

# Pre-Feasibility Study

## MAIZE STARCH AND RELATED PRODUCTS



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## 1 INTRODUCTION

Pakistan's economy has delivered yet another year of solid economic growth in 2005-06 in the midst of an extraordinary surge in oil prices and the devastating earthquake of October 8, 2005. Pakistani corporate and consumers continue to be the bright spot. Consumer spending remained buoyant and investors remained upbeat on the strength and sustainability of the current growth momentum, despite higher energy prices and natural calamities.

With economic growth at 6.6 % in 2005-06, Pakistan's economy has grown at an average rate of almost 7.0 % per annum during the last four years (2002/03 – 2005/06) and over 7.5 % in the last three years (2003/04 –2005/06). The growth momentum that Pakistan has sustained for the last four years is underpinned by dynamism in industry, agriculture and services, and the emergence of a new investment cycle with investment rate reaching new height at 20.0 % of GDP.

Therefore, the pre-requisites for sustained economic growth appear to have gained a firm footing during the last four years. The outgoing fiscal year (2005-06) has been an extraordinary year for the economy of Pakistan. At the very onset of the year the economy faced headwinds from rising oil prices, hovering around \$ 70 – 75 per barrel and putting severe strains on the country's trade balance and the budget. The massive earthquake of October 8, 2005 also caused extensive damage to property, infrastructure, school, hospital etc. and a loss of over 70,000 human lives.

Growth has remained buoyant with real GDP growing at 6.6 % in 2005-06 as against the revised estimates of 8.6 % last year and the 7.0 % target for the year. The key drivers of this year's growth have been the service sectors and industry. Large-scale manufacturing grew weaker-than-expected by 9.0 % as against 15.6 % of last year and 14.5 % target for the year, perhaps exhibiting signs of moderation on account of higher capacity utilization on the one hand and a strong base effect on the other.

The services sector continued to perform strongly at 8.8 %. Construction also continued to show strong performance, partly due to the activity in the private housing market, spending on physical infrastructure, and reconstruction activities in the earthquake affected areas. Consumer spending remained strong and investment spending gained further traction.

The most important achievements of this year include:

- (i) a solid pace of economic expansion in an extra-ordinary environment, underpinned by weaker-than-targeted performance of large-scale manufacturing and robust performance of services;
- (ii) three or four years of strong economic growth has positioned Pakistan as one of the fastest growing economies in Asian region;
- (iii) real per capita GDP grew by 4.7 % and per capita income in current dollar term was up by 14.2 %, reaching \$ 847.
- (iv) a sharp pick up in overall investment reaching at a new height of 20 % of GDP and most notably, private sector investment remained buoyant owing to a rare confluence of various positive developments in the economy;
- (v) a robust consumer spending ably supporting the ongoing growth momentum;

- (vi) the credit to private sector continue to rise at the back of improving investment climate, the private sector has borrowed over Rs.1100 billion in less than three years (2003/04 and until April 22, 2006) while their cumulative borrowing in the previous eighteen years (1984 – 2003) have been Rs.921 billion;
- (vii) a significant abatement of price pressure indicating a steady deceleration in overall inflation, especially food inflation, the overall inflation decelerating from 9.0 % in July 2005 to 6.2 % in July 2006 and food inflation decelerating from 9.7 % to 3.6 % in the same period;
- (viii) energy consumption, particularly electricity and gas continue to rise at double-digit level, reflecting strong buoyancy in the economy;
- (ix) despite pressure emanating from the earthquake-related expenditures the underlying fiscal deficit performed better than the target;
- (x) the Central Board of Revenue (CBR) collecting taxes more than the target;
- (xi) a sharp reduction in public and external debt burden;
- (xii) the record public sector development program (PSDP) remained on track despite massive spending on earthquake related activities;
- (xiii) exports and imports continue to grow at high double-digit level;
- (xiv) workers' remittances at around \$ 4.5 billion continue to remain one of the largest sources of external finance for Pakistan;
- (xv) a continued accumulation of foreign exchange reserves;
- (xvi) exchange rate continued to remain stable despite extra-ordinary increase in imports and deterioration in trade balance;
- (xvii) privatization program achieved unprecedented success with the strategic sale of some difficult and complicated public sector units;
- (xviii) highest ever foreign direct investment flows, exceeding \$ 3.0 billion;
- (xix) The successful launch of new 10 year and 30 year 144A sovereign bond in international debt capital markets, totaling \$ 800 million and reflecting a vote of confidence by the international investor community on Pakistan's economic policies, reform agenda and future outlook.<sup>1</sup>

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<sup>1</sup> Economic Survey 2005 -2006

## 2 AGRICULTURAL SECTOR

Agriculture is the mainstay of Pakistan's economy. Nearly 22 % of total output (GDP) and 44.8 % of total employment is generated in agriculture, whereas, 65.9 % of country's population living in rural areas is directly or indirectly linked with agriculture for their livelihood. Agriculture contributes to growth as a supplier of raw materials to industry as well as market for industrial products. Whatever happens to agriculture is bound to affect not only the country's growth performance but to a large segment of the country's population as well. It also substantially shares in Pakistan's exports.

### 2.1 Agricultural Growth

Over the last five years agriculture growth has witnessed mixed trends. During the first two years (2000-01 and 2001-02), the country experienced the crippling drought, which badly affected its agriculture and eventually overall growth in agriculture turned negative for these two years. In the preceding years (2002-03 to 2004-05), relatively better availability of irrigation water had positive impact on overall agricultural growth and this sector exhibited modest to strong recovery.

**Table 1: Agriculture Growth (%)**

Year	Agriculture	Major Crops	Minor Crops
2000-01	-2.2	-9.9	-3.2
2001-02	-0.1	-2.5	-3.7
2002-03	4.1	6.9	0.4
2003-04	2.3	1.9	4.0
2004-05	6.7	17.8	3.0
2005-06 (P)	2.5	-3.6	1.6
P= Provisional.		Source: Federal Bureau of Statistics	

The performance of agriculture during the fiscal year 2005-06 has been weak. Against the target of 4.2 % and last year's achievement of 6.7 %, overall agriculture grew by 2.5 % in 2005-06 on the back of poor showing of major crops and forestry, and weaker performance of minor crops and fishery.

### 2.2 Crop Situation

There are two principal crop seasons in Pakistan, namely the "Kharif", the sowing season of which begins in April- June and harvesting during October-December; and the "Rabi", which begins in October-December and ends in April-May.

Rice, sugarcane, cotton, maize, mong, mash, bajra and jowar are "Kharif" crops while wheat, gram, lentil (masoor), tobacco, rapeseed, barley and mustard are "Rabi" crops. Major crops, such as, wheat, rice, cotton and sugarcane account for 90.1 % of the value added in the major crops. The value added in major crops accounts for 35.2 % of the value added in overall agriculture. Thus, the four major crops (wheat, rice, cotton, and sugarcane), on average, contribute 31.7 % to the value added in overall agriculture.

The minor crops account for 12.3 % of the value added in overall agriculture. Livestock contribute almost 50 % to agriculture – much more than the combined contribution of major and minor crops (47.5%).

## 2.3 Maize

Maize is third important cereal/crop after wheat and rice and has a great potential of processing due to its high nutritive value and commercial uses. Maize (also known as corn) is 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. Starch is produced from maize than any other crop. Maize is the most important raw material for industrial starch.

Maize accounts for 4.8% of the total cropped area and 3.5% of the value of agricultural output. It is planted on an estimated area of 0.9 million hectare with an annual production of 1.3 million tonnes.

### 2.3.1 Area and Production

The table below shows that area under cultivation during the period.

**Table 2: Production of Major Crops (000 tons)<sup>2</sup>**

Year	Cotton (000 bales)	Sugarcane	Rice	Maize	Wheat
2001-02	10,613	48,042	3,882	1,664	18,226
2002-03	10,211	52,056	4,478	1,737	19,183
2003-04	10,048	53,419	4,848	1,897	19,500
2004-05	14,265	47,244	5,025	2,797	21,612
2005-06 (Jul-Mar)	12,417	44,312	5,547	3,560	21,700

**Table 3: Area & Production of Minor Crops**

Crops	2004-05		2005-06(P)		% Change in production
	Area (000 hectares)	Production (000 tons)	Area (000 hectares)	Production (000 tons)	
<b>KHARIF</b>					
Maize	982	2,797	1,022	3,560	27.3
Bajra	343	193	438	221	14.5

<sup>2</sup> Ministry of Food, Agriculture & Livestock, Federal Bureau of Statistics



Jawar	308	186	250	153	-17.7
<b>RABI</b>					
Gram	1,094	868	1,064	527	-39.3
Barley	93	92	87	87	-5.4
Rapeseed & Mustard	243	203	234	188	-7.4
Tobacco	51	101	57	120	18.8

The bulk (97%) of the total production comes from two major provinces, NWFP and Punjab, NWFP accounting for 57% of the total area and 68% of total production. Punjab contributes 38% acreage with 30% of total maize grain production. Very little maize 2-3% is produced in the province of Sindh and Balochistan. Though not included in Pakistan official statistics maize is an important crop of AJK with about 0.122 million hectare of maize being planted during kharif. Similarly a very growing and high yielding sector of maize, the spring maize area and production in Punjab is not accounted for, which covers around 0.070 million ha with about 50 million tones of maize grain being produced.<sup>3</sup>

### 2.3.2 Production Environment

Approximately 65% of the maize in Pakistan has access to irrigation; the remainder is farmed under strictly rained condition. 84 % of the maize production in Pakistan is concentrated in two principal geographic clusters: 11 districts in NWFP/Northern Punjab and 9 districts in the central Punjab.

Maize in Pakistan is cultivated as a multipurpose food and forage crop, generally by resource poor farmers using marginal land, few purchased inputs, with significant portions of harvest distant for home/farm consumption.

Pakistan is facing a number of environmental threats, of which, land degradation appears to be the worst. According to a study, the severity and cost of land degradation in South Asia that includes Iran and Afghanistan is approximately 2 % of the region's GDP and 7 % of the value of its agricultural output. Pakistan faces a similar situation. In Pakistan, land degradation mainly encompasses deforestation and desertification, salinity, soil erosion, water-logging, depletion of soil fertility and negative nutrient balances.

### 2.3.3 World Top Ten Maize Producers

Maize is one of the most important cereal crops in the world agricultural economy and is grown in many countries. The Top ten producing are as follows.<sup>4</sup>

<sup>3</sup> Pakistan Statistics

<sup>4</sup> UN Food & Agriculture Organization

<b>World Top Ten Maize Producers – 2005 (million metric ton)</b>	
 <a href="#">United States</a>	280
 <a href="#">People's Republic of China</a>	131
 <a href="#">Brazil</a>	35
 <a href="#">Mexico</a>	21
 <a href="#">Argentina</a>	20
 <a href="#">Indonesia</a>	15
 <a href="#">France</a>	13
 <a href="#">India</a>	12
 <a href="#">South Africa</a>	12
 <a href="#">Italy</a>	11
<b>World Total</b>	<b>692</b>

#### **2.4 Land Degradation – A threat to Agriculture**

Pakistan is facing a number of environmental threats, of which, land degradation appears to be the worst. According to a study, the severity and cost of land degradation in South Asia that includes Iran and Afghanistan is approximately two per cent of the region's GDP and seven per cent of the value of its agricultural output. Pakistan faces a similar situation.

In Pakistan, land degradation mainly encompasses deforestation and desertification, salinity and sodality, soil erosion, water-logging, depletion of soil fertility and negative nutrient balances.

### 3 MAIZE STARCH AND RELATED PRODUCTS

Maize is one of the important crops of Pakistan and has a great potential of processing due to its high nutritive value and commercial uses. 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. Starch is [produced](#) from maize than any other crop.

The Composition of maize is as follow:

**Table 4: Composition of Maize**

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

#### 3.1 Starch

World corn crop is 600 million ton per annum. Nearly 10% 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 pharmaceutical industries. The derivatives of maize starch included glucose or corn syrup, corn sugar and industrial alcohol which are employed in different industries.

Starch is the major carbohydrate reserve in plant tubers and seed endosperm where it is found as granules, each typically containing several million amylopectin molecules accompanied by a much larger number of smaller amylose molecules. By far the largest source of starch is corn (maize) with other commonly used sources being wheat, potato, tapioca and rice. Amylopectin (without amylose) can be isolated from 'waxy' maize starch whereas amylose (without amylopectin) is best isolated after specifically hydrolyzing the amylopectin with pullulanase. Genetic modification of starch crops has recently led to the development of starches with improved and targeted functionality.

##### 3.1.1 Structural unit

Starch consists of two types of molecules, amylose (normally 20-30%) and amylopectin (normally 70-80%). Both consist of polymers of Alpha-D-glucose units in the conformation. In amylose these are linked  $-(1 \rightarrow 4)-$ , with the ring oxygen atoms all on the same side, whereas in amylopectin about one residue in every twenty or so is also linked  $-(1 \rightarrow 6)-$  forming branch-points. The relative proportions of amylose to amylopectin and  $-(1 \rightarrow 6)-$  branch-points both depend on the source of the starch, *e.g.* amylomaizes contain over 50% amylose whereas 'waxy' maize has almost none (~3%).

### 3.2 Corn Oil

In wet milling industries gluten feeds and corn oil are the main by-products. Corn products are mainly consist of the endosperm without separation of starch from gluten such a cornmeal, homing. In the dry milling, corn oil may not be produced as by product depending upon the size of the plant. Corn oil contains linoleum acid and oleic acid as the main fatty acids. It is used for salad purposes, margarine, cake and biscuit making as well as for greasing of backing pans etc. There is specific demand and supply gap available

### 3.3 Corn Gluten

It is a by-product of the industrial processing of corn, with specific properties. The protein content generally ranges between 60 and 70 %, and these are mainly readily digestible proteins which make corn gluten a valuable ingredient in poultry feed. Besides in vitamins (xanthophylls and carotene), corn gluten is also rich in essential amino acids, playing thus a significant role in growing poultry. It can also be used in the foodstuffs industry (Sodium glutamines, an additive for spices, is obtained by the hydrolysis of gluten).

### 3.4 Corn Fiber

It is a byproduct of the industrial processing of corn, with specific properties. Corn fiber is mainly rich in cellulose, but also in mineral matters, vitamins and fats, being thus a valuable ingredient in cattle feed, particularly for the animals with the shorter digestive tract.

### 3.5 Regulations to Starch and Related Products

The current Laws, Regulations and Government Duties on starch and other related products are as follows:

#### 3.5.1 Custom Duties and Taxes

Chapter 11 of Custom Tariff and Trade Controls lists the tariff applicable to maize starch and related products, which are as follows;

**Table 5: Custom Duties & Taxes**

HS Code	Description	CD%	ST%	Unit
11.08	<b>Starches; inulin.</b>			
	Starches:			
1108.1200	Maize (corn) starch	20	15	Kg.

However the Central Board of Revenue (CBR) through S.R.O. 525(I)/2006 dated June 5, 2006 in suppression of SRO 621(I) 2005 has mentioned a number of goods on which sales tax shall be charged at the rate of zero per cent on the supply and import thereof and Maize (corn) starch having HS code 1108.1200 is one of them.

### 3.5.2 Quality and Other Standards

At the moment there are two general, voluntary, standards with which manufacturers can comply: ISO14001 and ISO 9000 and Safe Quality Food (SQF) has recently been introduced in the European Union.

### 3.5.3 Environmental Regulation

In order to regulate and improve the country environment, the Government of Pakistan established policies and administrative framework in early 1980s for environmental protection and created the following agencies and laws.

- Provisional Environment Protection Department.
- Environmental Protection Act 1997.
- Pakistan environmental Protection Agency (PEPA).

Pakistan environmental Protection Agency (PEPA) developed and also enforcing the National Environmental Quality Standards (NEQS). As a policy it has been decided that in future any industrial unit, which does not include a sound environmental protection and management plan, would not be sanctioned.

## 4 MARKET ANALYSIS

There are various industries in Pakistan which consume starch and other maize based products. Due to multiple use of starch, its demand is rapidly growing. The largest consuming industry of starch is Textile Industry. With the rapid growth in textile industry, the consumption of starch has been increasing gradually.

Like textile sector, the food and allied consuming industrial capacity has also quadruplicated over the period. Food industries include Biscuit, Confectionery, Feed, Chinese Food, Glucose & Fructose manufacturing industries.

### 4.1 Starch Industry

As mentioned above the maize crop categorized as cereal having 72% starch in the grain. Production of starch is the major objective of wet-milling industry. The present status and projected potential for the wet-milling of corn in Pakistan is as given below:

- |   |                  |
|---|------------------|
| • Current annual utilization of maize in starch industry. | 0.300 Million T. |
| • Maximum, potential utilization by year 2005             | 0.350 Million T. |

### 4.2 Market Supply

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. Starch is widely used in textile, paper, paper board, soap, cosmetics, leather rayon industries where as glucose is used by the food industries, pharmaceuticals, confectionery, sweet meats, fruit preservation etc.

Presently there are 6 main maize processing units having a total installed milling capacity of 136500 tones as detailed in the table below:

**Table 6: Installed Capacity of Maize Starch**

Sr. no	Name & Location	Milling Capacity (Tones)	Annual Installed Capacity (Tones)					
			Starch	Liquid Glucose	Corn feed	Gluten	Cake	Oil
1	Rafhan Maize Products, Faisalabad	70,000	15,000	6,000	4,800	3,000	900	900
2	Glaxo Lab Lahore	16,500		16,500	2,400	1,500	600	600
3	Pakistan Corn, Products	70,000	3,600	1,800	1,200	600	240	240
4	Swat Corn Products	17,500	13,600		2,100	1,200	300	300
5	Maize Products Gujranwala	8,000	4,500		1,200	600	300	300
6	Fauji Corn Complex Jahangira	17,500	6,700	3,500	2,700	1,700	400	400
<b>Total</b>		<b>136,500</b>	<b>43,400</b>	<b>27,800</b>	<b>14,400</b>	<b>8,600</b>	<b>2,740</b>	<b>2,740</b>

### 4.3 Market Demand

The major product of maize is starch. With the rapid growth in textile mills, the consumption of starch has increased by 4 times. The present production of starch does not meet the demand. Following table shows the existing demand of starch and starch based consuming industry and projected demand up to 1993.

**Table 7: Existing & Projected Demand of Starch (tones)**

Serial	Industry	Existing Demand	Projected Demand
1	Textile industry	53,934	71,785
2	Jute Industry	363	444
3	Paper & Board & Packing paper	15,300	20,364
4	Liquid Glucose	76,716	93,980

5	Dextrose Powder	10,000	12,250
6	Biscuit, Confectionery Custard powder, Bakery and other food	15,000	18,895
7	Fructose sanctioned capacity	81,000	101,943
8	Thinner filler binder stabilizer adhesive Glues remoistening gum	5,000	6,298
9	Safety match	3,000	3,674
10	Cosmetics	500	672
11	Wood, metal costing	500	612
12	Chinese Carrier in printing surgical dressing, dyes and explosives.	500	6,298
13	Cheese food, fast food, soups etc.	3,000	3,779
14	Dry cleaning Plants laundries	5,000	6,298
15	Misc. consumption of starch	1,000	1,200
<b>TOTAL</b>		<b>270,813</b>	<b>348,492</b>

#### 4.3.1 Market for Maize Starch and Related Products

The grain is quite nutritious with a high %age of easily digested carbohydrates fats and proteins and hardly and deleterious substances. Besides food, maize and maize products have numerous industrial uses such as in adhesives, explosives, soaps and for textile sizing etc.

- **Textile Industry:** In Weaving Units during sizing it is used. Size is added to yarn to improve the efficiency of weaving performance and is removed in the first wet processing operation. Of all the starches available commercially, Maize Starch best fulfills the above requirements of sizing.

Starch is also used in the textile finishing operation to change the stiffness, feel or handle of the fabrics, to modify the appearance by filling the interstices of the weave and to add weight. Fabrics finished with starch alone are quite stiff and the finishing solutions usually contain a relatively large amount of film modifying materials. Starch is also --- conjunction with thermoplastic or the thermosetting resins to obtain permanent finish. The composition of solutions used to modify the hand of fabric construction and fabric properties desired.

Back filling is the process of applying a mixture of starch or starches and filler such as talc or clay to the back of fabrics, without obscuring the weave on the face of the fabrics. This type of finish increases the stiffness and the capacity of the fabric by filling the interstices of the weave with starch mixture. Fabrics thus prepared are used in window shades and in binding for books.

- Pharmaceutical uses:** Maize products also manufacture starch suitable for pharmaceutical uses such as binder or disintegrating agent in tablets under the trade name 'Mapropharm' which fulfills all the specifications as per pharmacopoeia. Dextrose anhydrous is generally manufactured from starch, basically maize starch. It is manufactured by vacuum evaporation of the dextrose solution and by crystallization. Dextrose is less sweet than sugar. In ice-cream, sherbets, etc. large amount of dextrose can be used to increase the solid substance without unduly increasing the sweetness. Moreover, solutions of dextrose have a lower freezing point than those of cane sugar resulting in ice-cream with smoother creamier texture. Dextrose is widely used in preference to cane sugar for canned and ready-made food confectionery, dairy products, carbonated beverages, canned fruits, meat products, jam and jellies etc. The main advantage of dextrose over sugar is that its moderate sweetness does not obliterate the finer flavors yet; dextrose is as powerful a preservative as sugar.
- Paper Industry:** Maize starch is widely used in surface sizing and eras ability to increase the strength of the paper. It also increases the stiffness of the paper. It is also used in surface sizing to improve the appearance and eras ability. Both native starch and modified starch like thin boiling starch, oxidised and esterified starches have respective applications in the paper industry
- Hotel and Industry:** Maize Starch used as in hotels, industrial canteens and housewives.
- Feed Production:** In addition to edible oil the shortage of animal protein required for human health is another problem. Maize offers best opportunity for converting vegetable protein into animal protein. The use of maize in poultry and livestock feed industry is restricted because of the availability of other cereal i.e. wheat and rice (broken) comparatively at lower prices. Keeping in view need as well the expected increase in poultry production, the projected demand for maize may be as under:

**Table 8: Feed Production & Projection**

Present use of maize grain for poultry feed production per annum	0.450 Million Tone
Possible demand for maize grain (if use of wheat and rice banned)	0.8 -1.0 Million Tone

- Processed raw materials:** Maize Starch used as industrial raw materials by a wide range of food manufacturing industries. Main users are:

  - Other food Industries:** The following products utilize a variety of dehydrated vegetables

    - Dry mixes – ready meal mixes, stuffing mixes, spice mix (curry powder), and sauce mix.
    - Baby foods – both canned and dried baby foods.



- Baker products –products are used in the production of garnish pasties, pies and bread making.
- Canned foods –such as potatoes, carrots, and onions are used in canned stews and soups.
- Processed meat – hamburgers, sausages and many delicatessen-type meat products.

#### **4.4 Research & Development Activities**

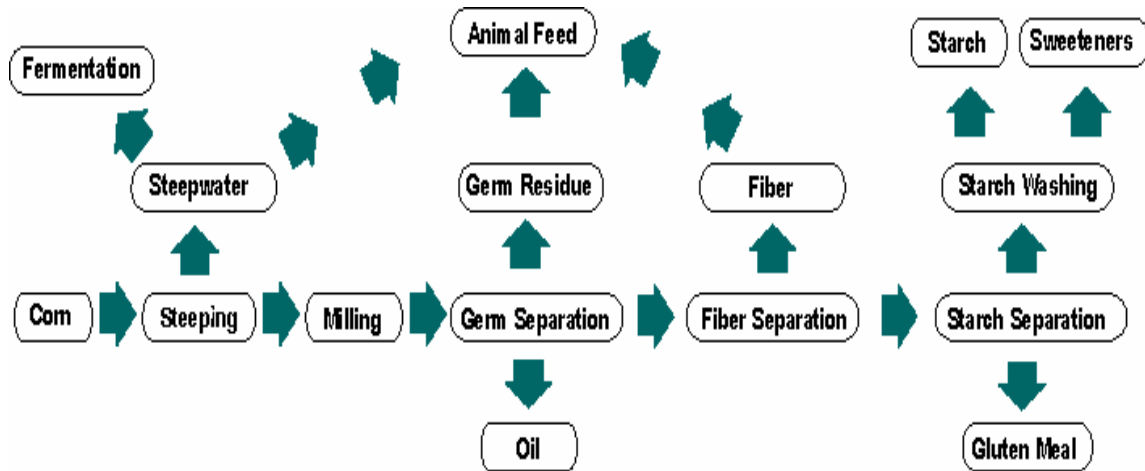
##### *4.4.1 LIST OF DIFFERENT PUBLIC AND PRIVATE INSTITUTES/ ORGANIZATIONS*

Today, viable maize research institute are in place in Yousafwala (Sahiwal). Pirsabak (Nowshera) and NARC (Islamabad). In addition partial research activities are carried out when and where needed i.e. AARI (Faisalabad), AJK and Bhalwal (Sargodha).

- Rafhan Maize Products Co. Ltd., Rakh Kanal East Road, Faisalabad.
- Pakistan Cooking Oil Manufacturers Association, LAHORE.
- M/s. Punjab Cooking Oil Mills Ltd., Khanewal Road, KABIRWALA.
- United Industrial Ltd., 101, First Floor, Regency Arcase, FAISALABAD.
- Food Technology Research Lab., S.S.O., Pak. Agri. Research Council, ISLAMABAD.
- Agricultural Research Institute, Ternab, PESHAWAR.
- Deptt. of Food Technology, University of Karachi, KARACHI.
- PCSIR Laboratories Complex, Off, University Road, KARACHI.
- Govt. Public Analyst, Food Laboratory, HYDERABAD.
- Trading Corporation of Pakistan Ltd.,
- Lever Brothers Pakistan Ltd., Awari Plaza, Fatima Jinnah Road, KARACHI.
- Pakistan Vanaspati Manufacturers Association, ISLAMABAD.
- Agricultural Research Institute, TANDOJAM.
- Pakistan Standards & Quality Control Authority, Standards Development Centre, KARACHI.

## 5 THE PROCESS AND PLANT LAYOUT

### 5.1 Wet Grinding Process



The basic process of starch production involves following steps:

- Soaking & preliminary grinding of maize:** Starch quantity and quality depends to a large extent on correct maize soaking. The soaking process is carried out by exposing the maize to a sulphur dioxide solution of 0.25-0.30% at a temperature of 52-58 degrees C for a period of 55-70 hours depending on the raw material quality, on the principle of countercurrent. Certain Physico-chemical and microbiological changes occur during soaking. The bonds between the separate components of the maize kernel are weakened, facilitating their separation. The preliminary grinding of the soaked maize is intended to free the germ and for its ensuing separation, and is carried out in special disintegrator disk mills. Following the initial crude grinding of the maize, the freed germ is separated from the hull, bran and starch in special hydro cyclones
- Separation, washing, dehydration:** The separation of the germ and its washing with the aid of hydro cyclones and special arc screens is carried out consecutively in three stages under minimal loss of starch
- Drying of Maize Germ:** The washed germ is strained in arc screens dehydrated in a worm press and dried in a special drier to 8% moisture contents. After separation of the germ, the maize kernel is finely ground in a special mill of the Condux type. End product yields depend largely on the fineness of grinding. The ground material contains, starch, as well as gluten and cellulose bran.
- Fine Grinding, separation, Washing & Dehydration of Bran:** The bran is separated and washed on the principle of countercurrent with a battery of arc screens. The washed bran is dehydrated in a non-stop worm press. The chosen scheme ensures effective washing, whereby the content of free starch in the bran is reduced to nil. The freed bran, mixed with gluten condensed in the vacuum filter, is dried in a special drier to 14% moisture and used in the preparation of poultry and animal fed.

- **Separation & Refining of Starch Milk:** In order to ensure a constant and high quality of starch, suitable for the production of glucose, modified starches, etc. the raw starch suspension is refined. Refinement includes concentration of the starch milk to a suitable concentration for dehydration, separation of the undissolved admixtures (gluten and fibers) and the washing of starch with clean water. Separation is carried out consecutively in three stages on the principle of countercurrent whereby some 70% of the protein is separate. The separated protein suspension (Gluten) is fed to a gluten concentrator for condensation to about 12-14% dry substance and 65-72% pure protein content, and is used in animal & poultry feed formulation.
- **Dehydration Drying & Packing of Starch:** The dried maize starch is high quality trade product satisfying international market demands. The dried maize starch is pneumatically transported to a collective hopper in a suitable room. A semi-automatic packing installation is used for packing the trade product. During condensation of the soaked maize extraction water with a highly productive vacuum evaporating installation a trade product is obtained which is rich in proteins an inorganic salts. It is used as valuable raw material in the production of antibiotics and as fodder. Germ separated is processed to extract oil by means of expeller/solvent extraction units. And the oil is then filtered and refined. The refining process consists of following sections.
  1. Deacidifying
  2. Bleaching
  3. Deodorizing

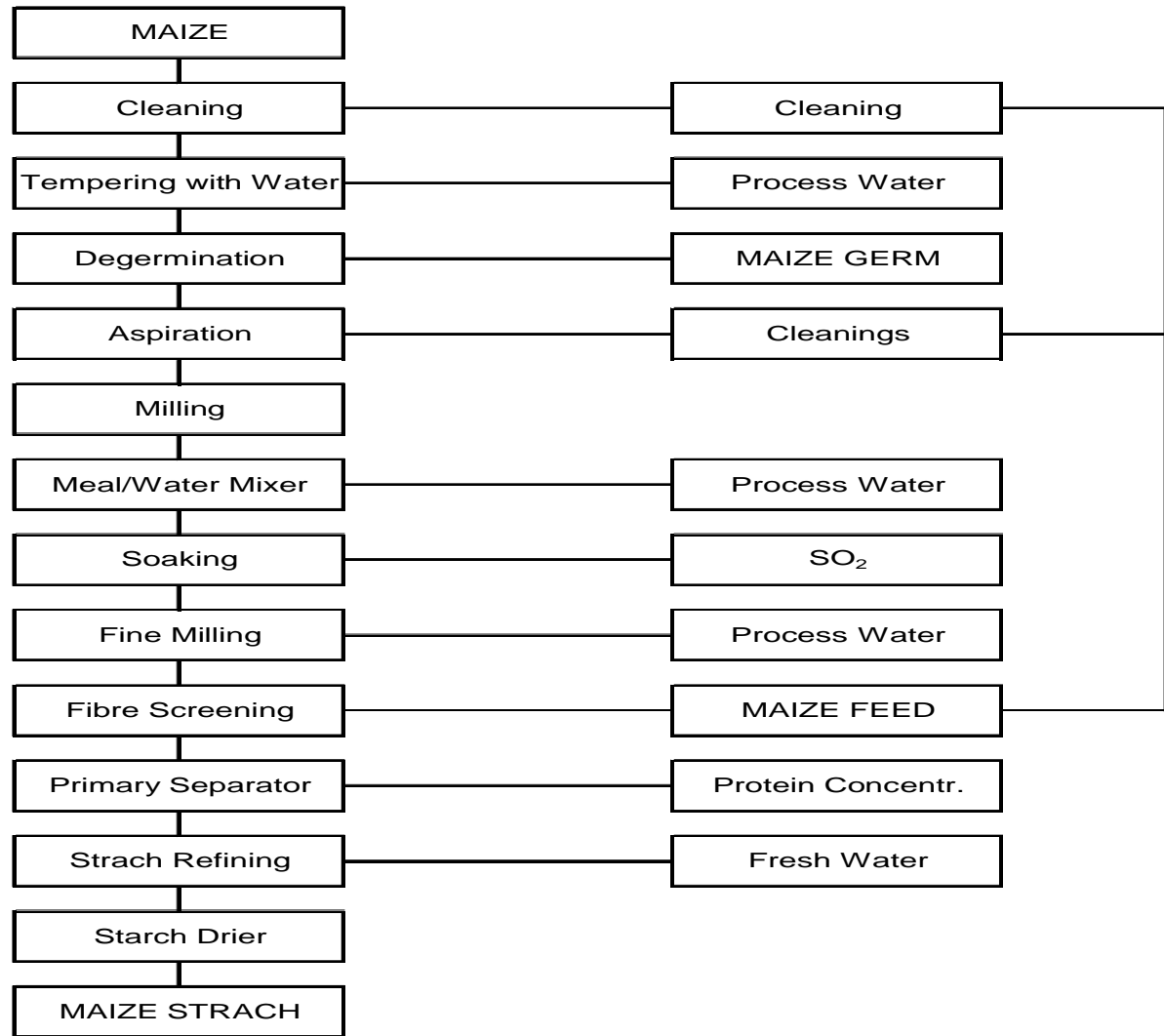
## 5.2 Product Mix

**Table 9: Product Mix**

Serial	Product Category	Product
1.	Main Product	Starch
2.	Primary by Product	Oil
3.	Secondary by Product	Fiber, Gluten, Ashes

5.3 Flow Chart

DIAGRAM PLAN



## 6 THE PROJECT

The proposed project envisages setting up a unit for the manufacturing of starch and allied products i.e. gluten, cakes, oil, by using starch as basic raw material. Along others following are most important.

- **Dextrose Monohydrate (DMH):** It is prepared by acidic hydrolysis of starch and is used in food, pharmaceuticals, beverages, confectionery, industries, and antibiotics and sorbitol manufacturing.
- **Liquid Glucose:** Incomplete hydrolysis of starch under high temperature and catalytic action of mineral acid gives this product. It is widely used in food pharmaceuticals, confectioneries, tanneries, etc.
- **Dextrose Anhydrous/I.P.:** By the removal of one molecule of water from DMH, dextrose anhydrous/I.P. is achieved. Its application is in intravenous fluid manufacturing, glucose saline injections etc.
- **Sorbitol:** Sorbitol is manufactured through hydrolysis of DMH solution and is utilized in the manufacture of toothpaste cheese, textile dyeing, confectionery, pharmaceuticals, cosmetics, emulsions, foods, cigarettes, writing ink etc.
- **Glucose D:** It is achieved by blending DMH with calcium phosphate, calcium glycerophosphate and vitamin D. This is an energy giving food and it widely used all over the country.

Besides these products processing of by-products can also attract investment, as the cobs are considered the richest source of furfural and activated carbon. But it is possible only if corn cobs will be procured directly from the farmers instead of maize grains.

### 6.1 Project Cost

**Table 10: Project Cost**

Capital Requirements	105,431,500
Preliminary expenses	785,000
Working Capital	6,450,000
<b>Total Investment Required</b>	<b>Rs. 112,666,500</b>

### 6.2 Financial Plan

**Table 11: Financial Plan**

Equity 50 %	56,333,250
Debt 50 %	56,333,250
<b>Total</b>	<b>112,666,500</b>

### 6.3 Location Suitability

The project could be located either in the consumption areas or in the major maize producing divisions namely Faisalabad, Rawalpindi, Multan, and Lahore of Punjab.

Availability of infrastructural facilities like road, water, power, and gas, skilled and unskilled labor also should also be kept in view while selecting the project location.

#### 6.4 Area Requirements

Three acres of land is sufficient to accommodate the project. The estimated covered area is 42000 sq. ft. The Details of covered area are given below:

**Table 12: Area Requirement**

1	Site Area	Area (sq. ft.)
2	Covered area	42,000
2.01	Production Facilities	28,000
2.02	Storage Facilities	80,00
2.03	Office Lab, workshop etc.	60,000

Total Land would amount to Rs. 108,000 sq.ft. For future expansion, land purchase cost per sq.ft. is Rs. 39, where as covered area construction cost is Rs. 1050 per sq.ft.

**Table 13: Land & Building Cost**

1	Site Area	Area (sq. ft.)	Construction Cost/sq.ft.	Total Cost
2	<b>Covered area</b>	<b>42,000</b>	<b>1,050</b>	<b>44,100,000</b>
2.01	Production Facilities	28,000	1,050	29,400,000
2.02	Storage Facilities	80,00	1,050	8,400,000
2.03	Office Lab, workshop	60,000	1,050	6,300,000
3	<b>Land</b>	<b>108,000</b>	<b>39</b>	<b>4,212,000</b>
	<b>Total Land &amp; Building</b>			<b>48,312,000</b>

#### 6.5 Office Furniture

Following is the detail for office furniture:

**Table 14: Office Furniture**

Items	Number	Unit Cost	Total Cost
Executive Table	1	20,000	20,000
Computer and other Tables	6	6,000	36,000
Sofas	1	10,000	10,000
Store Rags / Shelves	5	15,000	75,000
Chairs	15	1,500	22,500
Fans & Lights	20	3,000	60,000
Carpet, Curtains, etc.	1	25,000	25,000

Fire Extinguisher	5	5,000	25,000
<b>Total</b>			<b>273,500</b>

## 6.6 Office Equipments

Detail for Office equipments is given blow:

**Table 15: Office Equipments**

Items	Number	Unit Cost	Total Cost
Computer	5	28,000	140,000
Printer Laser	1	10,000	10,000
Fax	1	12,000	12,000
Air Conditioner	8	22,000	176,000
<b>Total</b>			<b>338,000</b>

## 6.7 Office Vehicles

Detail of office vehicles is give blow:

**Table 16: Office Vehicles**

Items	Number	Unit Cost	Total Cost
Vehicle-For Chief Executive	1	1,000,000	1,000,000
Shahzor-Hyndai	2	650,000	1,300,000
<b>Total</b>			<b>2,300,000</b>

## 6.8 Machinery

Following machines are required for this project. Machinery will be imported and purchased locally.

Discription	Qty	Unit Price	Total Amount
<b>IMPORTED</b>			
Bend Screen-No. 1	1	850,000	850,000
Mill Degerunator-No. 1	1	1,350,000	1,350,000
Bend Screen for germ	1	975,000	975,000
Feed Separator-No. 1	1	1,200,000	1,200,000
Bend Screen-No. 2	1	850,000	850,000
Mill-No. 2	1	1,450,000	1,450,000
Feed Separator-No. 2	1	1,200,000	1,200,000
Bend Screen No. 3	1	850,000	850,000

Fine Mill	1	1,500,000	1,500,000
Fine Bend Screen	1	850,000	850,000
Auto Brush Strainer for Starch Separator	1	450,000	450,000
Starch Separator No. 1	1	650,000	650,000
Starch Separator No. 2	1	650,000	650,000
Starch Separator No. 3	1	650,000	650,000
Middling Separator No.1	1	350,000	350,000
Middling Separator No. 2	1	350,000	350,000
<b>LOCAL</b>			
Corn Feed Conveyor	1	850,000	850,000
Shifter	1	115,000	115,000
Feed Conveyor for scale tank	1	450,000	450,000
Scale Tank	1	500,000	500,000
Screw Feeder	1	125,000	125,000
Screw Conveyor for steep tank	1	150,000	150,000
Steep tank	1	400,000	400,000
Shute for steeping maize	1	150,000	150,000
Stand Catcher	1	750,000	750,000
Service tank for No. 1 Mill	1	450,000	450,000
Receive tank for No. 1 Mill	1	450,000	450,000
Receive tank for starch milk and gluten liquid	1	350,000	350,000
Germ Separator	1	150,000	150,000
Dehydrator for feed	1	1,200,000	1,200,000
Dryer for Feed	1	850,000	850,000
liquid	1	150,000	150,000
Air Compressor	1	650,000	650,000
Flotation system No. 1	1	450,000	450,000
Service Tank for starch separator	1	150,000	150,000
Flowtation System No. 2	1	450,000	450,000
Flowtation System No. 3	1	450,000	450,000
Flowtation System No. 4	1	450,000	450,000
Gluten Settler	1	300,000	300,000
Dehydrator for Starch	1	150,000	150,000
Dryer for starch	1	550,000	550,000
Steam Boiler	1	5,500,000	5,500,000
Gyro Shifter	1	850,000	850,000
Bucket Conveyor for paker.	1	450,000	450,000
Packing machine for product starch	1	1,200,000	1,200,000



Agitator for tank	1	150,000	150,000
water and water	1	225,000	225,000
Switchboard	1	325,000	325,000
Platform for steep tank	1	125,000	125,000
Piping material for plant	1	80,000	80,000
SO <sub>2</sub> Plant Sulphur Furnace	1	850,000	850,000
SO <sub>2</sub> storage Tank	1	850,000	850,000
Feed Planding and packing	1	750,000	750,000
Power Generator	1	18,000,000	18,000,000
<b>TOTAL</b>	<b>38</b>		<b>54,220,000</b>

## 6.9 Raw Material:

### 6.9.1 Main Raw Material:

Maize is the common and vital raw material needed for the manufacture of starch which is further processed into glucose, and a number of other valuable products. The maize production is 1250000 tones (1989-90), of which 25% is processed. Annual requirement of maize for the proposed project is 15000 tones.

### 6.9.2 Other Raw Materials:

Among these, Polypropylene bags for packing of starch and by-products and empty oil drums of 45 gallon each will be needed for oil.

## 6.10 Utilities Required:

- **Connected Load:** The processing plant installation will included electric motors. The power consumption is approximately 500 KW.
- **Steam:** The steam is used for starch and by-products drying and for heating purpose for the process. The consumption is approximately 50 tones/day
- **Process Water:** It is used for separation of maize starch from maize protein and cleaning, etc. Daily requirement is about 100 cubic meters. Whereas the requirement of cleaning water is 30 cubic approximately 50 Kg/day.
- **Chemicals:** For sanitary reason Sulpher Dioxide is dosed into the process when the flour is mixed with process water. The consumption of SO<sub>2</sub> approximately 50 Kg/day

## 6.11 Manpower and Technical Know How

Around 75 persons comprising administrative staff and production staff will be required. The break-up is given below:

- |                         |    |
|-------------------------|----|
| a) Administrative Staff | 7  |
| b) Production Staff     | 68 |

Operating labor, supervisory and managerial staff requirements are given in enclosed Annexure. The shift labor and supervisory requirement is based on 360 days of the year. The preparation/pre-treatment-line labors (20 labor/shift, daily-wage basis) work in collaboration with the permanent workers of the factory.

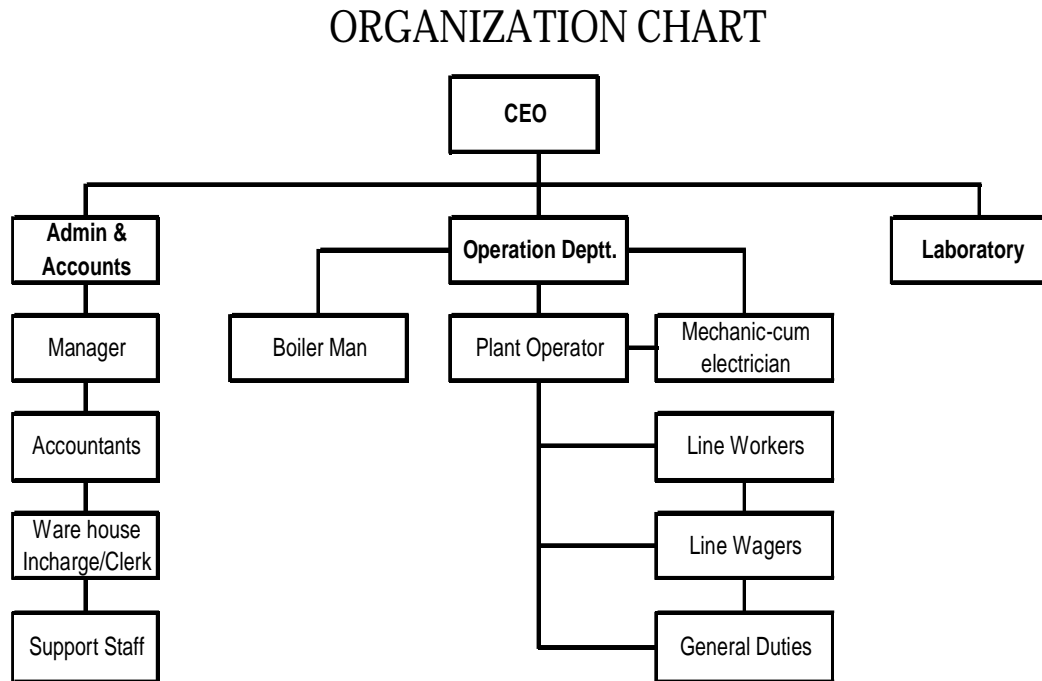
#### 6.11.1 Human resource

Following in the detailed table of human resource requirements:

**Table 17: Human Resource**

	No. Of Employees	Monthly Salary	Annual Salary
<b>Production Staff:</b>			
Production Manager	1	60,000	720,000
Work Manager	1	35,000	420,000
Formen	1	25,000	300,000
Shift +Workshop In charge	4	18,000	864,000
Operators	10	6,500	780,000
Skilled & Semi Skilled Labour	48	5,000	2,880,000
Watchman/ Gateman	3	5,000	180,000
<b>Total Production Staff/Salary</b>	<b>68</b>		<b>6,144,000</b>
<b>Admin. &amp; Accounts:</b>			
Director/CE	1	100,000	1,200,000
Manager	1	30,000	360,000
Accountant	1	20,000	240,000
Laboratory Technician	1	15,000	180,000
Ware house Incharge/Clerk	1	18,000	216,000
Drivers	2	5,000	120,000
<b>Total Admin Staff/ Salary</b>	<b>7</b>		<b>2,316,000</b>
<b>Grand Total</b>	<b>75</b>		<b>8,460,000</b>

## 6.11.2 Organization Chart



## 6.12 Project Findings

Table 18: Project's Findings

<b>IRR</b>	<b>25%</b>
<b>NPV</b>	<b>25,323,843</b>
<b>Pay Back ( Years)</b>	<b>2.3</b>

## 7 FINANCIAL PROJECTIONS

### 7.1 Projected Balance Sheet

YEAR	Start up	1	2	3	4	5	6	7	8	9	10
<b>FIXED ASSETS</b>	105,431,500	97,215,750	89,777,605	83,029,533	76,896,145	71,312,078	66,220,329	61,570,928	57,319,867	53,428,238	49,861,516
	105,431,500	97,215,750	89,777,605	83,029,533	76,896,145	71,312,078	66,220,329	61,570,928	57,319,867	53,428,238	49,861,516
Preliminary Expenses	785,000	628,000	471,000	314,000	157,000	-	-	-	-	-	-
	106,216,500	97,843,750	90,248,605	83,343,533	77,053,145	71,312,078	66,220,329	61,570,928	57,319,867	53,428,238	49,861,516
<b>CURRENT ASSETS</b>											
Accounts Receivables	-	14,553,844	17,343,331	20,545,177	22,599,695	26,635,355	31,252,149	36,525,950	42,541,988	49,395,975	54,335,573
Stocks	-	6,693,750	7,976,719	9,449,344	10,394,278	12,250,399	14,373,802	16,799,381	19,566,338	22,718,692	24,990,561
Advances to Employees	-	857,580	973,698	1,071,068	1,178,175	1,295,992	1,425,591	1,568,150	1,724,965	1,897,462	2,087,208
Tools & Spares	-	2,711,000	2,982,100	3,280,310	3,608,341	3,969,175	4,366,093	4,802,702	5,282,972	5,811,269	6,392,396
Cash & Bank Balances	6,450,000	16,551,469	35,118,372	56,804,815	80,922,247	113,582,512	158,446,224	218,455,312	292,086,753	382,322,196	485,560,353
	6,450,000	41,367,644	64,394,220	91,150,714	118,702,736	157,733,433	209,863,859	278,151,494	361,203,016	462,145,595	573,366,092
<b>TOTAL ASSETS</b>	112,666,500	139,211,394	154,642,825	174,494,247	195,755,881	229,045,511	276,084,188	339,722,422	418,522,883	515,573,832	623,227,608
	-	-	-	-	-	-	-	-	-	-	-
<b>CAPITAL EMPLOYED REPRESENTED BY:</b>											
<b>SHARE CAPITAL</b>											
5,633,325 Shares @ Rs.10/- each	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250	56,333,250
UNAPP. PROFIT/(LOSS)	-	11,584,581	30,323,026	53,193,573	78,264,761	113,896,647	162,825,528	228,192,219	307,457,175	404,677,674	513,704,141
	56,333,250	67,917,831	86,656,276	109,526,823	134,598,011	170,229,897	219,158,778	284,525,469	363,790,425	461,010,924	570,037,391
<b>LONG TERM LIABILITIES</b>											
Finance Lease	-	-	-	-	-	-	-	-	-	-	-
Long Term Loan	56,333,250	53,368,342	47,438,526	41,508,711	35,578,895	29,649,079	23,719,263	17,789,447	11,859,632	5,929,816	0
Others	-	-	-	-	-	-	-	-	-	-	-
	56,333,250	53,368,342	47,438,526	41,508,711	35,578,895	29,649,079	23,719,263	17,789,447	11,859,632	5,929,816	0
<b>CURRENT LIABILITIES</b>											
Creditors	-	15,366,221	17,733,123	20,362,323	22,172,946	25,419,902	29,084,852	32,874,081	37,886,059	43,147,649	47,156,229
Utilities Payable	-	2,559,000	2,814,900	3,096,390	3,406,029	3,746,632	4,121,295	4,533,425	4,986,767	5,485,444	6,033,988
	-	17,925,221	20,548,023	23,458,713	25,578,975	29,166,534	33,206,147	37,407,506	42,872,826	48,633,093	53,190,217
<b>TOTAL</b>	112,666,500	139,211,394	154,642,825	174,494,247	195,755,881	229,045,511	276,084,188	339,722,422	418,522,883	515,573,832	623,227,608

## 7.2 Projected Income Statement

Years	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sales	145,538,444	173,433,313	205,451,770	225,996,948	266,353,545	312,521,493	365,259,495	425,419,883	493,959,752	543,355,728
Cost of Sales	115,246,658	132,998,423	152,717,426	166,297,093	190,649,267	218,136,387	246,555,608	284,145,443	323,607,366	353,671,715
Gross Profit	30,291,787	40,434,889	52,734,345	59,699,854	75,704,278	94,385,106	118,703,887	141,274,440	170,352,386	189,684,012
Operating Expenses:										
Operating Expenses	6,226,769	7,007,826	7,904,515	8,607,131	9,743,929	11,037,826	12,507,293	14,173,082	16,058,481	17,617,649
Depreciation	8,215,750	7,438,145	6,748,072	6,133,388	5,584,067	5,091,749	4,649,401	4,251,061	3,891,629	3,566,722
Amortization of Preliminary Exp.	157,000	157,000	157,000	157,000	157,000	-	-	-	-	-
	14,599,519	14,602,971	14,809,587	14,897,519	15,484,996	16,129,575	17,156,695	18,424,142	19,950,110	21,184,371
Operating Profit	15,692,268	25,831,918	37,924,757	44,802,336	60,219,283	78,255,531	101,547,192	122,850,297	150,402,276	168,499,641
Interest on Loan	3,379,995	6,226,307	5,514,729	4,803,151	4,091,573	1,778,945	-	-	-	-
Interest on Lease	-	-	-	-	-	-	-	-	-	-
	3,379,995	6,226,307	5,514,729	4,803,151	4,091,573	1,778,945	-	-	-	-
Profit before Tax	12,312,273	19,605,612	32,410,029	39,999,185	56,127,710	76,476,586	101,547,192	122,850,297	150,402,276	168,499,641
Taxation (see working)	727,692	867,167	9,539,482	14,927,996	20,495,823	27,547,705	36,180,502	43,585,341	53,181,778	59,473,174
<b>Profit after Tax</b>	<b>11,584,581</b>	<b>18,738,445</b>	<b>22,870,547</b>	<b>25,071,188</b>	<b>35,631,886</b>	<b>48,928,881</b>	<b>65,366,690</b>	<b>79,264,957</b>	<b>97,220,498</b>	<b>109,026,467</b>
Balance B/F	-	11,584,581	30,323,026	53,193,573	78,264,761	113,896,647	162,825,528	228,192,219	307,457,175	404,677,674
Retained Earnings	11,584,581	30,323,026	53,193,573	78,264,761	113,896,647	162,825,528	228,192,219	307,457,175	404,677,674	513,704,141
Dividend										
Cash	-	-	-	-	-	-	-	-	-	-
Bonus	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-
Balance C/F	11,584,581	30,323,026	53,193,573	78,264,761	113,896,647	162,825,528	228,192,219	307,457,175	404,677,674	513,704,141

### 7.3 Projected Cash Flows

YEAR	1	2	3	4	5	6	7	8	9	10
<b>SOURCES</b>										
FROM OPERATION										
Profit Before Tax	12,312,273	19,605,612	32,410,029	39,999,185	56,127,710	76,476,586	101,547,192	122,850,297	150,402,276	168,499,641
Add: Depreciation	8,215,750	7,438,145	6,748,072	6,133,388	5,584,067	5,091,749	4,649,401	4,251,061	3,891,629	3,566,722
Amortization	157,000	157,000	157,000	157,000	157,000	-	-	-	-	-
	8,372,750	7,595,145	6,905,072	6,290,388	5,741,067	5,091,749	4,649,401	4,251,061	3,891,629	3,566,722
	<u>20,685,023</u>	<u>27,200,757</u>	<u>39,315,101</u>	<u>46,289,573</u>	<u>61,868,777</u>	<u>81,568,335</u>	<u>106,196,594</u>	<u>127,101,358</u>	<u>154,293,905</u>	<u>172,066,363</u>
<b>APPLICATION</b>										
Capital Expenditure	-	-	-	-	-	-	-	-	-	-
Repayments of Loan	2,964,908	5,929,816	5,929,816	5,929,816	5,929,816	5,929,816	5,929,816	5,929,816	5,929,816	5,929,816
Tax Payment	727,692	867,167	9,539,482	14,927,996	20,495,823	27,547,705	36,180,502	43,585,341	53,181,778	59,473,174
	3,692,600.12	6,796,982.35	15,469,297.50	20,857,812.24	26,425,639	33,477,521	42,110,318	49,515,157	59,111,593	65,402,990
SURPLUS / (DEFICIT)	<u>16,992,423</u>	<u>20,403,774</u>	<u>23,845,803</u>	<u>25,431,761</u>	<u>35,443,137</u>	<u>48,090,814</u>	<u>64,086,276</u>	<u>77,586,202</u>	<u>95,182,312</u>	<u>106,663,373</u>
INCREASE/(DECREASE) IN WORKING CAPITAL	6,890,953	1,836,871	2,159,360	1,314,329	2,782,873	3,227,101	4,077,189	3,954,760	4,946,869	3,425,216
NET INCREASE/(DECREASE)	<u>10,101,469</u>	<u>18,566,903</u>	<u>21,686,443</u>	<u>24,117,432</u>	<u>32,660,264</u>	<u>44,863,712</u>	<u>60,009,087</u>	<u>73,631,441</u>	<u>90,235,443</u>	<u>103,238,157</u>
OPENING BANK BALANCES	6,450,000	16,551,469	35,118,372	56,804,815	80,922,247	113,582,512	158,446,224	218,455,312	292,086,753	382,322,196
CLOSING CASH BALANCE	<u>16,551,469</u>	<u>35,118,372</u>	<u>56,804,815</u>	<u>80,922,247</u>	<u>113,582,512</u>	<u>158,446,224</u>	<u>218,455,312</u>	<u>292,086,753</u>	<u>382,322,196</u>	<u>485,560,353</u>

## 8 ASSUMPTIONS

<b>Revenue Assumptions</b>			
No of Processing days		300	
Processing Capacity		15,000	
Maize Price Per Tone		9,375	
<b>Product Composition</b>	<b>% of Yield</b>	<b>Yield In Tones</b>	<b>Selling Value/ KG</b>
Starch	68%	10,200	24.40
Protein	9%	1,275	0.05
Oil	4%	570	16.50
Fiber	3%	450	0.77
Ash	2%	255	0.35
Price Growth Rate per unit per year		10%	
<b>Production</b>			
Starting Capacity %		60%	
Max Capacity /Day (Tons)		15,000	
Production growth Rate per year %		5%	
<b>Financial</b>			
Project life		10	
Debt - Equity		50%-50%	
Interest Rate		14%	
Installments per Year		2	
Tax Rate		37%	
<b>Operations</b>			
Days Operational in a year		300	
Days operational in a month		25	
Shifts		1	
<b>Cash Flows</b>			
Account receivables		30	
Raw material		30	
Accounts payable		40	
<b>Depreciation</b>			
Land		0	
Building		5%	
Machinery		10%	
Furniture & Fixture		10%	
Vehicle		20%	
Computers		30%	