Pre-Feasibility Study

MAIZE STARCH AND RELATED PRODUCTS

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2 EXECUTIVE SUMMARY

Maize Starch and Related Products Manufacturing Unit is proposed to be located keeping in view the easy availability of the raw material i.e., maize. As per current agricultural practices, the cultivation of corn is concentrated in different areas of Punjab such as Sahiwal, Arifwala, Pakpattan, Chiniot, Vehari, Lahore and Kasur and KPK. As for KPK, corn cultivation is dispersed in different areas due to low land holdings. Hence the proposed unit may be installed in the aforementioned regions of Pakistan.

The proposed unit will produce Maize Starch from maize. The finished product is used in textiles, pharmaceuticals, paper, hotel industry, feed production, plastics, petroleum, and food industry as an ingredient in snacks, and also to bind meat mixtures and thicken gravies and soups.

The installed production capacity of maize starch unit is 1.25 tons per hour which adds up to producing 10,800 tons of maize starch per annum based on 360 working days (24 hours a day). However, the capacity utilization during the first year of operations is assumed to be 75% i.e. 8,100 tons of maize starch. The proposed unit comprises a total investment of 304.928 million rupees with fixed investment of Rs. 288.074 million and working capital of Rs. 16.853 million. The Net Present Value (NPV) of the project is Rs. 172.138 million with an Internal Rate of Return (IRR) of 27% and a payback period of 4.33 years.

The project will provide employment opportunities to 59 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 **Maize Starch and Related Products 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 it's 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

Maize is one of the important crops of Pakistan and has great potential due to its high nutritive value and commercial use. Maize (also known as corn) is a common name for a cereal grass widely grown for food and livestock fodder. Maize ranks with wheat and rice as one of the world's chief grain crops. Maize is the major raw material for production of starch.

The Composition of maize is as follow:

Table 1: Composition of Maize

Starch	60-72%
Moisture	11-15%
Crude Protein	9-10%
Oil	4-5%
Cellulose	2%
Ashes	1%

The worldwide corn crop is 600 million tons per annum. Nearly 10% of this is made into starch or starch derived sweeteners making corn starch the largest starch commodity in the world.

Maize starch is employed in the manufacture of asbestos, ceramics, plastics, oil and pharmaceuticals. The derivatives of maize starch include glucose or corn syrup, corn sugar and industrial alcohol which are used in different industries.

Other commonly used sources of starch are wheat, potato, tapioca and rice. Genetic modification of starch crops has recently led to the development of starches with improved and targeted functionality.

The bulk (99%) of the total corn production comes from two major provinces, KPK, accounting for 51 percent of the total area and 30 percent of total production and Punjab contributing 48 percent area, with 69 percent of total corn production. The production and yield in Punjab is higher than KPK mainly due to the use of hybrid seed and adoption of better agronomic practices. In Punjab the cultivation of corn is concentrated in Sahiwal, Arifwala, Pakpattan, Chiniot, Vehari, Lahore and Kasur areas. As for KPK, corn cultivation is scattered in different areas due to low land holdings.

Maize Starch can be used in a wide variety of industries for following purposes;

- Textile weaving units in the process of sizing. Starch is also used in the textile finishing operations, to modify the appearance by filling the

interstices of the weave and to add weight as well as obtain permanent finish.

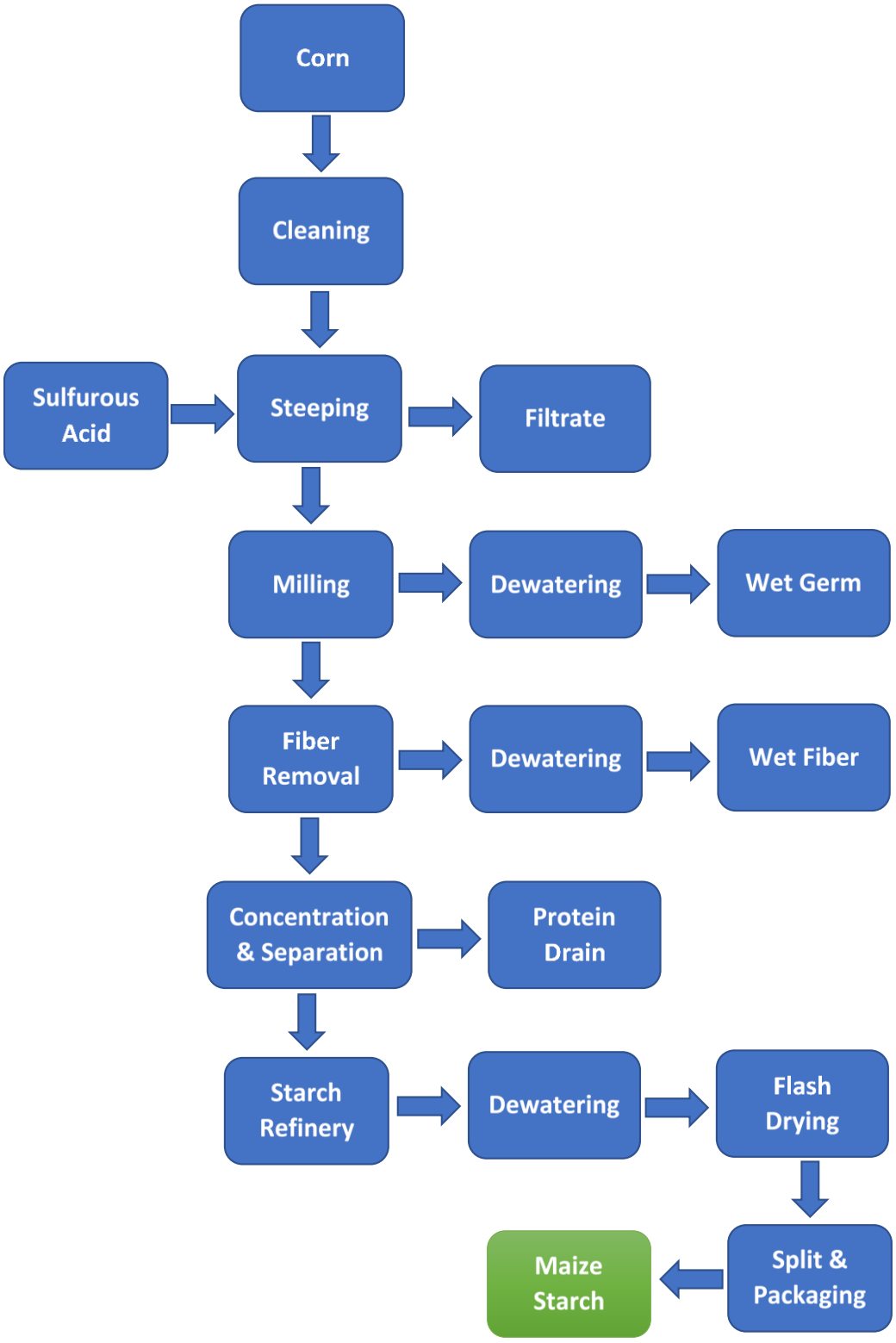
- It is used in the pharmaceutical industry as a binder or disintegrating agent in tablets whereas Dextrose anhydrous is generally manufactured from maize starch.
- In ice-cream, sherbets, etc. large amount of dextrose can be used to increase the solid substance without unduly increasing the sweetness.
- In paper industry, it is used in surface sizing and increases the strength and stiffness of the paper. It is also used in surface sizing to improve the appearance.
- There is use of Maize Starch in hotels, industrial canteens and households.
- In addition to edible oil the shortage of animal protein required for human health is a problem. Maize is ideal for converting vegetable protein into animal protein.
- Starch offers several prospective advantages as a raw material for plastics applications because it is renewable, biodegradable and obtained from a variety of plant sources and is a low-cost material.
- Numerous modified starches have been prepared and their suitability studied for various oilfield applications such as filtrate-loss control, mud-rheology modification, shale stabilization, enhanced oil recovery (EOR), water shutoff, and some of these starches have been widely used in this area.
- It is also used in dry mixes, baby foods, baker products, canned foods and processed meat.
- It is also used for processed meat – hamburgers, sausages and many delicatessen-type meat products.

The present status of maize starch consumption in Pakistan is given below:

Major volume (75%) of total production is directly consumed as human food in the form of “Chapatti” and snack food, whereas 25% is processed, out of which 12% is utilized by the industries producing starch, glucose, baby foods, snack foods, corn flakes etc. and remaining 13% is consumed by poultry feed.

5.1 Production Process Flow

Production Process of Maize Starch and related products is given below in detail;



I. Inspection & Cleaning

Approximately 70 percent of the kernel is starch (from the endosperm), about 10 percent is protein (predominantly gluten), four percent is oil (extracted from the germ), and two percent is fiber (from the hull). It is the goal of the corn refining process to separate each component and then further refine it into specific products. Corn arrives at the refining facility by truck, barge or railcar. Refinery staff inspects the corn shipments and cleans them twice to remove pieces of cob, dust, chaff, and foreign materials. The corn is then conveyed to storage silos, until ready to go to the refinery for steeping, the first processing step.

II. Steeping

The clean corn is fed into the steeping tanks. During steeping, the kernels absorb water, increasing their moisture levels from 15 percent to 45 percent and increasing the size to more than double. The addition of 0.1 percent sulfur dioxide to the water prevents excessive bacterial growth in the warm environment. As the corn swells and softens, the mild acidity of the steep water begins to loosen the gluten bonds within the corn and release the starch. After steeping, the corn is coarsely grounded to break the germ loose from other components. Steep water is condensed to capture nutrients in the water for use in animal feeds and as a nutrient for later fermentation processes. The ground corn, in water slurry, flows to the germ separators.

A complete steeping process in one tank includes four stages:

1. Put the steeping solution and corn into the steeping tank
2. Steep corn
3. Discharge steeping solution
4. Discharge the steeped corn

III. Grinding, Germ Separation & Fiber Separation

The steeped corn is fed into the first crusher through feed hopper, the germ can be separated after crushing. A portion of starch will be released.

Grinding includes two steps:

- First Crushing
- Second Crushing

After each grinding step, there are two-stage de-germing cyclones for separating the germ. The bottom flow of 1st de-germing cyclone flows into the bend sieve depending on gravity, the overflow flows into the second crusher. The overflow of the 1st de-germing cyclone firstly separates the germ, the overflow contains some starch, in order to recover these starch, use a three-stage bend sieve with process water to wash away the free starch. The washed germ is dewatered in a horizontal spiral centrifuge. The bottom flow of 2nd de-germing cyclone flows into bend

sieve, the starch milk will be extracted (the screened starch), the overflow the bend sieve will flow into the grinding mill.

The bottom flow of the crusher is pumped into a multistage bend sieve system. The bottom flow of the 1st stage bend sieve is the remaining of the screened starch. The overflow containing fibers will be pumped into the subsequent stages and washed to recover the remaining starch.

IV. Starch & Gluten Separation

Gluten has low density compared to starch. By passing mill starch through a centrifuge, the gluten is readily spun out for use in animal feeds. The starch, with just one or two percent protein remaining, is diluted, washed eight to 14 times, re-diluted, and washed again in hydroclones to remove the last trace of protein and produce high quality starch, typically more than 99.5 percent pure.

V. Starch Conversion

Starch, suspended in water, is liquefied in the presence of acid and / or enzymes which convert the starch to a low-glucose solution. The overflow of the primary centrifuge contains few proteins. The gluten, water and protein particles are concentrated by centrifuge, then recovered by vacuum filter dewatering. The overflow of the cyclone can be used as processed water. The starch separated by the primary centrifuge is washed and refined by multistage cyclone, the washed water comes from the user's water supply system. Before washed water is fed into the multiple stage cyclone, the foreign impurities will be removed by de-sanding and filtrating apparatus.

VI. Dewatering

The starch milk refined by multiple stage cyclone flows into the starch milk tank, then pumped to the dewatering, drying and packing units stipulated in Tapioca starch processing line.

5.2 Installed and Operational Capacities

As per the machinery employed, the installed capacity of it is 10,800 tons per year, however in the first year of the functions, it will operated at 75% of its installed capacity.

The details of Maize Starch and Related Products' (By-products) operational and installed capacity are given in the table below:

Table 2: Installed and Operational Capacities

Description	Operational Hours / day	Installed Capacity (Tons/Hour)	Installed Production Capacity (Tons)	Operational Capacity 75% - in tons Year 1
Maize Starch	24	1.25	10,800	8,100
Fiber	24	0.19	1,654	1,241
Germ	24	0.12	1,008	756
Gluten	24	0.08	699	524
Steep Water	24	0.09	773	579
Total			**14,934**	**11,200**

6 CRITICAL FACTORS

One of the key success factors for the proposed project would be to control and carefully monitor the entire production process as it involves high waste production in the form of Fibre, Protein, Oil, Ash and others.

Another important aspect of this proposed feasibility is the marketing and promotion of the produced Maize Starch and Related Products in the local as well as foreign Market. This involves allocating a heavy budget towards promotional activities.

Key success factors are:

- Utmost care taken while selecting maize grain. Only the best quality grains should be used.
- Waste production should be kept at minimum and production process needs to be monitored very carefully.
- Advance sale orders can ensure the success of the business.
- Product should be offered in different price ranges, so it is affordable to all income groups creating a wider target market.
- It is recommended to estimate the maize grain requirements for the year and this should be contracted for in advance with the suppliers so as to secure from the drastic changes in the prices of the maize grain.
- Quality maintenance will play an important role as it is evident from the behaviour of the general consumers that they are more specific towards health issues than ever before.
- Cost Accounting system should be strengthened so as to monitor the entire process and determine the reasons for major variances in the process such as Material, Labor and Factory Overhead Variances.

7 GEOGRAPHICAL POTENTIAL FOR INVESTMENT

The said project can be set up in any industrial area. It is recommended to establish the unit in an area where raw material is easily available. It may be any Industrial Area of Punjab in metropolitans like Lahore, Rawalpindi or Islamabad.

The bulk (99%) of the total production comes from two major provinces, KPK, accounting for 51 percent of the total area and 30 percent of total production and Punjab contributing 48 percent area, with 69 percent of total corn production. The provinces of Sindh and Baluchistan produce a very small quantity of corn. The production and yield in Punjab is higher than KPK mainly due to the use of hybrid seed and adoption of better agronomic practices. In Punjab, the cultivation of corn is concentrated in Sahiwal, Arifwala, Pakpattan, Chiniot, Vehari, Lahore and Kasur areas. As for KPK, corn cultivation is scattered due to low land holdings. Approximately 65 percent of the maize in Pakistan has access to irrigation; the remainder is farmed under rain-fed conditions.

8 POTENTIAL TARGET CUSTOMERS / MARKETS

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

9 PROJECT COST SUMMARY

9.1 Project Economics

All the figures in this financial model have been calculated for estimated sales of Rs. 604.71 million 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 3: Project Economics

Description	Details
Internal Rate of Return (IRR)	27%
Payback Period (Yrs.)	4.33
Net Present Value	Rs. 172,137,771

9.2 Project Financing

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

Table 4: Project Financing

Description	Details
Total Equity (50%)	Rs. 152,463,935
Bank Loan (50%)	Rs. 152,463,935
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 5: Project Cost

Description	**Amount Rs.**
Land	12,000,000
Building / Infrastructure	57,888,949
Machinery & Equipment	201,111,840
Furniture & Fixtures	1,772,400
Office Vehicles	2,632,875
Office Equipment	2,223,100
Pre-Operating Costs	9,745,242
Training Costs	700,000
Total Capital Costs	**288,074,405**
Working Capital	
Equipment Spare Part Inventory	736,317
Raw Material Inventory	14,617,148
Cash	1,500,000
Total Working Capital	**16,853,465**
Total Investment	**304,927,871**

9.4 Space Requirement

The space requirement for the proposed Maize Starch and Related Products is estimated considering various facilities including management office, production hall, storage, open space, etc. Total 1 acre of land would be required for establishing this unit whose cost is estimated at Rs. 12 million. Details of space requirement and cost related to land & building is given below;

Table 6: Space Requirement

Description	Area (Sq.ft.)	Unit Cost (Rs.)	Total Cost (Rs.)
Management Office	1,500	2,500	3,750,000
Processing Area	27,667	1,600	44,267,200
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	6,000	50	300,000
Raw Material Store	500	1,500	750,000
External Development			1,000,000
Boundary Wall (Run. Feet)	835	1,600	1,335,749
Total Infrastructure			**57,888,949**

9.5 Machinery & Equipment Requirement

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

Table 7: Machinery & Equipment Requirement

Sr. No	Description	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
1	**Pretreatment Of Corn**			
1.1	Under The Hopper	1		
1.2	Bucket Elevator	1		
1.3	Permanent Magnet Cylinder	1		
1.4	Cylinder Cleaning Sieve	1		

1.5	Cyclone Dust Collector	1		
1.6	Air Lock	1		
1.7	Blower	1		
1.8	Plane Rotary Sieve	1		
1.9	Cyclone Dust Collector	1		
1.1	Air Lock	1		
1.11	Blower	1		
	Sub Total	**11**		
2	**Corn Steeping Unit**			
2.1	Destone Slot	1		
2.2	Corn Delivery Pump	1		
2.3	Corn Steeping Tank	10		
2.4	Liquid Circulation Pump	10		
2.5	Steam Heating Pipe	10		
2.6	Destone Slot	1		
2.7	Steeped Corn Delivery Pump	1		
2.8	Corn Conveying Water Tank	1		
	Sub Total	**35**		
3	**Grinding And Sieving Unit**			
3.1	Sands And Stone Collector	1		
3.2	Water Screen	1		
3.3	Corn Silo	1		
3.4	Process Water Buffer Tank	1		
3.5	Backwashing Pump	1		
3.6	Degerming Mill 1st Stage	1		
3.7	Storage Tank For 1st Stage	1		
3.8	Storage Tank For 1st Stage	1		
3.9	1st Germ Cyclone	1		
3.10	Gravity Bend Sieve	1		
3.11	Degerming Mill 2nd Stage	1		
3.12	Storage Tank For 2nd Stage	1		

3.13	Pump For 2nd Stage	1		
3.14	2nd Germ Cyclone	1		
3.15	Cyclone Underflow Storage Tank	1		
3.16	Slurry Pump	1		
3.17	Gravity Bend Sieve	1		
3.18	Impact Grinding	1		
3.19	Lubricating System	1		
3.20	Storage Tank After Impact Grinding	1		
3.21	Slurry Pump	1		
3.22	Gravity Bend Sieve	1		
3.23	Fiber Washing Sieve	6		
3.24	Fiber Washing Pump	7		
3.25	Fiber Washing Slot	1		
3.26	Thick Starch Slurry Storage Tank	1		
3.27	Thick Starch Slurry Delivery Pump	1		
3.28	Overflow Slurry Transition Tank	1		
3.29	Overflow Slurry Delivery Pump	1		
3.30	Sulfurous Acid Storage Tank	1		
	Sub Total	**41**		
4	**Starch Refining Unit**			
4.1	Desanding Cyclone	1		
4.2	Filter	1		
4.3	Separator	1		
4.4	Separator Underflow Transition Tank	1		
4.5	Concentrated Starch Slurry Tank	1		
4.6	Concentrated Slurry Pumps	1		
4.7	Separator	1		
4.8	Separator Underflow Transition Tank	1		
4.9	Concentrated Starch	1		

	Slurry Tank			
4.10	Concentrated Slurry Pumps	1		
4.11	Filter	1		
4.12	12 Stage Hydrocyclone	1		
4.13	Cyclone Underflow Transition Tank	1		
4.14	Finished Slurry Tank	1		
4.15	Finished Slurry Delivery Pump	1		
4.16	Washing Water Tank	1		
4.17	Washing Water Delivery Pump	1		
4.18	Washing Water Desander	1		
	Sub Total	**18**		
5	**Starch Dewatering And Drying Unit**			
5.1	Head Tank	1		
5.2	Peeler Centrifuge	1		
5.3	Transition Tank	1		
5.4	Delivery Pump	1		
5.5	Screw Conveyor	1		
5.6	Flash Dryer	1		
5.7	Feeder	1		
5.8	Lifting Machine	1		
5.9	Air Locker	1		
5.10	Blower	1		
5.11	Finished Screen			
5.12	Final Product Silo	1		
5.13	Computer Quantitative Packing Scale	1		
	Sub Total	**13**		
6	**Fiber Dewatering And Drying Unit**			
6.1	Dewatering Bend Sieve	1		
6.2	Belt Presser	1		
6.3	Tube Bundle Dryer	1		
6.4	Fan	1		

6.5	Grinder	1		
6.6	Computer Quantitative Packing Scale			
	Sub Total	**6**		
7	**Germ Washing And Drying Unit**			
7.1	Germ Washing Gravity Bend Sieve	1		
7.2	Germ Washing Tank	1		
7.3	Delivery Pump	1		
7.4	Germ Washing Gravity Bend Sieve	1		
7.5	Germ Wringer	1		
7.6	Tube Bundle Dryer	1		
7.7	Blower			
7.8	Washing Water Transition Tank	1		
7.9	Wash Water Pump	1		
7.10	Computer Quantitative Packing Scale	1		
	Sub Total	**10**		
8	**Process Water Unit**			
8.1	Process Water Tank	2		
8.2	Processing Water Pump	1		
8.3	Seperator Water Pump	1		
	Sub Total	**4**		
9	**Gluten Extraction And Drying Unit**			
9.1	Tank For Gluten Milk	1		
9.2	Gluten Delivery Pump	1		
9.3	Air Flotation Tank	1		
9.4	Transition Process Water Tank	1		
9.5	Process Water Pumps	1		
9.6	Two Flotation Tank	1		
9.7	Gluten Settling Tank	4		
9.8	Gluten Delivery Pump	1		
9.9	Van Filter	3		
9.10	Pulverizer	2		

9.11	Tube Bundle Dryer	1		
9.12	Fan	1		
9.13	Screw Conveyor	1		
9.14	Screw Conveyor	1		
9.15	Computer Quantitative Packing Scale	1		
	Sub Total	**21**		
10	**Sulphurous Acid Unit**			
10.1	Sulfur Burner	1		
10.2	SO2 Setting Chamber	1		
10.3	Cooler	1		
10.4	SO2 Absorption Tower	2		
10.5	FRP Fan	1		
10.6	Sulphurous Acid Storage Tank	1		
10.7	Sulphurous Acid Delivery Pump	1		
10.8	Process Water Pump	1		
10.9	Acid Pump	1		
	Sub Total	**10**		
11	**Corn Slurry Evaporation And Concentration Unit**			
11.1	Thin Corn Slurry Storage Tank			
11.2	Thin Corn Slurry Storage Pump	1		
11.3	Three-Effect Falling Film Evaporator			
11.4	Thick Corn Slurry Delivery Tank			
11.5	Thick Corn Slurry Delivery Pump	1		
11.6	Circulating Water Tank			
11.7	Lye Tank			
	Sub Total			
12	**Others**			
12.1	Platform Scale	1		
12.2	Portable Sealing Machine			

12.3	Floor Scale			
12.4	Gas-Distribution Cylinder			
	Sub Total			
13	Engineering And Supervision Of Installation, Commissioning			
14	Pipes , Valves, Installation, Materials And Instruments			
15	Electrical Equipments, Cables Etc.			
16	Workshop Equipments And Pipes Insulation			
	Imported Machinery & Equipment Cost (FOB)			143,100,000
	Freight For Karachi			108,000
	Custom Duty (Fob)		5%	7,155,000
	Sales Tax (Fob)		17%	24,327,000
	Additional Sales Tax (Fob)		3%	4,293,000
	Clearance And Transportation Charges			716,040
	Supervision In Commissioning & Installing			1,252,800
	Boiler	1	2,000,000	2,000,000
	Generator 900 KW	1	12,000,000	12,000,000
	Misc. Equipment (Water Pump, Reverse Osmosis Plant, Etc.)	1	2,500,000	2,500,000
	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
	Total Machinery & Equipment Cost			**201,111,840**

9.6 Furniture & Fixtures Requirement

Details of the furniture and fixture required for Maize Starch and Related Products Manufacturing Unit is given below:

Table 8: 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	20	20,000	400,000
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	-	20%	295,400
Total Furniture & Fixtures			**1,772,400**

9.7 Office Equipment Requirement

Following office equipment will be required for Maize Starch and Related Products Manufacturing unit.

Table 9: Office Equipment Requirement

Description	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
Laptop	4	100,000	400,000
Computers with LCD	16	60,000	960,000
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%	202,100
Total Office Equipment			**2,223,100**

9.8 Office Vehicle Requirement

Following office vehicles are required for Maize Starch and Related Products Manufacturing Unit;

Table 10: Office Vehicle Requirement

Description	Quantity	Unit Cost (Rs.)	Total Cost (Rs.)
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
Total Office Vehicles cost			**2,632,875**

9.9 Human Resource Requirement

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

Table 11: 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	3	40,000
Plant Operator	3	24,000
Manager Finance & Admin	1	60,000
Accounts officer	2	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	3	15,000

Officer		
Mechanical Foreman	1	30,000
Electrical Incharge	1	30,000
Mechanic	2	18,000
Electrician	2	18,000
Shift Supervisors	3	20,000
Store Keeper	2	20,000
Office coordinator	1	15,000
Packing Staff	6	15,000
Weigh Bridge Operator	2	15,000
Driver	2	15,000
Lifter Operator	3	15,000
Office Boy	2	15,000
Guard	4	18,000
Sweeper	3	15,000
Total	**59**	

Seasonal labor will be hired on daily wages. In year 1 the seasonal labor cost will be around PKR 13.81 million with 10% incremental effect each year.

9.10 Raw Material Requirement

Maize (Corn) is the main raw material for the proposed business, which will be procured either directly from the farms or from distributors of local grain market. Following table provides the details of maize required as raw material:

Table 12: Raw Material Requirement

Description	Maize Required Per Hour	Requirement for Year 1 (Tons)	Finished Goods Inventory (Tons)	Raw Material used in Year 1	Cost per Ton (Rs.)	Total Cost (Rs. In Millions)
Maize Required	2.083	13,500	(188)	13,313	25,088	333.99
Freight in		13,500	(188)	13,313	600	7.99
Other Material (Mon glyceride, Glycerol mono-Palmitate, antioxidants, sodium salts, SO2, Sulfurous Acid, etc.)		11,045		11,045	800	8.84
Total						**350.81**

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 said expenses are estimated to be around Rs. 9.22 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 3: Revenue Generation – Year 1

Description	Operational Capacity 75% - in Year 1 (Tons)	Finished Goods Inventory (Tons)	Production Sold in Year 1 (Tons)	Sale Price Per Ton (Rs.)	Revenue (Rs.)
Maize Starch	8,100	(113)	7,988	75,000	599,062,500
Fiber	1,241	(17)	1,223	2,000	2,446,542
Germ	756	(11)	746	1,200	894,689
Gluten	524	(7)	517	2,800	1,447,616
Steep Water	579	(8)	571	1,500	857,103
Total	**11,200**	**(156)**	**11,045**		**604,708,450**

10 USEFUL WEB LINKS

Small & Medium Enterprises Development Authority (SMEDA)	www.smeda.org.pk
Government of Pakistan	www.pakistan.gov.pk
Ministry of Industries & Production	www.moip.gov.pk
Ministry of Education, Training & Standards in Higher Education	http://moptt.gov.pk
Government of Punjab	www.punjab.gov.pk
Government of Sindh	www.sindh.gov.pk
Government of Khyber Pakhtunkhwa	www.khyberpakhtunkhwa.gov.pk
Government of Balochistan	www.balochistan.gov.pk
Government of Gilgit Baltistan	www.gilgitbaltistan.gov.pk
Government of Azad Jamu Kashmir	www.ajk.gov.pk

Trade Development Authority of Pakistan (TDAP)	www.tdap.gov.pk
Security Commission of Pakistan (SECP)	www.secp.gov.pk
Federation of Pakistan Chambers of Commerce and Industry (FPCCI)	www.fpcci.com.pk
State Bank of Pakistan (SBP)	www.sbp.org.pk
Punjab Small Industries Corporation	www.psic.gop.pk
Sindh Small Industries Corporation	www.ssic.gos.pk
Punjab Vocational Training Council (PVTC)	www.pvtc.gop.pk
Technical Education and Vocational Training Authority (TEVTA)	www.tevta.org
Punjab Industrial Estates (PIE)	www.pie.com.pk
Faisalabad Industrial Estate Development and Management Company (FIEDMC)	www.fiedmc.com.pk
Pakistan Horticulture Development Export Company (PHDEC)	ww.phdec.org
Ministry of National Food Security and Research (MNFSR)	www.mnsfr.gov.pk
Pakistan Agriculture Research Council (PARC)	www.parc.gov.pk
National Agriculture Research Council (NARC)	www.narc.gov.pk
Agriculture University of Faisalabad (UAF)	www.uaf.edu.pk
Agriculture Marketing Information Service	www.amis.pk
Ayub Agricultural Research Institute (AARI), Faisalabad	www.aari.punjab.gov.pk

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	604,708,450	718,893,303	840,249,488	978,687,977	1,136,411,669	1,315,893,219	1,448,488,436	1,593,337,279	1,752,671,007	1,927,938,108
Cost of sales										
Maize Cost including Freight in	341,975,760	406,549,774	475,179,332	553,469,304	642,665,477	744,166,191	819,151,666	901,066,832	991,173,515	1,090,290,867
Other Material (Monoglyceride, Glycerol mono-Palmitate, antioxidants,	8,835,802	10,504,234	12,277,451	14,300,269	16,604,876	19,227,401	21,164,839	23,281,323	25,609,456	28,170,401
Operation costs 1 (direct labor)	9,869,000	10,999,244	12,099,786	13,310,370	14,642,002	16,106,791	17,729,782	19,502,761	21,453,037	23,598,340
Operating costs 2 (machinery maintenance)	2,208,951	2,626,058	3,069,363	3,575,067	4,151,219	4,806,850	5,291,210	5,820,331	6,402,364	7,042,600
Direct electricity including Generator and Boiler expense	110,689,497	131,590,584	153,804,355	179,144,975	208,015,674	240,869,064	265,140,096	291,654,106	320,819,516	352,901,468
Packing Cost	8,835,802	10,504,234	12,277,451	14,300,269	16,604,876	19,227,401	21,164,839	23,281,323	25,609,456	28,170,401
Daily Wages	13,805,941	16,412,865	19,183,517	22,344,170	25,945,118	30,042,815	33,070,061	36,377,067	40,014,774	44,016,252
Total cost of sales	496,220,752	589,186,994	687,891,255	800,444,423	928,629,241	1,074,446,514	1,182,712,494	1,300,983,743	1,431,082,118	1,574,190,329
Gross Profit	108,487,697	129,706,310	152,358,233	178,243,554	207,782,427	241,446,705	265,775,942	292,353,536	321,588,890	353,747,779
General administration & selling expenses										
Administration expense	8,124,000	8,936,400	9,830,040	10,813,044	11,894,348	13,083,783	14,392,162	15,831,378	17,414,515	19,155,967
Administration benefits expense	2,031,000	2,234,100	2,457,510	2,703,261	2,973,587	3,270,946	3,598,040	3,957,844	4,353,629	4,788,992
Electricity expense	2,453,760	2,699,136	2,969,050	3,265,955	3,592,550	3,951,805	4,346,986	4,781,684	5,259,852	5,785,838
Water expense	60,000	66,000	72,600	79,860	87,846	96,631	106,294	116,923	128,615	141,477
Travelling expense	2,031,000	2,234,100	2,457,510	2,703,261	2,973,587	3,270,946	3,598,040	3,957,844	4,353,629	4,788,992
Communications expense (phone, fax, mail, internet, etc.)	1,624,800	1,787,280	1,966,008	2,162,609	2,378,870	2,616,757	2,878,432	3,166,276	3,482,903	3,831,193
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.)	812,400	893,640	983,004	1,081,304	1,189,435	1,308,378	1,439,216	1,583,138	1,741,452	1,915,597
Promotional expense	6,047,084	7,188,933	8,402,495	9,786,880	11,364,117	13,158,932	14,484,884	15,933,373	17,526,710	19,279,381
Professional fees (legal, audit, consultants, etc.)	3,023,542	3,594,467	4,201,247	4,893,440	5,682,058	6,579,466	7,242,442	7,966,686	8,763,355	9,639,691
Depreciation expense	24,154,066	24,154,066	24,154,066	24,154,066	24,154,066	24,598,386	24,598,386	24,598,386	24,598,386	24,598,386
Amortization of pre-operating costs	1,949,048	1,949,048	1,949,048	1,949,048	1,949,048	-	-	-	-	-
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
Subtotal	53,433,851	56,965,635	60,786,890	65,064,471	69,851,430	73,702,138	78,620,602	84,015,824	89,950,567	96,478,786
Operating Income	55,053,846	72,740,674	91,571,343	113,179,084	137,930,998	167,744,567	187,155,340	208,337,713	231,638,322	257,268,993
Gain / (loss) on sale of office equipment	-	-	-	-	889,240	-	-	-	-	
Gain / (loss) on sale of office vehicles	-	-	-	-	1,053,150	-	-	-	-	
Earnings Before Interest & Taxes	55,053,846	72,740,674	91,571,343	113,179,084	139,873,388	167,744,567	187,155,340	208,337,713	231,638,322	257,268,993
Interest on short term debt	866,981	866,981	-	-	-	-	-	-	-	-
Interest expense on long term debt (Project Loan)	20,165,208	17,114,544	13,636,787	9,672,144	5,152,450	-	-	-	-	-
Interest expense on long term debt (Working Capital Loan)	652,612	-	-	-	-	-	-	-	-	-
Subtotal	21,684,801	17,981,525	13,636,787	9,672,144	5,152,450	-	-	-	-	-
Earnings Before Tax	33,369,045	54,759,149	77,934,556	103,506,940	134,720,937	167,744,567	187,155,340	208,337,713	231,638,322	257,268,993
Tax	10,901,665	18,388,202	26,499,594	35,449,928	46,374,827	57,933,098	64,726,868	72,140,699	80,295,912	89,266,647
NET PROFIT/(LOSS) AFTER TAX	**22,467,380**	**36,370,948**	**51,434,962**	**68,057,012**	**88,346,110**	**109,811,469**	**122,428,472**	**136,197,014**	**151,342,410**	**168,002,346**

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
Assets											
Current assets											
Cash & Bank	1,500,000	-	21,297,820	58,784,224	106,842,286	160,659,137	277,661,553	404,510,753	544,427,662	695,823,852	985,363,087
Accounts receivable		49,702,064	54,394,593	64,074,361	74,750,855	86,921,903	100,779,653	113,604,726	125,006,536	137,507,190	151,257,909
Finished goods inventory		6,989,025	8,190,262	9,561,857	11,125,868	12,907,063	14,933,239	16,426,562	18,069,219	19,876,141	21,863,755
Equipment spare part inventory	736,317	919,120	1,127,991	1,379,529	1,681,944	2,044,965	2,363,576	2,729,930	3,153,069	3,641,795	-
Raw material inventory	14,617,148	19,114,975	24,575,946	31,487,554	40,218,238	51,227,209	62,027,998	75,053,877	90,815,192	109,886,382	-
Total Current Assets	16,853,465	76,725,185	109,586,612	165,287,526	234,619,191	313,760,277	457,766,018	612,325,848	781,471,678	966,735,359	1,158,484,751
Fixed assets											
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	57,888,949	54,994,501	52,100,054	49,205,606	46,311,159	43,416,712	40,522,264	37,627,817	34,733,369	31,838,922	28,944,474
Machinery & equipment	201,111,840	181,000,656	160,889,472	140,778,288	120,667,104	100,555,920	80,444,736	60,333,552	40,222,368	20,111,184	-
Furniture & fixtures	1,772,400	1,595,160	1,417,920	1,240,680	1,063,440	886,200	708,960	531,720	354,480	177,240	-
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	2,223,100	1,778,480	1,333,860	889,240	444,620	2,837,302	2,269,841	1,702,381	1,134,921	567,460	-
Total Fixed Assets	277,629,164	253,475,097	229,321,031	205,166,964	181,012,898	163,936,405	139,338,019	114,739,632	90,141,246	65,542,860	40,944,474
Intangible assets											
Pre-operation costs	9,745,242	7,796,193	5,847,145	3,898,097	1,949,048	-	-	-	-	-	-
Legal, licensing, & training costs	700,000	630,000	560,000	490,000	420,000	350,000	280,000	210,000	140,000	70,000	-
Total Intangible Assets	10,445,242	8,426,193	6,407,145	4,388,097	2,369,048	350,000	280,000	210,000	140,000	70,000	-
TOTAL ASSETS	**304,927,871**	**338,626,475**	**345,314,788**	**374,842,587**	**418,001,138**	**478,046,682**	**597,384,036**	**727,275,481**	**871,752,924**	**1,032,348,219**	**1,199,429,225**
Liabilities & Shareholders' Equity											
Current liabilities											
Accounts payable		30,662,023	36,606,904	43,018,622	50,403,684	58,906,335	68,432,221	75,895,194	84,175,623	93,428,508	92,507,167
Short term debt	-	10,786,394	-	-	-	-	-	-	-	-	-
Other liabilities											
Total Current Liabilities	-	41,448,417	36,606,904	43,018,622	50,403,684	58,906,335	68,432,221	75,895,194	84,175,623	93,428,508	92,507,167
Other liabilities											
Long term debt (Project Loan)	144,037,203	122,246,744	97,405,621	69,086,740	36,803,217	-	-	-	-	-	-
Long term debt (Working Capital Loan)	8,426,733	-	-	-	-	-	-	-	-	-	-
Total Long Term Liabilities	152,463,935	122,246,744	97,405,621	69,086,740	36,803,217	-	-	-	-	-	-
Shareholders' equity											
Paid-up capital	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935	152,463,935
Retained earnings		22,467,380	58,838,328	110,273,290	178,330,302	266,676,411	376,487,880	498,916,352	635,113,366	786,455,776	954,458,123
Total Equity	152,463,935	174,931,315	211,302,263	262,737,225	330,794,237	419,140,347	528,951,816	651,380,287	787,577,301	938,919,711	1,106,922,058
TOTAL CAPITAL AND LIABILITIES	**304,927,871**	**338,626,475**	**345,314,788**	**374,842,587**	**418,001,138**	**478,046,682**	**597,384,036**	**727,275,481**	**871,752,924**	**1,032,348,219**	**1,199,429,225**

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
Operating activities											
Net profit		22,467,380	36,370,948	51,434,962	68,057,012	88,346,110	109,811,469	122,428,472	136,197,014	151,342,410	168,002,346
Add: depreciation expense		24,154,066	24,154,066	24,154,066	24,154,066	24,154,066	24,598,386	24,598,386	24,598,386	24,598,386	24,598,386
amortization of pre-operating costs		1,949,048	1,949,048	1,949,048	1,949,048	1,949,048	-	-	-	-	-
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		(49,702,064)	(4,692,528)	(9,679,769)	(10,676,493)	(12,171,049)	(13,857,750)	(12,825,073)	(11,401,811)	(12,500,654)	(13,750,719)
Finished goods inventory		(6,989,025)	(1,201,238)	(1,371,595)	(1,564,011)	(1,781,195)	(2,026,175)	(1,493,324)	(1,642,656)	(1,806,922)	(1,987,614)
Equipment inventory	(736,317)	(182,804)	(208,870)	(251,538)	(302,415)	(363,021)	(318,611)	(366,354)	(423,139)	(488,726)	3,641,795
Raw material inventory	(14,617,148)	(4,497,827)	(5,460,971)	(6,911,608)	(8,730,684)	(11,008,970)	(10,800,789)	(13,025,880)	(15,761,314)	(19,071,190)	109,886,382
Accounts payable		30,662,023	5,944,882	6,411,717	7,385,062	8,502,651	9,525,885	7,462,973	8,280,429	9,252,885	(921,341)
Cash provided by operations	(15,353,465)	17,930,798	56,925,337	65,805,284	80,341,585	97,697,641	117,002,416	126,849,201	139,916,909	151,396,190	289,539,235
Financing activities											
Project Loan - principal repayment		(21,790,459)	(24,841,123)	(28,318,880)	(32,283,524)	(36,803,217)	-	-	-	-	-
Working Capital Loan - principal repayment		(8,426,733)	-	-	-	-	-	-	-	-	-
Short term debt principal repayment		-	(10,786,394)	-	-	-	-	-	-	-	-
Additions to Project Loan	144,037,203	-	-	-	-	-	-	-	-	-	-
Additions to Working Capital Loan	8,426,733	-	-	-	-	-	-	-	-	-	-
Issuance of shares	152,463,935	-	-	-	-	-	-	-	-	-	-
Purchase of (treasury) shares											
Cash provided by / (used for) financing activities	304,927,871	(30,217,191)	(35,627,517)	(28,318,880)	(32,283,524)	(36,803,217)	-	-	-	-	-
Investing activities											
Capital expenditure	(288,074,405)	-	-	-	-	(7,077,573)	-	-	-	-	-
Acquisitions											
Cash (used for) / provided by investing activities	(288,074,405)	-	-	-	-	(7,077,573)	-	-	-	-	-
NET CASH	**1,500,000**	**(12,286,394)**	**21,297,820**	**37,486,404**	**48,058,061**	**53,816,851**	**117,002,416**	**126,849,201**	**139,916,909**	**151,396,190**	**289,539,235**

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 Maize per Ton including Freight in	Rs. 25,688
Packing Cost Per Ton[1]	Rs. 800
Other Material (Mon glyceride, Glycerol mono Palmitate, antioxidants, sodium salts, SO2,Sulfurous Acid, etc.)	PKR 800
Production Cost Growth Rate	10%

12.3 Revenue Assumptions

Description	Details
Maize Starch Sales Price Per Ton	75,000
Growth is Sales Price	10%

[1] Inner Liner LDP Bag with Outer PP Bag (Food Grade) will be used as Packing

Days Operational / Year	360
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