748,720	305,568,925	388,656,202	480,837,260	583,021,476
<b>Total Equity</b>	<b>94,930,835</b>	<b>109,013,537</b>	<b>131,242,575</b>	<b>162,574,788</b>	<b>204,064,584</b>	<b>258,374,871</b>	<b>325,679,555</b>	<b>400,499,759</b>	<b>483,587,037</b>	<b>575,768,095</b>	<b>677,952,311</b>
<b>TOTAL CAPITAL AND LIABILITIES</b>	<b>189,861,670</b>	<b>204,643,165</b>	<b>210,436,466</b>	<b>228,686,023</b>	<b>255,341,015</b>	<b>292,832,573</b>	<b>365,817,669</b>	<b>445,269,218</b>	<b>533,580,401</b>	<b>631,664,322</b>	<b>728,437,457</b>

## 11.3 Cash Flow Statement

Calculations										SMEDA	
Cash Flow Statement										Amount in PKR	
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<i>Operating activities</i>											
Net profit		14,082,702	22,229,038	31,332,213	41,489,797	54,310,286	67,304,684	74,820,205	83,087,278	92,181,058	102,184,216
Add: depreciation expense		12,777,798	12,777,798	12,777,798	12,777,798	12,777,798	13,203,883	13,203,883	13,203,883	13,203,883	13,203,883
amortization of pre-operating costs		1,723,237	1,723,237	1,723,237	1,723,237	1,723,237	-	-	-	-	-
amortization of training costs		70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
Deferred income tax		-	-	-	-	-	-	-	-	-	-
Accounts receivable		(26,068,563)	(2,259,275)	(4,840,063)	(5,524,798)	(6,298,078)	(7,170,767)	(6,615,611)	(5,877,715)	(6,465,487)	(7,112,036)
Finished goods inventory		-	-	-	-	-	-	-	-	-	-
Equipment inventory	(324,000)	(75,168)	(90,686)	(109,209)	(131,295)	(157,603)	(137,634)	(158,967)	(183,607)	(212,066)	1,580,235
Raw material inventory	(16,200,000)	(4,708,800)	(5,972,076)	(7,558,270)	(9,547,297)	(12,038,395)	(11,765,216)	(14,235,911)	(17,225,452)	(20,842,797)	120,094,214
Accounts payable		17,809,312	3,281,691	3,809,682	4,422,461	5,134,555	5,680,412	4,631,344	5,223,905	5,902,863	(5,411,081)
<b>Cash provided by operations</b>	<b>(16,524,000)</b>	<b>15,610,519</b>	<b>31,759,727</b>	<b>37,205,389</b>	<b>45,279,905</b>	<b>55,521,801</b>	<b>67,185,363</b>	<b>71,714,944</b>	<b>78,298,291</b>	<b>83,837,453</b>	<b>224,609,431</b>
<i>Financing activities</i>											
Project Loan - principal repayment		(12,998,106)	(14,817,841)	(16,892,339)	(19,257,266)	(21,953,283)	-	-	-	-	-
Working Capital Loan - principal repayment		(9,012,000)	-	-	-	-	-	-	-	-	-
Short term debt principal repayment		-	(4,899,587)	-	-	-	-	-	-	-	-
Additions to Project Loan	85,918,835	-	-	-	-	-	-	-	-	-	-
Additions to Working Capital Loan	9,012,000	-	-	-	-	-	-	-	-	-	-
Issuance of shares	94,930,835	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares		-	-	-	-	-	-	-	-	-	-
<b>Cash provided by / (used for) financing activities</b>	<b>189,861,670</b>	<b>(22,010,106)</b>	<b>(19,717,428)</b>	<b>(16,892,339)</b>	<b>(19,257,266)</b>	<b>(21,953,283)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<i>Investing activities</i>											
Capital expenditure	(171,837,670)	-	-	-	-	(6,656,400)	-	-	-	-	-
Acquisitions		-	-	-	-	-	-	-	-	-	-
<b>Cash (used for)/ provided by investing activities</b>	<b>(171,837,670)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>(6,656,400)</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>NET CASH</b>	<b>1,500,000</b>	<b>(6,399,587)</b>	<b>12,042,299</b>	<b>20,313,050</b>	<b>26,022,639</b>	<b>26,912,118</b>	<b>67,185,363</b>	<b>71,714,944</b>	<b>78,298,291</b>	<b>83,837,453</b>	<b>224,609,431</b>

## 12 KEY ASSUMPTIONS

### 12.1 Operating Cost Assumptions

Description	Details
Administration Benefit Expenses	25% of admin. expense
Traveling Expenses	25% of admin. expense
Communication Expenses	20% of admin. expense
Office expenses (stationary, entertainment, janitorial services, etc.)	10% of admin. expense
Promotional expense	1% of revenue
Office Vehicle Running Expenses	40% of the Vehicle Cost
Professional fee (Legal, Audit, etc.)	0.5% of revenue
Operating costs growth rate	10%
Depreciation on Building and Infrastructure	5%
Depreciation on Machinery & Equipment	10%
Depreciation on Furniture and Fixture	10%
Depreciation on Office Equipment	20%
Depreciation on Office Vehicle	20%

### 12.2 Production Cost Assumptions

Description	Details
Cost of Potatoes per Ton including Freight in	Rs. 6,300
Packing Cost Per Ton <sup>4</sup>	Rs. 800
Other Material (Mon glyceride, Glycerol mono-Palmitate, antioxidants, sodium salts, SO <sub>2</sub> , etc.)	PKR 1,000
Cost used in Per Ton Potato Starch	
Production Cost Growth Rate	10%

### 12.3 Revenue Assumptions

Description	Details
Potato Starch Sales Price Per Ton	65,261
Growth in Sales Price	10%

<sup>4</sup> Inner Liner LDP Bag with Outer PP Bag (Food Grade) will be used as Packing

Days Operational / Year	180
Hours Operational Per Day	24
Production Capacity in First Year	75%
Percentage Increase in Production Capacity every Year	5%
Maximum Production Capacity	100%

## 12.4 Financial Assumptions

Description	Details
Debt	50%
Equity	50%
Interest Rate on Debt	14%
Debt Tenure	5