Pre-Feasibility Study

Animal Feed Mill

(Inclusive of Urea Molasses Block Preparation)

Small and Medium Enterprise Development Authority

Government of Pakistan

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1 INTRODUCTION TO SMEDA

The Small and Medium Enterprise Development Authority (SMEDA) was established with the objective to provide fresh impetus to the economy through the launch of an aggressive SME support program.

Since its inception in October 1998, SMEDA had adopted a sectoral SME development approach. A few priority sectors were selected on the criterion of SME presence. In depth research was conducted and comprehensive development plans were formulated after identification of impediments and retardants. The all-encompassing sectoral development strategy involved recommending changes in the regulatory environment by taking into consideration other important aspects including finance, marketing, technology and human resource development.

SMEDA has so far successfully formulated strategies for sectors including, fruits and vegetables, marble and granite, gems and jewelry, marine fisheries, leather and footwear, textiles, surgical instruments, transport and dairy. Whereas the task of SME development at a broader scale still requires more coverage and enhanced reach in terms of SMEDA's areas of operation.

Along with the sectoral focus a broad spectrum of business development services is also offered to the SMEs by SMEDA. These services include identification of viable business opportunities for potential SME investors. In order to facilitate these investors, SMEDA provides business guidance through its help desk services as well as development of project specific documents. These documents consist of information required to make well-researched investment decisions. Pre-feasibility studies and business plan development are some of the services provided to enhance the capacity of individual SMEs to exploit viable business opportunities in a better way.

This document is in the continuation of this effort to enable potential investors to make well-informed investment decisions.

2 Purpose of the document

The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs to facilitate investment and provide an overview about processing of animal feed and urea molasses blocks. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document covers various aspects of feed milling and urea molasses block concept development, start-up, production, finance and business management. The document also provides sectoral information, brief on government policies and international scenario, which have some bearing on the project itself.

This particular pre-feasibility is regarding "Animal Feed Mill with Urea Molasses Block (UMB) Preparation" which comes under "Livestock and Agriculture " sector. Before studying the whole document one must consider following critical aspects, which form the basis of any investment decision.

3 Crucial Factors & Steps in Decision Making for Investment

Before making the decision, whether to invest in this project or not, one should carefully analyze the associated risk factors. A SWOT analysis can help in analyzing these factors which can play important role in making the decision.

3.1 Strengths

- Investment in dairy and livestock sector is increasing day by day and quality feed is a pre requisite in profitable dairy and livestock farming.
- Feed and Urea Molasses Blocks (UMB) formulation according to modern techniques with proper utilization of locally available cheaper feedstuffs leads to success in dairy and livestock farming hence for feed business too.

3.2 Weaknesses

- Limited availability of protein sources of standard quality due to low or static production, processing technology, variable composition and adulteration.
- Comparatively poor nutrient composition of indigenous feed ingredients due to differences in varieties and use of improper soil fertilizers.
- Improper use of pesticides, the residues of which result in poor feed utilization.
- Lack of proper storage facility. Due to this fact various agricultural products when produced under quite high moisture content, thus liable to be affected with insect damage, auto-oxidation and fungal contamination.
- Lack of nutritional data of indigenous fed ingredients particularly for amino acids, energy, vitamins, minerals and by pass protein value especially in high producing cattle/buffalo.
- Improper storage, transfer, grading, feed milling and mixing of feed ingredients may also affect the quality of feed.
- Animal feed and urea molasses blocks (UMB) cannot be produced economically on a small scale. Cost of labour for each batch and cost of overhead keep on decreasing with the increasing production.
- There is no quality standards and quality control for UMB. The excess intake of Urea may be fatal to livestock resulting in urea toxicity.

3.3 Opportunities

- The annual growth rate in livestock population of Pakistan was 3 percent (Economic Survey of Pakistan, 2003-04) due to which there is demand for compound feed. The increased productivity would require better feed utilization and increase in overall feed availability both from fodder crops and formulated compound feed.
- The agro industrial by products can be better utilized in formulated compound feed.
- In order to meet the rapidly increasing demand for the various kinds of livestock products (Milk & meats), the better rations with improved feed formula are needed to get more meat and milk, for the same feed supplies. By increasing livestock numbers, rather than their average weight, the feed requirements are much larger.

3.4 Threats

- Implementation of WTO. Open and competitive commodity pricing
- There is no feed ingredient quality control program as improper storage, transfer, grading, feed milling and mixing of feed ingredients may also affect the quality of feed.
- The prices of different feedstuffs vary through out the year. Improper storage of raw material can affect its nutritional value.
- There is limited availability of protein sources of standard quality due to low or static production, processing technology, variable composition and adulteration.
- Lack of proper labeling on product.
- Lack of awareness among dairy and livestock farmers to use compound feed & UMB for the high production of their animals is a constant threat for feed mill business as well.

4 Project Profile

4.1 Opportunity Rationale

Livestock production is an integral part of Pakistan's agriculture sector and plays a vital role in national economy. At present, livestock is contributing about 49.1% to the agricultural sector and 11.4 per cent to the GDP. Its net foreign exchange earnings in 2003-04 were 53 billion, which is about 11 percent of the overall export earnings of the country. The role of livestock in rural economy may be assessed by the fact that 30 to 35 million of the total rural population is engaged in livestock farming, having 2 to 3 cattle/buffalo and 5 to 6 sheep/goats per family deriving 30 to 40 per cent of income from it[1].

Pakistan's livestock population is supported by feed resources derived from the crops sector, rangelands, grazing areas and agro industrial by-products. The type, availability and utilization of these feed resources vary greatly in the country's different agro ecological zones. In order of importance, the major feed resources are crop residues (46%), grazing (27%), cultivated fodder (19%), cereal/legume grains and by-products (6%) and oil cakes, meals and animal protein (2%). Most farmers (about 75%) have small land holdings on which most of the livestock population is concentrated. The smallholders' priority is to grow cereal grains for human consumption, but these also provide straw and stover for their animals, which is low in protein and energy. In the case of wheat, the value of the straw is around 60% of that of the grain. The nutrients available under the present pattern of feed utilization do not meet the requirements of Pakistan's existing livestock population.

[1] *Source: Economic Survey of Pakistan, 2003-04*

Table 4-1 Population of livestock (million)[2]

Species	1999-00	2000-01	2001-02	2002-03	2003-04(E[3])
Cattle	22.0	22.4	22.8	23.3	23.8
Buffalo	22.7	23.3	24.0	24.8	25.5
Sheep	24.1	24.2	24.4	24.6	24.7
Goats	47.4	49.2	50.9	52.8	54.7

Table 4-2 Production of Livestock Products

Product	1998-99	1999-00	2000-01	2001-02	2002-03
Milk (Million Tones)	24.877	25.566	26.284	27.031	27.811
Beef (Thousand tones)	963	986	1010	1034	1060
Mutton(Thousand tones)	633	649	666	683	702

There appear to be deficiencies of 24% of the Total Digestible Nutrients (TDN) and 39.4% of Crude Protein (CP) requirements for livestock. There is a growing trend towards the establishment of more intensive dairy cattle and buffalo production systems in peri-urban areas of Pakistan. An estimated 40 million tones of crop residues are produced annually in Pakistan, out of which 52.5 % and 22.0 % are contributed by wheat and rice respectively. Traditionally, cereal straws are fed to cattle and buffalo year-round, but their proportion in the ration increases during periods of feed scarcity. The major sources of supplementary feed in Pakistan are by-products from cereal milling and oilseed production. Wheat bran, rice bran and rice polishing are the main milling by-products. Cottonseed cake, rapeseed cake and maize oil cake account for almost two-thirds of the total protein supplement used to feed dairy animals.

Cultivated fodder is used as cut-and-carry feeds and may include berseem, oats, rape, barley and sometimes wheat during the winter season and maize, sorghum and millet during the summer season. Most of these crops are ready for harvesting about 2 to 3 months after sowing. Periods of scarcity occur in May-June. Fodder becomes available in July and again in October- November. Of the total cultivated area, only 13% is devoted to fodder crop production. Despite large increases in the ruminant population (62%) during the past 20 years, the land devoted to fodder crops has declined by about 17%, with a corresponding increase in land used for food grain production. This has further increased the dependence of livestock on crop residues and by-products.

Animal feed mill with UMB preparation is an agro-based project in which locally available feed resources rich in protein and carbohydrate are mixed according to nutritional

[2] *Source =Economic Survey of Pakistan, 2003-04*
[3] *E = Estimated*

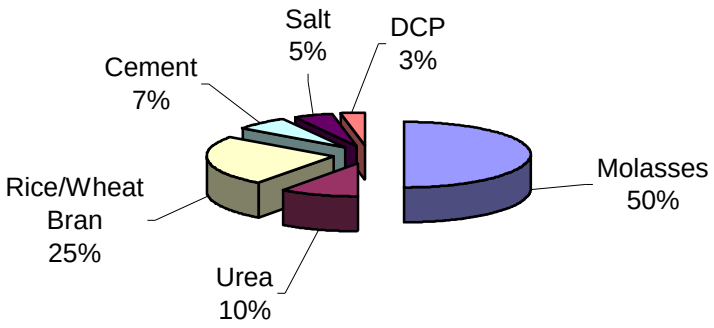
formula in order to raise the livestock in such a manner that when fed to livestock, they get nutritionally balanced feed according to their body needs. The process is done through semi mechanized and with/ with out manual handling of different feedstuffs.

At present, Pakistan has 215 feed mills, but only few are preparing compound feed for livestock. Generally, mixed compound feeds are prepared at home by farmers. Feed accounts for almost 70% of total cost of production of milk or meat. Hence a balanced feed will positively affect milk and meat production of livestock. The cake is a by-product from oil mills and is a valuable raw material for animal feed. Since animal keeping is worldwide, hence animal feeding is an important component.

Molasses is a thick, viscous material, which is a by-product of the sugar industry. Being a concentrated by-product, it provides a range of trace minerals and a complete mixture of vitamins. It is high in soluble carbohydrates. Although a cheaper source of energy, it is not commonly used by farmers due to difficulty in handling. Molasses can be included in ration by mixing it with other concentrates in the form of licks. Molasses increases the palatability and consumption of poor quality roughage and is a good carrier for urea as Non-Protein Nitrogen (NPN) source for livestock (ruminants).

Cereal brans are high in phosphorus, trace minerals and also a range of vitamins. In addition they provide a slow release amino acid source from the relatively insoluble proteins to the microbes.

General UMB Formula



As the name suggests, Urea Molasses Blocks (UMB) are lick blocks containing urea, molasses, vitamins and minerals. The feeding of the blocks is a convenient and inexpensive method of providing a range of nutrients required by both the rumen microbes and the animal, which may be deficient in the diet. The main justification for using the blocks depends on their convenience for packaging, storage, transport and ease of feeding.

Urea contains 46% nitrogen, which is equivalent to 287% crude protein and is rapidly digested by ruminants. Urea provides the small amount of extra nitrogen required, for utilization of the dry matter, in addition to that present in the forage. The UMB, therefore, provides the nutrient requirements of both the microbes and the host animal. The ingredients are designed to provide a wide rage of nutrients to cover all potential deficiencies. But the UMB should be fed only in limited quantities. The UMB is designed in such a way that animals can only lick it but not chew it. Because by chewing the animals

will eat more urea per unit of time than they can handle and can result in urea toxicity in the animals

4.2 Project Brief

The proposed project will be producing 1 ton of compound animals feed per hour and 25 Urea Molasses Block (UMB) per hour. This feed and UMB will be supplemented to livestock in addition to green fodder *ad libitum (Freely available to animals)* for high production. Different formulae may be used to prepare compound feed such as calf fattening formula and dairy animal formula etc. to facilitate the customers nationwide. The proposed business will be manufacturing compound animal feed and Urea Molasses Block (UMB) for meeting the demand of dairy and livestock farmers.

4.3 Viable Economic Size

Animal feed and UMB Mill can be designed with a wide range of processing capacity and product mix depending upon the demand, according to availability of feed stuffs and their storage capacity. However, it is suggested that the smallest viable economic unit should have a capacity of preparing 1 ton of compound feed per hour (i.e., 16 tons in 2 shifts, each of 8 hrs) and 200 UMB in 8hrs. The project in this pre feasibility study has an annual production capacity of 4800 tons of compound animal feed and 60,000 UMB.

4.4 Market Entry Timing

Compound animal feed and UMB is used in all class of livestock throughout the year that the demand never gets affected with seasons. So the proposed business can be started at any time of the year. At the commencement of the proposed business, it is important that the entrepreneur must have good knowledge of the production and have contacts with the farmers.

4.5 Proposed Business Legal Status

The proposed legal structure of the business entity is either sole proprietorship or partnership. Although selection totally depends upon the choice of the entrepreneur but this financial feasibility is based on a Sole Proprietorship.

4.6 Proposed Capacity

This pre feasibility suggests production of 4,800 tons of animal feed and 60,000 UMB annually. However the proposed project will be started with an initial year capacity of 85%. This production capacity justifies the running cost of the project.

4.7 Project Investment

The total cost of the project is Rs.10, 681,113.

Table 4-3 Project Costs

Capital Investment	5,820,649
Working Capital Requirement	4,860,463
Total Investment	**10,681,113**

The proposed pre-feasibility is based on the assumption of 50% debt and 50% equity. However this composition of debt and equity can be changed as per the requirement of the investor.

Table 4-4 Project Financing

Debt	50%	5,340,556
Equity	50%	5,340,556
Total project Investment		**10,681,113**

Table 4-5 Viability

IRR	24%
NPV @20%	1,486,523
Pay Back Period (year)	3

4.8 Proposed Location

Feed mill should be in an area where there is more product demand e.g. near the areas where dairy and livestock farming is already being done. These areas include:

- Karachi
- Lahore
- Rawalpindi
- Multan
- Faisalabad
- Sahiwal
- Jhang
- Okara
- Bahawalpur
- Sargodha
- Gujranwala etc.

4.9 Key Success Factors/Practical Tips for Success

The feed industry should aim at fully utilizing all low cost feed ingredients available in country such as molasses, urea, by products of edible oil and grain milling industries, minerals and vitamins. There is a need to launch programs in following areas to achieve the desired targets.

- Establishment of Animal feed mill with UMB preparation in feed ingredients surplus areas such as sugar mills & oil mills to fully utilize the molasses, oil cakes and other by-products of milling industries to prepare cheaper feed.
- Introduce the use of urea molasses block feeding for meeting the protein, energy and mineral requirement of the animal. (This is marketing aspect of the UMB)
- Formulate the nutritionally balanced but cheaper formula for feeding animals. This is called Least Cost Ration Formulation.
- The farmers having large number of animals (more than 100 animals) can prepare compound feed and UMB on their own farms **(Optional)** but Animal feed and UMB Mill is an independent enterprise and should not be linked with livestock farming.

5 SECTOR & INDUSTRY ANALYSIS

5.1 Major Players

There are few numbers of animal feed mills, which are in operation both in organized sector and informal sector in Pakistan. Livestock sector is utilizing many different feed resources of varying quality and availability. Most small-scale farmers base their livestock enterprises on the use of crop residues, resulting in a low output of milk and meat per animal. The need to make better use of crop residues has prompted considerable research and many promising technologies are now available. New avenues for research and policy development may lie in the adjustment of livestock types and numbers, increased production of fodder, the tapping of new or non-conventional feed resources, and the strategic movement of fodder.

Animal feed industry has not yet developed to any sizeable extent in Pakistan. The feed industry is presently working only 60 percent of its installed capacity. This is hardly enough to satisfy the domestic demand. But as the unutilized capacity is available with the existing mills, they can easily increase their capacity. Only some sporadic efforts have been made to undertake cattle feed industry on commercial lines and with limited success. However, these are made available at reasonable prices to our cattle farmer.

5.2 Hubs of Animal Feed Mills

There are hardly a couple of industrial units in Punjab, which are exclusively producing compound animal feed. If we look at the development of animal feed industry in the country, it is revealed that this industry, so vital for the growth of livestock sub-sector of agriculture is still in a bad shape. A number of poultry feed mills of varying capacities have been established across the country, their main concentration being in the Punjab and Sindh provinces. A few of these poultry feed mills are also occasionally engaged in preparing compound animal feeds. The feed industry in the country made a start on scientific and commercial lines in the early sixties. But it remained confined to the manufacture of poultry feeds. Messrs Lever Brothers (a foreign-based company) were the pioneer in this industry. The ***Feed Technology Units*** at NARC and Larkana produced 345 tones of cattle feed and 6000 Urea Molasses Blocks which were sold to livestock farmers in year 2002-03.

The quality of various types of feeds produced by different mills has wide variations. It is felt that the quality of feed in general is deteriorating. This, on the other hand, is disturbing the economics of the producers and is hampering the growth and development of the industry.

The deterioration in quality is due to:

- Non-availability of good quality protein ingredients
- Shortage of coarse grains (constituting about 50 percent of total ingredients)
- Non-existence of quality control of end products.

As a matter of fact feed mills regulate their production schedule according to the effective demand from the livestock farms. They do not produce in excess of ready demand as the shelf life of feed ranges from 2 to 3 months only. Even the ready demand fluctuates periodically with the change in weather and feed prices.

As there are no specified quality standards followed by feed mills and as they produce average quality feed, there are no wide variations in their selling prices of the same type of feed. However, there are some differences in prices of feeds produced by mills located in different regions, mainly due to difference in raw material prices.

Some of the poultry feed mills, which have the requisite machinery and equipment also occasionally, produce cattle feed. But the total quantity thus produced is very small. The cattle feed industry in the country is not developed scientifically and commercially due to ignorance of livestock owners about the utility of concentrated feeds and therefore they resort to cheaper conventional feed stuffs.

Moreover, the livestock population is scattered in small herds over vast areas making its commercial distribution a difficult job. This is also a limiting factor in popularizing the use of mill-made livestock feed in the country. However, cattle feed may be manufactured for export market.

In Turkey, which is a major feed-producing country, two mills are primarily manufacturing for export and filling contracts with Middle East to the extent of 100,000 tones of compound feed annually.

5.3 Legal Issues Regarding Animal Feed and UMB Mill

Compound feed is packed in bags of approximately 50 Kgs per bag capacity. The label includes following information:

1) Brand name
2) Date of manufacture
3) Particulars of feed additives
4) Nutritive composition of compound feed

On the other hand, one UMB may be of 5 kgs weight with above information provided on it. It is to be noted that misbranding and adulteration is prohibited according to ‘ The Punjab Animal Compound Feed and Feed Stuff Ordinance, 2002’.

6 MARKET INFORMATION

6.1 Sector Characteristics

The size of this sector is still growing. Animal feed mills have been set up around the areas where the livestock are kept in abundance. Few of the feed mills are as follows:

- National Feeds Limited, Lahore
- Punjnad Feeds pvt. Limited, Okara
- Vanda Pvt. Ltd, Sheikhupura
- Kahoot Feeds, Chalkwal
- Hafiz Vanda, Okara
- Al hafiz Feed Mill, Faisalabad
- Asia Feeds Pvt. Ltd., Multan
- Lahore Cattle Feed, Rehman Dairies, Lahore

6.2 Market Potential

Feed is a major cost (about 70%) in livestock and dairy farming. The processing and manufacturing of feed along with the efficient use of feed by cattle also contribute to the cost of feed. The demand for compound feed and Urea Molasses Blocks (UMB) is increasing day by day with the increase in awareness among farmers. The trend for concentrate feeding to livestock is changing from the conventional concentrate feeding to a formulated compound feed. Now a days, compound feed is used by many livestock and dairy farmers to get the maximum potential in terms of milk and meat. Compound feed and UMB are very beneficial as both provide all essential nutrients to the animal. The markets for animal feed need to be created within the country.

Today, about 3800 feed mills manufacture more than 80 percent of the world's industrial feed. The world's 10 largest feed manufacturers produce less than 65 million tones per year - less than 11 percent of global feed output. So, the global feed industry still remains broadly based with many locals and regional commercial feed companies as well as specialized firms. The European Feed Manufacturers' Federation (FEFAC) calculated that its members in the European Union, which produce some 120 million tones of compounded feed annually, accounts for approximately a quarter of all feed consumed by livestock in Western Europe which is approximately 1000 million tones annually.

Table 6-1 Global feed Manufacture[4]

Year	Manufactured feed (million tons)
1996	597
1997	605
1998	575
1999	586
2000	591
2001	597

Table 6-2 Top 10 feed producing countries[5]

Country	Feed production (million tones)
USA	142
China	58
Brazil	35
Japan	23
France	23
Canada	20
Mexico	20
Germany	18
Spain	17
Netherlands	18

Table 6-3 Global Output of Feed[6]

Region	Output (million tones)
Asia	132.0
Latin America	65.5
European Union	116.5
Non-EU Europe	48.5
Middle East/Africa	24.0
North America	160.0
Total	546.0

[4] *Source: Feed International 2002 World Feed Panorama Survey (2001 data)*

[5] *Source: Feed International 2002 World Feed Panorama Survey (2001 data) and The US Census Bureau*

[6] *Source: Feed International 2002 World Feed Panorama Survey (2001 data)*

6.3 Target Customers

This pre feasibility study suggests that compound feed bags and UMB will be sold to livestock farmers. Following are some of the target clients for a manufacturer of compound feed.

- Dairy farmers
- Calf fattening farmers
- Sheep farmers
- Goat farmers

The price of compound feed per kg and that of one UMB should be lower than that of simple cakes so that farmer could feel it economical. The cheaper the product, more will be its use in livestock feeding. To avoid risk of price fluctuations, the feed ingredients should be stored in season of availability.

7 PRODUCTION PROCESS FLOW FOR COMPOUND FEED

The compound feed preparation process requires:

a) high accuracy and precision of weighing

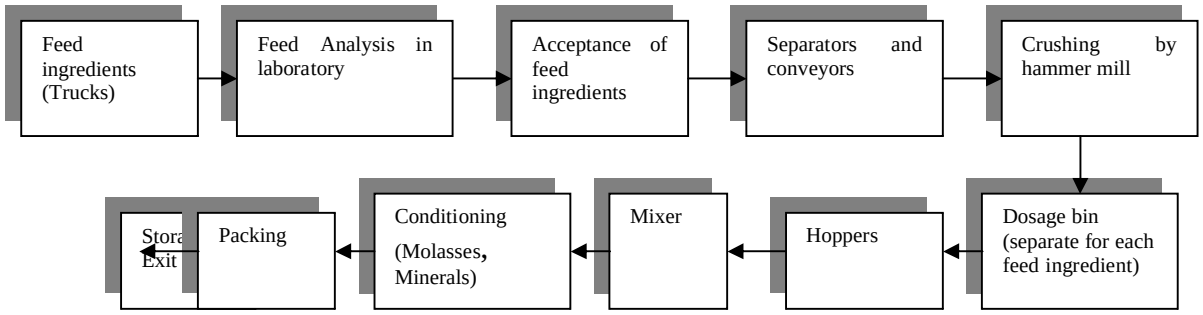
b) feed ingredient handling and processing

c) mixing

d) packing

e) labeling

Figure 7-1 Process Flow Diagram



A liquid storage and a direct-weight system for adding fat, molasses, and water is required.

Grain processing is done through hammer mill grinding. Mixed feed is delivered in bags or bulk load out to livestock farms.

7.1 Raw Material Requirement

Cattle are ruminant animals with four compartment stomach, capable of utilizing fibrous feedstuffs (forages, roughage, and by product feeds) and Non-Protein Nitrogen (NPN) source like urea that humans cannot utilize. By producing a high-quality protein from these

resources otherwise unusable by humans, cattle make a positive contribution to human nutrition in terms of meat and milk.

7.2 Classification of feed ingredients:

Feeds or feedstuffs are composed of several distinctly different groups of substances, known as nutrients e.g. proteins, carbohydrates, fats, minerals, vitamins and water. These have definite functions in body. For intelligent ration formulation, nutrients, nutrient composition and palatability of feedstuffs are important. These feedstuffs are grouped as follow,

7.2.1 Protein feedstuffs:

Common protein feedstuffs from plant origin are residues of oilseed after expeller or solvent extraction or products of wet milling of maize in starch making process. Nutritive value of protein feedstuffs depend upon their available amino acid composition, toxic materials and the changes brought during processing if any.

- Rape seed cake/meal
- Canola meal
- Cotton seed cake/meal
- Sunflower cake/meal
- Corn gluten meal (30 or 60%)
- Sesame cake/meal
- Urea
- Milk by products
- Maize oil cake

7.2.2 Carbohydrate/energy feedstuffs:

These are the products with less than 20%crude protein and 18% crude fiber.

- Molasses
- Rice polish
- Corn by products such as, Corn glutens; Corn steep liquor and enzose.

7.2.3 Mineral supplements:

- Salt (white/black)
- Bone meal
- Dicalcium phosphate (DCP)

7.2.4 Fats and oils:

This source of energy can be obtained from meat processing industry, refining of vegetable oils or vegetable oils itself.

7.3 Feed Formula for Cattle/Buffaloes:

These feed ingredients when mixed according to feed formula will provide adequate energy according to type, breed and physiological status of animal.

Table 7-1 Details of Raw Material

Material	Percentage Input	Input in Tones	Cost (Rs./Kg)	Total Cost (Rs.)
Cottonseed cake/ Maize grain	15%	648	9	5,832,000
Corn gluten	20%	864	6	5,184,000
Rice Polish	20%	864	7	6,048,000
Wheat straw/ Rice bran	22%	950	6	5,702,400
Molasses	15%	648	3	1,944,000
Urea	2%	86	10	864,000
Salt	2%	86	2	172,800
DCP	2%	86	14	1,209,600
Vegetable Oil	2%	86	49	4,233,600
Total	100%	4,320		**31,190,400**
Wastage	1%	43		311,904
Total Quantity of raw material to be used	**101%**	**4,363**		**31,502,304**

Note: There are seasonal fluctuations in the prices, hence the formula has to be changed accordingly keeping the feed cost as low as possible to compete the market. The information useful here is the composition of the feed ingredients. The feed mill owner can hire a technical person to formulate a least cost ration, as formulation of ration is a technical job.

The basic feed ingredients can be procured from local mandies.

7.4 Packing Cost

A 50 kg bag is sold in the market for compound feed which is easily available at a price of Rs. 25. Cost of bags for the first year is approximately Rs. 2,160,000.

7.5 Machinery Requirement

Following machinery will be required for the proposed project.

Table 7-2 Machinery Details (Animal feed)[7]

Description	Number	Cost (Rs.)	Total Cost (Rs.)
Hammer mill 16'' with electric motor 25 HP	1	70,000	70,000
Elevator 25 ft @ Rs 2400/-per ft. with electric motor 3HP	1	60,000	60,000
Elevator 20 ft. @ Rs 2400/-per ft. with electric motor 3HP	2	100,000	200,000
Elevator 23 ft. @ Rs 2400/-per ft. with electric motor 3HP	2	55,200	110,400
Mixer one ton capacity with electric motor 20 HP	1	150,000	150,000
Molasses Mixer with electric motor 10 HP	1	8,000	8,000
Molasses Pump with electric motor 3 HP	1	5,000	5,000
Molasses pipe line	1	10,000	10,000
Hoppers one ton	1	22,000	22,000
Molasses tank concrete 10 by 8 by 7	1	30,000	30,000
Separator 7 by 4 sq. ft.	1	70,000	70,000
Blower 12''	1	22,000	22,000
Cyclone	1	25,000	25,000
Air lock	1	10,000	10,000
Receiving in let (houdees) with shoots	2	40,000	80,000
Weighing scale, 100 kg	1	4,000	4,000
Bag closer or Sewing machine	1	5,000	5,000
Trolleys , drum , bins etc	3	3,000	9,000
Total Cost of Machinery			**890,400**

[7] *Source: National Feeds Ltd., 19 Km, Sheikhupura –Faisalabad Road, Feroz Wattawan*

8 RAW MATERIAL (UMB)

8.1 Classification of Feed Ingredients:

8.1.1 Protein Sources:

For urea molasses blocks (UMB), these are;

- Cotton seed cake/meal
- Corn gluten meal (30 or 60%)
- Urea

8.1.2 Carbohydrate Sources:

These are the products with less than 20% crude protein and 18% crude fiber.

- Molasses
- Corn by products such as corn cobs no; other corn by products

8.1.3 Mineral supplements:

- Salt (white/black)
- Bone meal
- Dicalcium phosphate (DCP)
- Calcium oxide (CaO)

These feed ingredients when mixed according to UMB formula will provide adequate energy to livestock. The formula for a UMB is not a fixed one. It has to be changed from time to time keeping in view the cost of ingredients used in the formula. And the cost of feed ingredient is never static.

9 PRODUCTION PROCESS OF UREA MOLASSES BLOCK (UMB)

A standard UMB consists of:

a)	Molasses	30-50 %
b)	Urea	5-10 %
c)	Rice/wheat/maize bran	15-25 %
d)	Salt	5-7 %
e)	Lime or cement	5-7 %
f)	DCP	2-4 %
g)	Minerals	1-2 %

The manufacture of UMB is done in advance of their proposed use. If they are to be used as a supplement during the dry season, when the quality of forage is very low, their

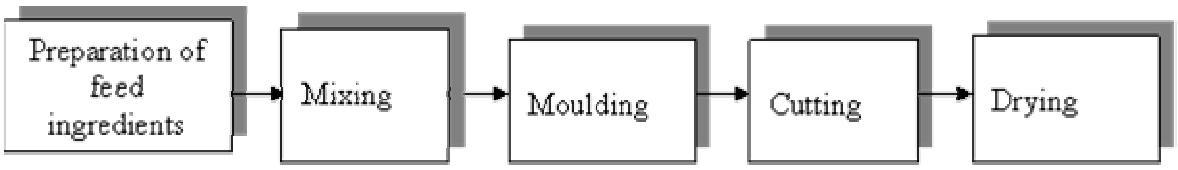
production should start before this period in order to have sufficient numbers of blocks available when required. But in view of the hygroscopic nature of the components, as well as of the blocks, it is better not to start production before the onset of the dry season and use it maximum after 3 months of their manufacturing.

9.1 Process Flow of UMB

The requirements are:

a) Accuracy and precision of weighing (the standard scale should be OK)
b) ingredient handling and processing
c) premixing of salts
d) mixing

Figure 9-1 Process Flow of UMB



Urea-molasses blocks (UMB) may be manufactured either on a small or on a larger scale depending on the number of uses and the expected length of the feeding period. Whatever scale of production is applicable the method of manufacture will be the same; the difference being the quantities of feed ingredients and the implements used in the manufacturing process. Our experience shows that blocks weighing 5 kg are most appropriate for feeding dairy cattle under smallholder situations. Assuming a daily intake of around 700 g/cow, each block will last for 7 days. Therefore, blocks can be replaced once a week on a specific day, making it a regular activity for the farmer.

9.2 Preparation of feed ingredients

All components should be weighed out before mixing. A standard volume or weight can be adopted for each component which would correspond with the weight of the block desired.

9.2.1 Molasses

For the molasses no preparation is necessary apart from measuring the quantity. Even if handling the molasses is a little difficult it should not be diluted with water. When ordering molasses from the sugar factory specify 'undiluted' molasses and check the BRIX value when the molasses is received. Molasses can be stored in the same tank as that used for transporting it. If the quantity of blocks manufactured is large enough, it might be preferable to have two tanks in order to avoid running out of stock.

9.2.2 Urea

The introduction of urea in the form of lumps in the mixture must be avoided in order to eliminate chances of urea toxicity in livestock. It may be necessary to crush the lumps, either by hand or by passing the urea through a hand mill and sieve.

9.2.3 Salt

As with the urea it is better to avoid lumps. The salt could be mixed with cement and then water added to improve the setting of the blocks.

9.2.4 Cement or quicklime

Cement should be mixed with water and salt. The quantities are:

3-4 liters of water

2.5 kg of salt per 10 kg of cement.

If quicklime is used it should be finely ground and it's reaction to the addition of water tested.

9.2.5 Bran

Bran does not need any preparation. However, bran is replaced by another fiber source such as peanut hulls or straw, these materials should be ground before mixing. Experience show that sometimes coarse grinding of fibrous material gives a better consistency to the block than fine grinding, especially if polishing are being included.

9.2.6 Equipment for mixing:

According to the rate of production foreseen and the level of investment, different types of mixers can be used. If adequate labor is available and only few blocks (say 150-200 UMB) are needed then manual mixing is possible. With 2 laborers, approximately 200 blocks of 5 kg each could be made over a period of 8 hours shift. However, for producing larger numbers of blocks, a concrete mixer is recommended. The cylinder of this concrete mixer should turn horizontally and as slowly as possible, to avoid the molasses, which is highly viscous, sticking to the side of the mixer. Spillage of the mixture should also be avoided. For bigger units it is recommended that a horizontal paddle mixer is installed (the ribbon mixer used in feed manufacture is not suitable) with one or two axles and a discharge valve.

9.3 Introduction of the components

It has been found that the order of introduction of the components plays an important role in the mixing process. The recommended order is as follows:

- Molasses
- Urea
- Salt, minerals etc.
- Cement or quicklime
- Bran

Following this order a homogenous mixture of the urea, salt and gelling agent in the molasses is assured. Any other components (e.g., minerals, and drugs) to be included are

introduced together with the salt. When using a concrete mixer the bran must be introduced in small quantities at a time, in order to ensure a homogenous mix. After a few minutes, when the mixture appears homogenous like peanut butter, the mixer is emptied (e.g. into wheelbarrows if large-scale production is being undertaken) and transported to the molding area.

9.4 Molding

Moulds are necessary to set the blocks in an acceptable shape. Once set, the frame can be removed for reuse and to allow the drying process to continue. Moulds can be of different types. The size of the mould(s) will depend on the preferred size of the block(s). The one recommended by the FAO is made out of 4 wooden planks with slots sawn in order to be able to assemble the frame easily. The dimensions of the frame can vary depending on the expected rate of production and size of blocks. The most appropriate for small scale manufacture of blocks are frames made out of a number of wooden planks with slots cut out to enable easy assembly and removal. Each compartment measures 12 x 10 x 8 inches.

It can hold a urea-molasses block weighing 4.5-5.0 kg. This type of mould is most suitable when drying and storage area is limiting. Since the frames are removable they can be re-used as soon as the urea-molasses mixture has started setting-in. Small plastic containers have been used successfully in Indonesia for preparing urea-molasses blocks. They produce blocks with acceptable solidity and are suitable for use in small units. An advantage of this type of mould is that the block can be offered to the animal while it is in the plastic container and once the block has been consumed the container can be re-used.

9.5 Cutting the blocks

Turning out and cutting is necessary when using large moulds. The board can be taken away the day after molding in order to facilitate drying. The cutting will take place later with a flat spade. The spade should be wetted in a bucket between each cut to avoid the mixture from sticking to it. With small plastic moulds, the blocks can be offered to animals while in the mould or the blocks may be removed simply by turning the containers upside down and tapping on the bottom of the container.

9.6 Drying

After removal of the moulds and cutting up, blocks are arranged on a drying area. Blocks must not be exposed to direct sunlight, but placed under a shade with good ventilation. After 24 to 72 hours the blocks are dry enough to be transported.

10 UTILIZATION OF UMB.

Some important guidelines towards the optimum utilization of UMB as supplements for forage based diet are described below. Urea molasses blocks should not be fed alone but only as a supplement. It requires a minimum amount of roughage to ensure that the animals are not over fed and thereby avoid urea toxicity.

10.1 Species of livestock

Since the blocks contain urea, therefore, these must only be fed to ruminants (buffalo, cattle, goats and sheep) and **never** to mono gastric (Single Compartment Stomach) species like chicken, donkeys, horses, pigs, and rabbits or to young, especially pre-ruminant calves, kid and lambs.

10.2 Feeding period

The aim of the UMB is to improve the utilization of low quality roughage, especially during and at the end of the dry season, when livestock are often dependent on crop residues or low quality dry season grazing, which are low in crude protein and high in fiber. Therefore, the production and distribution of UMB should be limited to these critical periods. There is no advantage in offering blocks when green forage is available, as during the wet and early dry seasons. To avoid wasting resources these should not be made available at these times.

10.3 Minimum Roughage Requirements

Since Urea Molasses Blocks are supplements, therefore, these should not be fed alone. A minimum quantity of roughage is needed to ensure that the animals do not consume too much urea, possibly leading to urea toxicity. One should remember that the purpose of the block is to improve the utilization of roughage and not to substitute it.

10.4 Adaptation of animals

The full daily ration of the block (e.g. ± 700 g/day per adult cow) should not be offered as soon as the feeding period starts but should be built up to over a period of at least 7-10 days. This is particularly important when animals have suffered a degree of underfeeding, as intake can be more rapid than usual. Animals not used to urea and also eating rapidly are the most likely to suffer from urea toxicity. After the adaptation period, animals will adjust their intakes to around those recommended, i.e., cattle: 700 g/day & small ruminants: 100 g/day. An easy way to restrict intake during the adaptation period is to limit the amount of time the blocks are accessible to an animal. A thumb rule is to offer UMB for one hour per day (about 200 g for cattle and 30 g for sheep/goat) during the first 3-4 days, then 3 hours per day (about 400 g for cattle and 60 g for sheep/goat) during the next 4-6 days. Thereafter, UMB along with ample supply of drinking water can be offered to them 24 hrs a day.

10.5 Feeding system

The distribution of the UMB should be done according to the livestock management system. Blocks can be offered to the animals in the evening when they are in their sheds.

10.6 Establishing priorities

If a farmer has a limited number of blocks available, he must also establish an order of priority for feeding his animals. Priority should be given to pregnant, lactating cows and draught animal.

10.7 Machinery Requirement

Following machinery will be required for the preparation of UMB.

Table 10-1 Machinery Details (UMB)[8]

Description	Number	Cost (Rs.)	Total Cost (Rs.)
Mixer Machine	1	25,000	25,000
Molasses Pump	1	5,000	5,000
Molasses Pipeline	1	10,000	10,000
Motor	1	5,000	5,000
Donkey Pump	1	5,000	5,000
Flat Spades	4	700	2,800
Moulds with Branding Details	7	700	4,900
Molasses Mixer	1	5,000	5,000
Trolleys, drums, bins	3	9,000	27,000
Molasses Tank	1	30,000	30,000
Total cost			**119,700**

11 LAND & BUILDING

The required space for animal feed and UMB Mill is 8246 Sq. feet (approximately 37 Marlas). Cost of land in the proposed areas is taken to be Rs. 50,000 per Marla.

11.1 Covered Area Requirement

Building for the proposed project comprises of two major blocks i.e. office block and factory block. Areas and construction cost for the said blocks are listed in the table below:

[8] *Source: Green Sand Frame, Jhang*

Table 11-1 Covered Area Details

Factory Block		**Sq. Ft.**	**Construction Cost /Ft.**	**Total Cost (Rs.)**
Plant Hall	30x50	1500	300	450,000
Plant Hall for Urea Molasses Blocks	30x40	1200	300	360,000
Meals Store	30x25	750	250	187,500
Store house for Urea Molasses Blocks	75x30	2250	150	337,500
Processed Feed	30x25	750	300	225,000
General Store	40x30	1200	300	360,000
		7650		**1,920,000**
Office Block				
Office Block	14x16	224	500	112,000
Bath room	6x6	36	500	18,000
Staff quarters (2 rooms)	14x12 x2	336	350	117,600
		596		**247,600**
Total Construction Cost		8246		2,167,600
Land Required (Marlas)		37		
Kanals		2		
Land Cost per Marla		50,000		
Total Land Cost				**1,832,444**
TOTAL COST OF LAND AND BUILDING				**4,000,044.44**

11.2 Recommended Mode

It is recommended to purchase land on preferred locations provided already in this pre feasibility.

12 Human Resource Requirement

Table 12-1 Human Resource Requirement

Employee Designation	No. of Employees	No. of Shifts	Monthly Salary (Rs.)	Annual Salary (Rs.)
Production Manager	1	1	40,000	480,000
Production In charge	1	2	15,000	360,000
Laborers	2	3	3,000	144,000
Mechanic/Electrician	1	1	6,000	72,000
Guard	2	1	3,000	72,000
Accounts Officer	1	1	7,000	84,000
Total				1,212,000

12.1 Utilities Required

- Electricity
- Telephone

13 FINANCIAL PROJECTIONS

13.1 Project Costs

ANIMAL FEED & UMB MILL				
Project Cost				
Land and Building				4,000,044
Plant and Machinery				1,010,100
Furniture and Fixture				70,000
Vehicles				650,000
Pre operating Expenses				40,000
Erection and Installation (5% of total machinery Cost)				50,505
Fixed Assets				**5,820,649**
Initial working Capital				4,860,463
Total Project Costs				**10,681,113**
Financing				
	Debt		50%	5,340,556
	Equity		50%	5,340,556
	Total Financing			**10,681,113**
Project Returns				
	IRR	%		24%
	Pay Back period	Yrs.		3
	NPV	Rs.		1,486,523

13.2 Projected Income Statement

ANIMAL FEED MILL
Projected Income Statement ***Rs. (1000)***

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Sales										
Sales of Feed	40,800	47,520	50,160	50,160	50,160	50,160	50,160	50,160	50,160	50,160
Sales of UMBs	2,550	2,700	2,850	2,850	2,850	2,850	2,850	2,850	2,850	2,850
	43,350	50,220	53,010	53,010	53,010	53,010	53,010	53,010	53,010	53,010
Cost of Sales	35,760	38,960	42,478	43,806	45,183	46,613	48,098	49,639	51,241	52,906
Gross Profit	7,590	11,260	10,532	9,204	7,827	6,397	4,912	3,371	1,769	104
Operating Expenses	890	976	1,069	1,172	1,285	1,401	1,538	1,688	1,852	2,033
Operating Profit	6,700	10,285	9,462	8,032	6,541	4,996	3,375	1,683	(84)	(1,930)
Less:										
Financial expenses	609	481	352	224	96	-	-	-	-	-
Profit Before Taxation	6,091	9,804	9,110	7,808	6,445	4,996	3,375	1,683	(84)	(1,930)
Income Tax	2,007	3,306	3,063	2,608	2,131	1,623	1,056	464	-	-
Net profit After Taxation	4,084	6,498	6,046	5,200	4,314	3,372	2,319	1,219	(84)	(1,930)
Retained earnings	-	4,084	10,582	16,628	21,828	26,143	29,515	31,833	33,052	32,969
Profit transferred to balance sheet	4,084	10,582	16,628	21,828	26,143	29,515	31,833	33,052	32,969	31,039

13.3 Projected Balance Sheet

ANIMAL FEED MILL											
Balance Sheet											Rs. (1000)
Capital and Reserves	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Share Capital	5,341	5,341	5,341	5,341	5,341	5,341	5,341	5,341	5,341	5,341	5,341
Retained Earnings	0	4,084	10,582	16,628	21,828	26,143	29,515	31,833	33,052	32,969	31,039
	5,341	**9,425**	**15,922**	**21,969**	**27,169**	**31,483**	**34,855**	**37,174**	**38,393**	**38,309**	**36,380**
Long Term Loan	5,341	4,272	3,204	2,136	1,068						
Current Liabilities											
Current portion of long term liabilitites		1,068	1,068	1,068	1,068	1,068					
Tax Payable		2,007	3,306	3,063	2,608	2,131	1,623	1,056	464	-	-
Accounts Payable	233	1,571	1,710	1,842	1,895	1,950	2,006	2,064	2,124	2,185	1,903
	233	4,646	6,085	5,973	5,571	5,148	3,629	3,120	2,588	2,185	1,903
	10,914	**18,343**	**25,211**	**30,078**	**33,807**	**36,632**	**38,485**	**40,294**	**40,981**	**40,495**	**38,283**
Fixed Assets											
Fixed Assets	5,781	5,438	5,095	4,752	4,409	4,066	3,723	3,380	3,038	2,695	2,352
Pre-operating expenses	40	32	24	16	8	0	0	0	0	0	0
	5,821	5,470	5,119	4,768	4,417	4,066	3,723	3,380	3,038	2,695	2,352
Current Assets											
Raw Material Inventory	4,463	4,867	5,292	5,450	5,614	5,782	5,956	6,134	6,318	6,508	-
RM Inventory UMBS	187	198	209	209	209	209	209	209	209	209	-
Finished Goods Inventory	-	4,419	4,819	5,239	5,396	5,558	5,725	5,897	6,074	6,256	6,444
FG Inveentory UMBs	-	186	196	207	207	207	207	207	207	207	207
A/C Receivable	-	2,168	2,511	2,651	2,651	2,651	2,651	2,651	2,651	2,651	2,651
Cash/Bank	443	1,036	7,065	11,553	15,313	18,158	20,013	21,815	22,484	21,969	26,630
	5,093	12,873	20,092	25,310	29,390	32,565	34,761	36,913	37,943	37,800	35,931
	10,914	**18,343**	**25,211**	**30,078**	**33,807**	**36,632**	**38,485**	**40,294**	**40,981**	**40,495**	**38,283**
	-	-	-	-	-	-	-	-	-	-	-

13.4 Projected Cash Flow Statement

ANIMAL FEED MILL											
Cash Flow Statement											*Rs. (1000)*
Operating activities	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Net profit	-	4,084	6,498	6,046	5,200	4,314	3,372	2,319	1,219	(84)	(1,930)
Amortization (Pre-operationa	-	8	8	8	8	8	-	-	-	-	-
Depreciation	-	343	343	343	343	343	343	343	343	343	343
Raw Material Inventory	(4,463)	(404)	(425)	(159)	(164)	(168)	(173)	(179)	(184)	(190)	6,508
Raw Material Inventory UME	(187)	(11)	(11)	-	-	-	-	-	-	-	209
Finished Goods Inventory	-	(4,419)	(400)	(420)	(157)	(162)	(167)	(172)	(177)	(182)	(188)
Finished Goods Inventory UI	-	(186)	(11)	(11)	-	-	-	-	-	-	-
Accounts receivable	-	(2,168)	(344)	(140)	-	-	-	-	-	-	-
Accounts payable	233	1,338	139	131	53	55	56	58	60	62	(282)
Tax Payable	-	2,007	1,300	(243)	(456)	(477)	(507)	(567)	(592)	(464)	-
Cash provided by operations	(4,418)	593	7,097	5,556	4,828	3,913	2,924	1,802	669	(515)	4,661
Financing activities											
Long term debt principal repayment			(1,068)	(1,068)	(1,068)	(1,068)	(1,068)	-	-	-	-
Addition to long term debt	5,341										
Owner's investment	5,341										
Cash provided by/ (used for)	10,681	-	(1,068)	(1,068)	(1,068)	(1,068)	(1,068)	0	0	0	0
Investing activities											
Capital expenditure	-5821										
Cash (used for)/ provided by	-5821	0	0	0	0	0	0	0	0	0	0
Net Cash	443	593	6,029	4,488	3,759	2,845	1,856	1,802	669	(515)	4,661
Cash balance brought forwa	0	443	1,036	7,065	11,553	15,313	18,158	20,013	21,815	22,484	21,969
Cash carried forward	**443**	**1,036**	**7,065**	**11,553**	**15,313**	**18,158**	**20,013**	**21,815**	**22,484**	**21,969**	**26,630**

14 Useful Terminology

Feed stuffs
Any substance of nutritive and biological value used in production manufacture of compound feed.

Feed grade
Specific product adequately tested to prove its safety for feeding purpose

Grinding
Process by which a feedstuff is reduced in particles by impact sheaving or attrition

Ration
Amount of balance feed in 24 hours

Meal
Ingredient ground in small particles for usage by animal

Compound feed
Any ground / pelleted/ crumbled/ mixture intended for feeding the animals. It includes a concentrate mixture accordingly to formula. It should not be adulterated or misbranded. It is accordingly to growth, reproduction and production status of animal.

Automatic Feed Mill
The establishment in which feed is carried out by automatic machinery, electrically operated with / without manual involvement.

Semi Automatic Feed Mill
The establishment of feed preparation carried out automatically with machinery and manual involvement.

Home Mixed Feed
Feed prepared for herds maintained on farm of owner.

Cake
Mass resulting from the processing of seeds in order to remove oils, fats or other liquids.
BRIX Value
Level of sugar in molasses

Urea Toxicity
Sick condition of animal due to excessive intake of urea.
Hygroscope:
A compound or product that absorbs moisture from environment.

Monogastric Animals:
The animals that have single compartment stomach