

# Pre-Feasibility Study

## DAIRY FARM (50 Animals)



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**June, 2005**

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## DISCLAIMER

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## DOCUMENT CONTROL

Document No.	PREF-17
Revision	2
Prepared by	SMEDA-Punjab
Issue Date	Mar, 2002
Revised in	June, 2005
Issued By	Library Officer

## **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 dairy and livestock farming. 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 dairy and livestock 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 "Dairy Farm" 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

Dairy production is all-inclusive activity, related to animal care, reproduction, feeding, and management. It is defined as all those aspects and activities relating to rising of dairy animals during their various phases of life to get wholesome milk. Before making the decision, whether to invest in the dairy and livestock farming 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

- Back bone and main stay of economy. Provides raw material for food & Leather industry.
- Major source of food, i.e. Milk & Meat
- Source of Farm Yard Manure (FYM).
- Sizeable foreign exchanges earning through exports.
- Wide scope of Milk Production, ranking 5th in the world.
- Ample human resource employment sector.
- Stationed, Permanently located secured loaning sector.
- Contended nature. Low cost living standard.
- Full family involvement, Devoted & Hardworking Sector.

#### 3.2 Weaknesses

- Low or lack of interaction with farmers. Poor information about each other. Lack of extension services.
- Lack of education and initiative in farmer, traditional approach due to lack of skills and management.
- Unorganized sector, unaware of basic farm management practices.
- Remote area, lack of farm to market approach & transportation.
- Non-availability of communication services.
- Lack of farm/ market infra structures & marketing information.
- Lack of record keeping on farm.
- No or low application of research work and pedigree record keeping.
- Management of dairy farm is a challenging job.
- Nutrition is still a problem hampering the livestock productivity in general and milk production in particular
- Enormous production losses due to endemic diseases every year.

#### 3.3 Opportunities

- Govt. of Pakistan & Sate Bank of Pakistan priority sector.
- Dairy products needs are much higher than supply.
- Ample opportunities are available in the Banking Sector.
- Commercially viable sector with great credit potential and absorption capacity.
- Vast range of area of operation, more needs and scope of development.

- Value added dairy products are in demand.
- Massive migration of labour to cities can be checked / stopped.
- Corporate financing will become a niche in lending market.
- Cooperatives can play a big role for development in dairy sector like India.

### 3.4 Threats

- Implementation of WTO will result in open & competitive commodity pricing.
- Due to fear of default, banker community has reluctance for lending loans.
- High risks of diseases in live stock.
- Defective and unorganized markets.
- Imbalance between prices of inputs & outputs.
- Rising trend of cost of production with higher rate of interest as compared to profit ratio.
- Lack of media projection, non-recognition of problems and monopoly of multinationals.
- Lack of community organizations and out dated farm practices.
- Lack of coordination towards common causes & goals.
- Lack of awareness about economics, demand & supply in market.
- Low saving, low holding capacity. Increasing level of poverty.
- Non-availability of subsidy, tax holidays.

## 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.

**Table 4-1 Population of livestock (million)<sup>1</sup>**

Species	1999-00	2000-01	2001-02	2002-03	2003-04(E <sup>2</sup> )
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

<sup>1</sup> Source = Economic Survey of Pakistan, 2003-04

<sup>2</sup> E = Estimated

**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 (000,tones)	963	986	1010	1034	1060
Mutton(000,tones)	633	649	666	683	702

Dairy farming is an agro-based project, which comprises of two aspects: dairy production and dairy technology. Dairy production is an all-inclusive activity, related to dairy animal care, reproduction, feeding, management and is defined as all those aspects and activities relating to raising of dairy animals during their various phases of life to get wholesome milk. Dairy technology relates to all aspects of processing milk to convert it into various products. This conversion of milk into product is practicable only if it is economically viable.

Dairy animals, mainly buffaloes and cows are purchased from the animal markets or breeders located in peri urban areas of cities like Karachi, Islamabad, Lahore, Okara, Sahiwal, Sheikhpura, Bahawalpur, Multan, Sargodha and Faisalabad. Dairy animals are fed on protein sources (concentrate) along with plenty of green fodder. Animals are milked twice a day i.e. morning and evening. The milk is sold at the farm or may be directly sold in the urban market. The milk price varies according to its quality and the season. Buffalo milk is sold at Rs 14-16 per liter at the farm gate and Rs 20-22 in the urban market. Cow milk is sold at Rs 11-13 per liter at the farm and Rs. 18-20 in the urban markets.

#### 4.2. Market Entry Timing

The demand of milk in summer is high as compared to winter. That's why the animals in summer are sold at a bit higher prices as compared to winter. So the proposed business can be started before the onset of summer season. 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 livestock breeders and farmers. The ability to work with people and animals, and efficient use of resources are important aspects in modern and commercial dairy farming.

#### 4.3. 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 Sole Proprietorship.

#### 4.4. Proposed Capacity

The feasibility study suggests an initial herd size of 50 animals, which is economical to justify the overhead cost. The farm size will increase to 100 animals within 10 years. Herds mix of 70% cows and 30% buffaloes are recommended to get the maximum milk production round the year.



Buffaloes (NiliRavi, Kundi) with second lactation (calving) 15 heads  
 Cows (Crossbred / Local) with second lactation (calving) 35 heads  
 A cow, on average, yields 12-14 liters of milk a day over a lactation period of 285 days whereas a buffalo, on average, yields 10 liters a day over a lactation period of 305 days.

#### 4.5. Project Investment

The total cost of the project is Rs. 5, 128, 691, out of which capital cost of the project is Rs. 4, 436, 011 for purchasing the animals and constructing the building and the rest is used to meet the working capital requirement.

**Table 4-3 Project Costs (Rs)**

Account Head	Total Cost (Rs)
Building/Infrastructure	956,161
Machinery & equipment	191,850
Animal Cost <sup>3</sup>	3,207,000
Pre-operating costs <sup>4</sup>	81,000
<b>Total Capital Cost</b>	<b>4,436,011</b>
Raw material inventory	72,680
Upfront land lease rental	540,000
Cash	80,000
<b>Working Capital Requirement (Rs)</b>	<b>692,680</b>
<b>Total Investment (Rs)</b>	<b>5,128,691</b>

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%	2,564,346
Equity	50%	2,564,346
<b>Total project Investment</b>		<b>5,128,691</b>

**Table 4-5 Project Economics**

Viability	Equity	Project
IRR (%)	30	26
NPV @20% (Rs)	1,876,211	4,873,710
Pay Back Period (year)	6.95	6.66

<sup>3</sup> Includes cost of supporting animals i.e. a donkey and a bull costing Rs. 7,000 and Rs. 25,000 respectively.

<sup>4</sup> Includes 5 months salary of Farm Manager and 1 month salary of workers.

#### 4.6. Proposed Location

The main agricultural, and dairying lands are in the great plains of the valley of the Indus and its tributaries (see Figure 14-1 in annexure 4) in the Punjab, Sindh and to a lesser extent the North West Frontier Province (NWFP). Irrigated land, about 16,000,000 hectares is by far the most important from the point of view of dairy production; there are also about 5,000,000 hectares of rainfed (*barani*) land.

#### 4.7. Key Success Factors/Practical Tips for Success

Commercial dairy farmers depend on land, labor and animals as the major resources. The thrust in modern dairy farming is on the increased use of capital and management. Successful dairy farming harnesses all available resources into productive and profitable unit. Dairy farming is highly complex as it includes breeding, management, feeding, housing, disease control and hygienic production of milk on farm. The judicious use of means and resources to achieve clearly defined goals is the key success factor in modern dairy farming i.e. the art of maximization and optimal utilization of resources and means for maximizing productivity and profits.

The low yielder animals are uneconomical to keep, hence these should be culled. The over all genetic improvement of all the dairy animals is necessary for improved milk production. It involves milking records at equal intervals, selection of bull from high producing mothers, progeny testing of breeding bull and then making extensive use of these bulls by well-organized Artificial Insemination (AI) program.

Feeding dairy animals on nutritious and high yielding hybrid varieties of forages can be adopted. The surplus forage should be preserved as silage or hay.

Other farm management practices include feeding for growth, lactation, pregnancy or maintenance, hygienic milk production, comfortable and ventilated barns, spraying/wallowing of animals in summer, timely detection of heifers, mating, with selected bull or AI service. If animals are bred within the 60-90 days of calving provided with clean surroundings, drinking water and feed according to the requirements, the over all performance of herd can be improved.

Timely vaccination against Rinderpest, Black Quarter, Foot and Mouth Disease, Brucellosis along with the prevention of mastitis and parasitic control will also improve the over all performance of dairy herd.

Hygienic milk production depends upon healthy animals, clean surroundings, clean hands of milkman and clean utensils.

### 5 SECTOR & INDUSTRY ANALYSIS

#### 5.1 Major Players

Dairy farming is not an organized sector in Pakistan. More than 90% of farming is done on subsistence level. There are very few progressive farmers, which are running the business of dairy farming in a professional manner. Milk processing was started in late 1970s, which is still facing challenges due to competition with the unprocessed milk. The processed milk has captured only 2% of the total milk market. Processed milk is not the consumer's preference due to high price differential. There are 28 milk-processing plants

in the country, which were installed in mid 1980s to promote usage of processed milk. Most of these milk plants are closed due to lack of professional management, inadequate milk supply and poor marketing campaign of the processed milk.

**Table.5.1 Land Holdings**

Size of the Farm in hectares (ha)	No. of Farms	%	Farm Area (Hectare)	%	Avg. size of Farm Area (ha)
Private Farms	5,070,963	-	19,149,673	-	3.8
Government Farms	149	-	103,035	-	-
All Farms	5,071,112	100	19,252,672	-	100
Under 0.5	678,538	13	193,126	1	0.3
0.5 - < 1.0	689,233	14	510,397	3	0.7
1- < 2	1,036,286	20	1,446,796	8	1.4
2- < 3	841,295	17	1,973,800	10	2.3
3- < 5	857,387	17	3,309,432	17	3.9
5- < 10	623,110	12	4,134,346	22	6.6
10- < 20	237,929	5	3,032,872	16	12.7
20- < 60	91,831	2	2,613,767	14	28.5
More than 60	15,354	-	1,935,101	10	126.0

(Source: Agricultural Statistics, 1999-2000).

**Table 5-2 Milk Processing Plants currently in operation**

Project	Products	Location
Noon Pakistan.	Milk powder/ butter	Bhalwal-Sarghodha
Nestle Milkpak.	UHT milk /Ghee	Sheikupura & Kabir Wala
Prime Dairies.	Pasteurized milk/yogurt	Manga-Lahore
Idara-e-Kisan (Halla).	Pasteurization milk/UHT	Pattoki/ Lahore
Chaudhry Dairy.	UHT milk, milk powder	Bhai Pheru
Am-Pak Dairy.	Pasteurization milk	Raiwind-Lahore
Royal Dairy.	UHT milk	Karachi

## 5.2 Hubs of Dairy Farming

The development of urban or peri-urban commercial dairy farms is something new in livestock production. Metropolitan cities like Lahore, Karachi, Multan, Rawalpindi, etc are the major markets of milk. Hence, dairy farms established in peri urban areas of these cities fulfill the daily need of these cities.

## 6 MARKET INFORMATION

### 6.1 Sector Characteristics

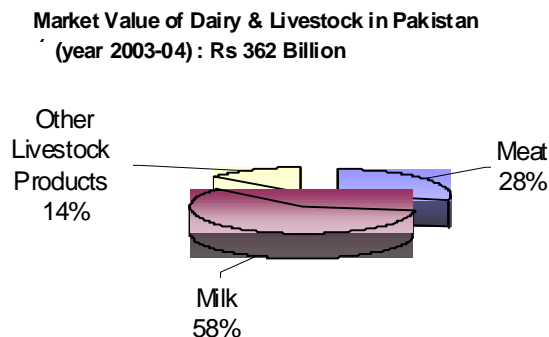
The size of this sector is still growing. Commercial Dairy farms have been set up in peri urban areas. Few of the commercial dairy farms are:

1. Sar Sabz Dairy Farm, Okara
2. Green Sands Livestock Farm, Jhang
3. Muzafarabad Livestock & Dairy Farms, Chishtian, Bahawalnagar.
4. Imam Dairy Farms, Khanewal
5. Arshad Dairy Farm, Fateh Jang, Attock

### 6.2 Market Potential

Pakistan is the fifth largest milk producer in the world. Milk production in year 2003-04 was about 27.81 million tons. Raw milk is used for drinking and tea making purpose. In rural areas, milk is used to make desi ghee, yogurt, whey (*lassi*) and butter. Rural as well as the urban households are the major consumers of milk.

**Figure 6-1 Market Value of Dairy & Livestock in Pakistan**



(Source: Agricultural Statistics of Pakistan, 2003-04)

The daily milk intake of major cities of Lahore & Karachi is 2-3 million liters and 4 million liters respectively. The demand for milk increases during summers as the consumption of whey (*lassi*) rises due to hot weather. Ghee is obtained by heating the milk to evaporate water and removing the curd. Liquid butter oil with 93% fat content and a much smaller volume results. It is easy to store and resists spoilage even at tropical temperatures. The ghee from buffalo milk is white and that from cow milk yellow. Dahi or curd (similar to yogurt) is another popular product. If not refrigerated it must be consumed within 24 hours. Khoya is a popular sweet. It is prepared by condensing the milk to about 20% fat. Sugar and some spices are added in order to obtain desirable flavors. It is a high value product however it also has a relatively short shelf life.

Milk processing companies use milk as a raw material to formulate different types of milk i.e. pasteurized milk, UHT treated milk, condensed milk, skim milk & milk powder, etc. Different value added products like yogurt, ice cream, butter and cheese are also prepared from the raw milk. The processed milk market has increased its share in quality

conscious consumers. The processed milk has achieved 4% share in Lahore milk market during the last two decades. The milk market is growing at a growth rate of 4.5% annually with increase in milk consumption. Metropolitan cities are the major markets for the sale of milk. Milk can be sold at farms or directly to milk centers in the urban market. Gawallas<sup>5</sup> collect milk from farmers in villages and deliver it at the consumer's doorstep. Milk collection networks of different processing companies also collect milk directly from the farm and transport it to the processing facilities.

### 6.3 Target Customers

This pre feasibility study suggests that milk will be sold on farm door through contractors, *gawalas*<sup>3</sup> or people around that area or may be pasteurized at farm by the farmer and then deliver it to the near by city. Following are some of the target clients for a dairy farmer.

1. Local people
2. Gwalas
3. Milk collection companies
4. Contractors

The cost of production per liter of raw milk should be lower than its sale price so that farmer could feel it economical.

## 7 FARM INPUTS

### 7.1 Land

#### 7.1.1. Land Requirement

About 108.14 acres of land is required for a dairy farm project of animals starting from 50 animals and at a target herd size of 200 animals in a period of 10 years. The area of fodder production can be minimized if farmer distributes the land in different fodder plots of different growing seasons in a rotation annually. Majority of this land would be used for growing green fodder for the animals. The other part would be used for building sheds for the animals to protect them from severity of the weather.

**Table 7-1 Land Requirements**

Description	Area (Acres)
Shed for Cows	0.10
Open Paddock for Cows	0.21
Shed for Buffaloes	0.05
Open Paddock for Buffaloes	0.10
Shed for Calves	0.07
Open Paddock for Calves	0.11
Shed for Calves (older than one year)	0.06
Open Paddock for Calves (older than one year)	0.10

<sup>5</sup> Local term used for milkman.

Stores for fodder, concentrate & machine room	0.07
Utensils & milk storage	0.04
Servant Room, Wash room	0.06
Water Pond	0.12
Land for fodder	107.04
<b>Total Land Requirement</b>	<b>108.14</b>

### 7.1.2. Land Lease

Lease is a better option for a new investor. Land on lease is available in rural areas for a period of 5-15 years. Advance rent for a few years will be charged initially. Good agriculture land is available with an annual rent of Rs 5, 000-10,000 per acre.

### Suitable Locations

Peri urban and rural areas where water is available to irrigate the crops are suitable locations for establishing a dairy farm.

### 7.1.3. Herd Mix

The ideal mixed herd should consist of 70% cows and 30% buffaloes for the viability of a farm. The cows are comparatively high yielders as compared to buffaloes. This means that there will be 35 cows and 15 buffaloes in a mixed herd.

**Table 7-2 Important Cattle & Buffalo Breeds in Pakistan**

Species	Milch Purpose	Dual purpose	Draught purpose
Buffaloes	Nili Ravi		
	Kundi		
Cattle	Sahiwal (Swl)	Tharparkar	(Heavy) Bhagnari & Dajal
	Red Sindhi	Kankrej	(Medium) Dhanni
			(Light) Rojhan & Lohani
Cross bred Cattle	Swl x Holstein Friesian (HF)		
	Swl x Jersey		

### 7.1.4. Buffalo Breed (*Bubalus bubalis*)

Only in Pakistan and India, there are well-defined breeds with standard qualities. There are 18 River buffalo breeds in South Asia, which are further classified into 5 major groups designated as the Murrah, Gujarat, Uttar Pradesh, Central Indian and South Indian breeds. The best known breeds are Nili Ravi, Jafarabadi, Surti, Mehsana, Kundi, Murrah, and Nagpuri. Most of the buffaloes of the Indian subcontinent belong to a nondescript group known as the Desi buffalo.

Nili Ravi and Kundi are the best dairy breeds of buffaloes in Pakistan. The Nili-Ravi is found mainly in Lahore, Sheikhpura, Faisalabad, Sahiwal, Multan and Bahawalnagar districts in Punjab Province. Their color is black and their average weight at maturity is 800 kg for the male and 525 kg for the female. They have a wedge shape, massive frame, small curly horns, and wall eyes. They often have white markings on the forehead, face, muzzle and legs and white switch of tail (buffaloes with such markings highly desired and popularly called "Panj Kalian"). They have a large, strong udder and are generally docile. The Kundi breed is found in Dadu, Hyderabad, Karachi, Larkana, Nawabshah, Sanghar and Thatta districts in Sind Province. The color is solid black. The average weight at maturity for the male is 600 kg and 375 kg for the female.

The purchase price of a buffalo in second lactation on average is Rs 70,000. The price of an animal depends upon its body configuration (condition), previous production and the production of its ancestors especially dam. The price of buffalo is higher in the summer and the monsoon season while lower in winter. Milch animals in second or third lactation are preferred, as the probability of increase in milk production is higher.

#### 7.1.5. Breeds of Cows Local (*Bos indicus*), Cross bred and Exotic (*Bos taurus*)

In crossbred cattle, F<sub>1</sub> or F<sub>2</sub> of crosses of Sahiwal x Jersey & Sahiwal x Holstein Fresien are preferred whereas in local breeds, Sahiwal cattle are suitable to start a dairy farm. The Sahiwal is one of the best dairy breeds in Pakistan. It is tick-resistant, heat-tolerant and noted for its high resistance to parasites, both internal and external. Cows much higher milk yields have been recorded. Due to their heat tolerance and high milk production they have been exported to other Asian countries as well as Africa and the Caribbean.

The Red Sindhi originated in the Sindh but due to its hardiness, heat resistance and high milk yields they have spread into many parts of India and at least 33 countries in Asia, Africa, Oceania and the Americas. They are normally a deep, rich red color but this can vary from a yellowish brown to dark brown. Males are darker than females and when mature may be almost black on the extremities, such as the head, feet and tail.

The Tharparkar breed is used for milk production and as draft animals. Tharparkar cattle are found in the areas in the vicinity of Umarnkot, Naukot, Dhoro Naro, Chhor, Mithi, Islamkot, Khari Ghulam Shah and Kach. The cows have an average weight of 408 kg.

The Holstein cow originated in Europe. The major historical development of this breed occurred in Netherland and more specifically in the two northern provinces of North Holland and Friesland. Holsteins are most quickly recognized by their distinctive color markings and outstanding milk production. Holsteins are large, stylish animals with color patterns of black and white or red and white. Holstein heifers can be bred at 15 months of age, when they weigh about 325 kgs body weight between 24 and 27 months of age. Holstein gestation is approximately nine months. The normal productive life of a Holstein is six years.

The Jersey breed originated on the Island of Jersey, a small British island in the English Channel off the coast of France. The breed was known in England as early as 1771 and was regarded very favorably because of its milk and butterfat production. Adaptable to a wide range of climatic and geographical conditions, outstanding Jersey herds are found from Denmark to Australia and New Zealand, from Canada to South America and from South Africa to Japan. They are excellent grazers and perform well in intensive grazing programs. They are more tolerant of heat than the larger breeds. With an average weight



of 350 kgs, the Jersey produces more milk. per kg of body weight than any other breed. The color in Jerseys may vary from a very light gray or mouse color to a very dark fawn or a shade that is almost black. Both the bulls and females are commonly darker about the hips and about the head and shoulders than on the body.

Australian Friesian Sahiwal breed is being developed in Australia by the Queensland Government for use in the tropical areas. The breed was evolved using the Sahiwal from Pakistan, and the Australian Holstein-Friesian. Since the 1960's when research work began on this breed, notable progress has been achieved towards the objective of combining tick resistance and heat tolerance with reliable milk production and fertility. It has now been extensively tested in the tropical and sub-tropical areas of Australia. Milk quality is good - protein level is 3.4 percent and butterfat is approximately four percent. These animals are available at an average price of Rs 60,000-65,000 per animal. The photos of different breeds are given in annexure 4.

#### 7.1.6. Bull

The elite bull (the bull selected on the basis of the milk production performance of its ancestors, this is called pedigree selection) is kept at the farm for natural mating in the herd separately for cows and buffaloes. Buffaloes are seasonal breeders and usually do not show the signs of heat. Hence, to avoid the prolonged calving intervals, timely natural or Artificial Insemination is necessary. One bull of good health and adult body weight can serve a herd of 50 buffaloes. Same is the case in cattle herd. A bull of 2 years age and 300-350 kgs weight is available at Rs 25,000.

### 7.3. Animal Breeding and Mating System

A desirable mating system determines which male will be allowed to mate with which female or group of females among the available breeding stock. The mating systems which may be used on a dairy farm are:

1. Inbreeding
2. Out breeding (Cross breeding & Grading)

Inbreeding is the mating of animals that are closely related to each other. This system can be utilized with some advantages if practiced with heavy culling and selection. Although inbreeding lowers milk production, but a small amount of inbreeding is involved in pure breeding for keeping the foundation livestock herd uncontaminated from crossing with ordinary or less useful livestock.

When non-relative animals of the same breed are mated together, the system is termed outbreeding. When animals belonging to two different breeds are involved, the mating is called crossbreeding. Outbreeding combined with selection is an important tool for improvement in total production of herd. This system brings about immediate improvement in milk production in next generation.

Grading is another practice of breeding native farm animals with purebred bulls of a specific breed e.g. Sahiwal or Red Sindhi. The offspring thus produced will have at least 50% inheritance of male. The females off springs of the cross are again mated with purebred bull. In the second-generation females, the inheritance of the male will be 75%. The process is repeated generation after generation so that the inheritance of the purebred male reaches approximately 99% by the sixth or seventh generation in the up graded

females. This method of improvement can be fully exploited by using the frozen semen of exotic dairy cattle breeds e.g. Holstein Friesien, Jersey etc. on the native cattle of Pakistan to increase milk production. Very encouraging results have been obtained through artificial insemination (AI).

#### 7.4. Animal Markets

Animal markets (mandies), Government and private livestock farms are the main sources for purchasing milk animals. Animal markets are situated in different places in Punjab, which includes Sheikupura, Okara, Sahiwal, Arifwala, Muridke and Jhelum. These markets operate on rotational basis in a week, or once a month.

There are different contractors available in the markets who help locating the proper animals. These contractors work on commission basis and the commission rate charged may vary from 1-2% of the animal price.

#### 7.5. Animal Housing

Sheds of the animals should be airy with protection of the animals from extreme temperatures and strong winds. The animal housing should be facilitated with drinking water for animals. There should be proper drainage system to keep hygiene at the farm. It consists of a built up animal shed, a brick soling paddock for animals, calving pens in which pregnant animals are kept separated from other animals before calving, one room for milk storage, one room for storing farm equipment and one for compound feed storage.

The animals can be dehorned, as they are easier to handle in barns and cause less accidental injury to neighboring animals, handlers, walls, and trees.

**Table 7-3 Space Requirement**

Description	Sq ft
Shed space for a cow/buffalo	40
Open Paddock for a cow/buffalo	80
Shed for a calf	40
Open paddock for a calf	80
Shed for a calf (older than one year)	26
Open Paddock for a calf (older than one year)	40
Stores for fodder & concentrate plus machine room	36
Utensils & milk storage	60
Servant room, wash room	12
Water pond	4

**Table 7-4 Total Infrastructure Cost**

Description	Sq.ft	Rate/Sq.ft	Total Cost
Shed for Cows	1600	150	240,000
Open Paddock for Cows	3200	5	16,000
Shed for Buffaloes	600	150	90,000

Open Paddock for Buffaloes	1200	5	6,000
Shed for Calves	829	150	124,000
Open Paddock for Calves	1276	5	6,380
Shed for Calves (older than one year)	539	150	80,835
Open Paddock for Calves (older than one year)	898	5	4,491
Stores for fodder, concentrate & machine room	840	150	125,945
Utensils & milk storage	624	150	93,638
Servant Room, Wash room	700	200	139,939
Water Pond	1426	20	28,523
<b>Total Infrastructure Cost</b>	<b>13,732</b>		<b>956,161</b>

### 7.6.Farm Machinery

The pre-feasibility suggests, hiring tractor for land preparation to grow fodder crops. Only few farm equipment like fodder chopper, water pumps, milk utensils will be purchased.

**Table 7-5 Farm Equipment**

Farm supplies	Rate	Capacity (No. of Animal)	Rs.
Calf feeder	1,200	5	12,000
Teat Dip Cup	350	10	1,750
Toka machine (chef cutter)	12,000	100	12,000
Water pump	5,000	1	5,000
Generator (Peter engine-20HP)	200,000	300	20,000
Tube Well	20,000	1	18,000
Miscellaneous Supplies	Rate	Capacity (No. of Animal)	Rs.
Freezer	20,000	25	40,000
Mule Cart	5,000	50	5,000
Ceiling Fans	2,000	10	10,000
Exhaust Fans	1,800	10	9,000
Miscellaneous farm utensils			7,500
Electrical fixtures (lighting, etc)			15,000
<b>Total Cost (Rs)</b>			<b>155,250</b>
Additional investment required during 4 years <sup>6</sup>			36,600

<sup>6</sup> As the capital cost will be budgeted for 4 years, therefore the initial machinery and equipment cost has been calculated on the basis of 4<sup>th</sup> year machinery requirement.

<b>Total Machinery Cost</b>			<b>191,850</b>
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## 7.7.Feed

### 7.7.1. Ration for Dairy Animals

The ration is allowance of nutritionally balanced feed in 24 hours. It includes green fodder and concentrate to increase animal productivity. Wheat straw<sup>7</sup> is also used as dry roughage along with green fodder. About 1 kg of concentrate is required for the production of 2.5-3 liters of milk. These feed ingredients when mixed according to feed formula will provide adequate energy according to energy and protein requirements of animal in production.

**Table 7-6 Details of Raw Material (Concentrate Feed)**

Material	Percentage Input	Cost (Rs./Kg)	Total Cost (Rs.)
Cottonseed cake/ Maize grain	15%	9	135.0
Corn gluten	20%	6	120.0
Rice Polish	20%	7	140.0
Wheat straw/ Rice bran	22%	6	132.0
Molasses	15%	3	45.0
Urea	2%	10	20.0
Salt	2%	2	4.0
DCP	2%	14	28.0
Vegetable Oil	2%	49	98.0
<b>Total</b>	<b>100%</b>		<b>722.0</b>

The concentrate feed price is Rs 10 per kg if purchased from market. The cost of concentrate will be lowered if feed ingredients are mixed on farm it would be approximately be Rs. 7.22 per kg.

### 7.7.3. Mineral Mixture

This is used as a feed supplement. It includes a mix of minerals (magnesium, iron, sodium and salts). Mineral mixtures are good source of energy and increase the animal productivity to give milk.

### 7.7.4. Fodder Crop

Fodder is grown at the land, which is acquired on lease or owned by the entrepreneur. Due to increased demand, improved forage crops such as multi-cut oats, berseem, lucerne, Sorghum- Sudan grass hybrids, mott grass, sorghum, maize and millet have been developed. These have become very popular in irrigated areas such as Kasur, Sheikhpura, Gujranwala, Faisalabad, Sargodha, and Renala Khurd (Punjab), Nowshera, Charsada, Mardan, and Peshawar (North West Frontier Province), and Hyderabad,

<sup>7</sup> A byproduct of wheat harvesting used as dry roughage for livestock and dairy animals

Sukkur, Larkana and Nawabshah in Sindh for peri-urban dairies. Details of fodder cultivars released by Research Institutions in Pakistan are given in Annex 3 (Table 13-4). Average forage yields in Pakistan are extremely low compared to yields obtained on research institutes and from well-managed farms and fields. These are very low as compared to their potential, with 22.8 tons per hectare a recent estimate. (Reference: FAO Statistical Databases)

Although improved varieties and technology are available, they have been slow to reach the dairy farms. Recent medium scale on-farm work has indicated that yields can be enhanced two to three fold by using available improved varieties and appropriate agronomic techniques. In an area where land and irrigation are the major limiting factors to enhancing fodder production, intensification is the only way to meet the needs for forage. Intensive and economical forage production per unit area per season would be the best choice. Also efforts should be made to produce and provide sufficient quantities of seed of multicut forage varieties and hybrids like mott grass to commercial dairy farms. The fodder yield (except multi cut Mott Grass which yield 100-150 tones/ acre in 4 to 6 cuttings per year) varies between 10 tons to 40 tons per acre depending upon the fertility of land, quality of seed and application of fertilizer.

**Table 7-7 Types of Dry & Green roughage**

Dry Roughage	Green Roughage	
	Summer Fodder	Winter Fodder
Wheat Straw	Maize	Barseem
Rice Straw	Sorghum	Alfalfa (Lucerne)
Oat Straw	Millet	Oats
Maize/Sorghum Stubble	Mott Grass	Rye Grass
Sugarcane Baggass	Sadabahar	Sugarcane tops
Cotton Seed Hulls	Guar	
Corn Cobs		

(Reference: Livestock & Dairy Development Department, Lahore)

(Reference: FAO Statistical Databases)

#### 7.7.5. Fodder Production Economics

The comparative economic feasibility of various forage crops produced under various farming systems is shown in Table 7-8.

**Table 7-8 Economics of forage production under improved production system per hectare in Pakistan**

Item	Forage Crop					
	Maize	Sorghum	S. S hybrid	Berseem	Lucerne	Oats
Land preparation	938	974	974	875	875	750
Seed & Sowing	1,200	688	2,000	1,250	1,250	1,250
Fertilizer	1,750	1,750	5,000	2,500	2,500	2,250
Irrigation	750	750	1000	1,100	750	500
Land Revenue/rent	1,750	1,750	4,500	6,250	6,250	1,875

Harvesting/Transport	1,875	1,750	3,500	3,000	3,750	3,000
<b>Total expenditure</b>	<b>8,263</b>	<b>7,662</b>	<b>13,774</b>	<b>14,825</b>	<b>15,635</b>	<b>9,625</b>
<b>Yield (Kilos)</b>	<b>80,000</b>	<b>79,750</b>	<b>160,000</b>	<b>102,500</b>	<b>103,750</b>	<b>115,000</b>
<b>Price/kg (Rs)</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.50</b>	<b>1.50</b>	<b>1.25</b>

*Variable Costs: Seeds, fertilizers, land preparation, irrigation, harvesting, Transport etc*

*Source: FAO Statistical Databases (2002)*

#### 7.7.5. Daily Fodder Requirement

There is no fixed fodder requirement for the animals but a rule of thumb says that an animal needs daily fodder equal to 9%-10% of its body weight (3% of live body weight on Dry Matter Basis). According to estimates, buffalo consumes 50-55 kg fodder daily while cow consumes about 40-45 kg.

#### 7.7.6. Wheat Straw (Bhusa or Turi)

Wheat straw is major, typical, and very popular dry roughage. It is always chaffed, and is the main or even only major dry roughage used on almost all the dairies. Traditional threshing methods break the straw into short pieces, *bhoosa*, and modern mechanical threshers have been designed to break the straw. Often sources of wheat straw are far from urban dairies of rainfed areas, sometimes in other provinces. In all urban dairies visited wheat straw was bought at Rs. 2 per kilo (80 Rs per mond) or even more; in the harvest season, however, in places where it is produced, it is available at Rs. 0.40 per kilo. In recent years baling units have been installed in central Punjab; bales are transported to major cities, and even to Gilgit, Skardu, and Chitral.

**Table 7-9 Cost for Green Fodder per Acre<sup>8</sup>**

Practice	Cost (Rs)
Fertilizer	1,500
Cultivator cost	1,000
Seed	1,000
Irrigation	1,500
<b>Total Cost (Rs.)</b>	<b>5,000</b>

**Table 7-10 Daily Feed Requirements**

Animal	Daily Requirement (kg)	Cost/kg	Amount
<b>Cow</b>			
Green Fodder	40.00	0.10	4.00
Dry Roughage	5.00	2.00	10.00
Concentrate	3.18	10.00	31.78
<b>Total</b>			<b>45.78</b>
<b>Buffalo</b>			

<sup>8</sup> The fodder cost does not include the land cost it is given in a separate head of land lease cost.

Green Fodder	50	0.10	5.00
Dry	5	2.00	10.00
Concentrate	3.18	10.00	31.78
<b>Total</b>			<b>46.78</b>

## 7.8. Medication

### 7.8.1. Vaccination & Medicine

Vaccination & medicine is required to prevent any disease outbreak in the animal herd. Each new animal will be vaccinated before entering the farm. It will cost Rs. 500 for both cow and buffalo per year. Vaccines are produced at Veterinary Research Institute, Ghazi Road, Lahore. The vaccines are provided to the Government Farms and Hospitals on payment. Farmers can also obtain these vaccines on payment according to prescribed schedule from the Institute. Technical guidance is also provided to the farmers. Farmers can have their animals vaccinated from the field Veterinary Hospitals and Centers.

### 7.8.2. Artificial Insemination (AI) Charges

Artificial Insemination (AI) charges will be Rs 300 per animal for both cow and buffalo. There are Four Semen Production Units (SPU) in Punjab, which works under Directorate of Breed Improvement, Livestock & Dairy Development Department, 16-Cooper Road, Lahore.

- i) SPU, Qadirabad District Sahiwal
- ii) SPU, Karaniwala District Bahawalpur
- iii) SPU, Kallur Kot District Bhakkar
- iv) SPU, Kherimurat District Attock.

For A.I. Services, the farmers are charged @ Rs.30/per insemination for local cattle and Buffalo and Rs.60/ for imported breed. Besides use of semen at the Provincial level, it is also supplied to the sister provinces and abroad. Semen of various breeds is also sold to the Private practitioners.

### 7.8.3. Labor Requirement

For a dairy enterprise, manpower is required for performing different animal husbandry practices at the farm e.g. feeding, watering, milking and care of animals etc. One mature person can handle eight milk animals easily. Six farm workers are recommended for handling 50-animals. A supervisor cum farm manager can be hired to supervise all the farm activities. The supervisor with B.Sc. (Honors) degree in Animal Husbandry (AH) may be hired as a farm manager so that he can handle the farm practices, administration & account matters at the dairy farm.

**Table 7-11 Labor Requirements**

Description	No.	Salary/month/Person	Annual Salary (Rs)
Farm Manager	1	10,000	120,000
Workers	7	3,000	252,000
<b>Total Labor Cost</b>	<b>8</b>		<b>372,000</b>

## 8 FARM OUTPUT

### 8.1. Lactation Period

The lactation period is the period during which the animals yield milk. These animals are called wet animals. Generally the lactation period of cows is 280 days and that of buffaloes is 305 days. For calculation, the feasibility has taken 80% of the total number of cows as wet cows and 70% of the total number of buffaloes as wet buffaloes. The calving interval (The interval between two calvings) in a buffalo is about 18-20 months, while cow has 15-16 months. The average milk yield of buffaloes is estimated at 1500 to 2300 liters per lactation

### 8.2. Milk Composition

Buffalo milk contains less water, more total solids, more fat, slightly more lactose, and more protein than cow's milk. It seems thicker than cow's milk because it generally contains more than 16% total solids compared with 12-14% for cow's milk. The butterfat content is usually 6-8%. Cow's milk butterfat content is usually between 3% and 5%. Because of its high butterfat content, buffalo milk has considerably higher energy value than cow's milk. Phospholipids are lower but cholesterol and saturated fatty acids are higher in buffalo milk. Studies have shown that this does not adversely affect the digestibility. Because of the high fat content, the buffalo's total fat yield per lactation compares favorably with that of improved breeds of dairy cattle.

Normally the protein in buffalo's milk contains more casein and slightly more albumin and globulin than cow's milk. The mineral content of buffalo milk is nearly the same as that of cow's milk except for phosphorus, which occurs in roughly twice the amount in buffalo milk. Buffalo milk tends to be lower in salt.

Buffalo milk lacks the yellow pigment carotene, precursor for vitamin A, and its whiteness is frequently used to differentiate it from cow's milk in the market. Despite the absence of carotene, the vitamin A content in buffalo milk is almost as high as that of cow's milk. Apparently the buffalo converts the carotene in its diet directly to vitamin A. The two milks are similar in B complex vitamins and vitamin C, but buffalo milk tends to be lower in riboflavin.

### 8.3. Breeding Stock Development

The proposed farmer will raise breeding stock, both future breeding bull and future dairy animals at his own farm by selecting good offspring of high producers. The first generation ( $F_1$ ) will be capable of giving milk after 3 years in case of cows and 4 years in case of buffaloes.

### 8.4. Increase in Milk Yield

The milk yield will be improved as a result of appropriate breeding systems discussed earlier. Low yielding animals are sold in the market. On an average, cows are productive for 7 to 8 years while buffaloes are productive for 8 to 9 years.



### **8.5.Sale Price**

Near the urban market, the selling price of buffalo's milk will be Rs 20-22 while cow's milk will be Rs 18-20 per liter.

### **8.6.Evening Milk**

Milk can be stored in a freezer with a capacity of 250 liters at the farm if milk collection is not possible in the evening.

### **8.7.Farm Revenues**

Farm revenue will increase with the passage of time, as the milk production will increase with the growth in herd size as well as its quality.

### **8.8.Male Calves**

Male calves will be sold at the farm sooner after birth for Rs 3,000-4,000 per animal. They can also be reared in separately for beef production.

## **9 USEFUL TERMINOLOGY**

### **Breed**

Animals that, through selection and breeding, have come to resemble one another and pass those traits uniformly to their offspring.

### **Compound feed**

Any ground mixture of ingredients intended for feeding the animals. It includes a concentrate mixture accordingly to formula.

### **Dehorning**

The process of removal of horns (in adult animal) or horn buds (in young calves). The process may be done by mechanical or chemical means.

### **Feedstuffs**

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

### **Heifer**

The term refers to young female bovine that reaches puberty age and is ready to breed.

### **Home Mixed Feed**

Feed prepared on farm.

### **Oil seed Cake**

Mass resulting from the processing of seeds, which is rich in protein and is used as a source of feed for livestock, e.g. cottonseed cake, maize oil cake etc.

### **Ration**

Amount of balance feed in 24 hours

## 10 FINANCIAL ANALYSIS

### 10.1 Income Statement

Calculations										
Income Statement										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Revenue from sale of milk	2,836,050	2,977,853	3,261,956	3,638,010	4,173,951	4,989,176	6,224,731	8,326,348	11,098,202	14,744,754
Other Income	62,500	55,000	302,046	389,497	459,096	530,876	760,684	1,033,217	1,260,789	3,580,548
<b>Total</b>	<b>2,898,550</b>	<b>3,032,853</b>	<b>3,564,002</b>	<b>4,027,507</b>	<b>4,633,047</b>	<b>5,520,052</b>	<b>6,985,414</b>	<b>9,359,565</b>	<b>12,358,991</b>	<b>18,325,302</b>
<i>Cost of sales</i>										
Cost of goods sold 1 (Feed Cost)	872,160	910,330	949,471	1,090,024	1,193,998	1,430,506	1,710,322	2,274,478	3,015,211	4,112,326
Medicine, Vaccination & Insemination Charges	32,500	34,125	37,265	41,385	47,405	56,412	70,556	95,120	127,726	170,413
Operating costs 3 (direct electricity & feul char	32,259	36,841	42,519	48,874	58,684	70,694	86,249	111,869	144,943	189,307
<b>Total cost of sales</b>	<b>936,919</b>	<b>981,296</b>	<b>1,029,254</b>	<b>1,180,282</b>	<b>1,300,087</b>	<b>1,557,611</b>	<b>1,867,127</b>	<b>2,481,467</b>	<b>3,287,881</b>	<b>4,472,046</b>
<b>Gross Profit</b>	<b>1,961,631</b>	<b>2,051,556</b>	<b>2,534,748</b>	<b>2,847,224</b>	<b>3,332,960</b>	<b>3,962,440</b>	<b>5,118,287</b>	<b>6,878,097</b>	<b>9,071,111</b>	<b>13,853,256</b>
<i>General administration &amp; selling expenses</i>										
Administration expense	372,000	408,218	447,963	491,577	591,642	706,531	901,048	1,126,744	1,539,248	2,104,466
Land lease rental expense	540,000	540,000	540,000	540,000	540,000	594,000	594,000	594,000	594,000	594,000
Office expenses (stationary, entertainment, jani	7,440	8,164	8,959	9,832	11,833	14,131	18,021	22,535	30,785	42,089
Professional fees (legal, audit, consultants, etc.)	14,180	14,889	16,310	18,190	20,870	24,946	31,124	41,632	55,491	73,724
Depreciation expense	66,993	66,993	66,993	66,993	196,178	196,178	196,178	196,178	354,336	354,336
Amortization of pre-operating costs	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100
<b>Subtotal</b>	<b>1,008,713</b>	<b>1,046,365</b>	<b>1,088,325</b>	<b>1,134,692</b>	<b>1,368,623</b>	<b>1,543,886</b>	<b>1,748,471</b>	<b>1,989,188</b>	<b>2,581,960</b>	<b>3,176,716</b>
<b>Operating Income</b>	<b>952,918</b>	<b>1,005,191</b>	<b>1,446,423</b>	<b>1,712,532</b>	<b>1,964,338</b>	<b>2,418,554</b>	<b>3,369,817</b>	<b>4,888,909</b>	<b>6,489,151</b>	<b>10,676,540</b>
<i>Other income (interest on cash)</i>	-	-	-	-	-	-	-	-	-	-
<b>Earnings Before Interest &amp; Taxes</b>	<b>952,918</b>	<b>1,005,191</b>	<b>1,446,423</b>	<b>1,712,532</b>	<b>1,964,338</b>	<b>2,418,554</b>	<b>3,369,817</b>	<b>4,888,909</b>	<b>6,489,151</b>	<b>10,676,540</b>
<i>Interest expense on long term debt (Debt facility :</i>	<i>339,518</i>	<i>283,134</i>	<i>218,433</i>	<i>144,186</i>	<i>58,986</i>	-	-	-	-	-
<b>Subtotal</b>	<b>339,518</b>	<b>283,134</b>	<b>218,433</b>	<b>144,186</b>	<b>58,986</b>	-	-	-	-	-
<b>Earnings Before Tax</b>	<b>613,400</b>	<b>722,057</b>	<b>1,227,991</b>	<b>1,568,346</b>	<b>1,905,351</b>	<b>2,418,554</b>	<b>3,369,817</b>	<b>4,888,909</b>	<b>6,489,151</b>	<b>10,676,540</b>
<i>Taxable earnings for the year</i>	<i>613,400</i>	<i>722,057</i>	<i>1,227,991</i>	<i>1,568,346</i>	<i>1,905,351</i>	<i>2,418,554</i>	<i>3,369,817</i>	<i>4,888,909</i>	<i>6,489,151</i>	<i>10,676,540</i>
<b>Tax</b>	<b>276,030</b>	<b>324,926</b>	<b>552,596</b>	<b>705,756</b>	<b>857,408</b>	<b>1,088,350</b>	<b>1,516,418</b>	<b>2,200,009</b>	<b>2,920,118</b>	<b>4,804,443</b>
<b>NET PROFIT/(LOSS) AFTER TAX</b>	<b>337,370</b>	<b>397,131</b>	<b>675,395</b>	<b>862,590</b>	<b>1,047,943</b>	<b>1,330,205</b>	<b>1,853,399</b>	<b>2,688,900</b>	<b>3,569,033</b>	<b>5,872,097</b>
<i>Balance brought forward</i>		337,370	734,501	1,409,896	2,272,487	3,320,430	2,325,317	2,089,358	2,389,129	2,979,081
Total profit available for appropriation	337,370	734,501	1,409,896	2,272,487	3,320,430	4,650,635	4,178,717	4,778,258	5,958,162	8,851,178
Dividend 50%	-	-	-	-	-	2,325,317	2,089,358	2,389,129	2,979,081	4,425,589
<b>Balance carried forward</b>	<b>337,370</b>	<b>734,501</b>	<b>1,409,896</b>	<b>2,272,487</b>	<b>3,320,430</b>	<b>2,325,317</b>	<b>2,089,358</b>	<b>2,389,129</b>	<b>2,979,081</b>	<b>4,425,589</b>

## 10.2 Balance Sheet Statement

Statement Summaries											SMEDA
Balance Sheet											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>Assets</b>											
<i>Current assets</i>											
Cash & Bank	80,000	103,286	129,346	358,625	702,985	1,207,271	377,581	270,198	669,712	1,461,706	4,396,280
Raw material inventory	72,680	79,654	87,233	105,153	120,943	152,144	191,000	266,702	371,237	531,631	-
Pre-paid annual land lease	540,000	540,000	540,000	540,000	540,000	594,000	594,000	594,000	594,000	594,000	-
<b>Total Current Assets</b>	<b>692,680</b>	<b>722,940</b>	<b>756,578</b>	<b>1,003,778</b>	<b>1,363,927</b>	<b>1,953,415</b>	<b>1,162,580</b>	<b>1,130,899</b>	<b>1,634,948</b>	<b>2,587,336</b>	<b>4,396,280</b>
<i>Fixed assets</i>											
Land	-	-	-	-	-	-	-	-	-	-	-
Building/Infrastructure	956,161	908,353	860,545	812,737	2,223,177	2,102,456	1,981,736	1,861,015	4,202,286	3,958,466	3,714,646
Animals	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000	3,207,000
Revaluation Surplus/ (loss)	-	188,500	411,000	641,495	1,239,780	1,907,033	3,213,361	5,046,402	7,497,939	9,495,948	-
Net value of animals	3,207,000	3,395,500	3,618,000	3,848,495	4,446,780	5,114,033	6,420,361	8,253,402	10,704,939	12,702,948	3,207,000
Machinery & equipment	191,850	172,665	153,480	134,295	677,837	602,379	526,921	451,464	726,590	616,074	505,558
<b>Total Fixed Assets</b>	<b>4,355,011</b>	<b>4,476,518</b>	<b>4,632,025</b>	<b>4,795,527</b>	<b>7,347,794</b>	<b>7,818,869</b>	<b>8,929,018</b>	<b>10,565,881</b>	<b>15,633,815</b>	<b>17,277,488</b>	<b>7,427,204</b>
<i>Intangible assets</i>											
Pre-operation costs	81,000	72,900	64,800	56,700	48,600	40,500	32,400	24,300	16,200	8,100	-
Training costs	-	-	-	-	-	-	-	-	-	-	-
<b>Total Intangible Assets</b>	<b>81,000</b>	<b>72,900</b>	<b>64,800</b>	<b>56,700</b>	<b>48,600</b>	<b>40,500</b>	<b>32,400</b>	<b>24,300</b>	<b>16,200</b>	<b>8,100</b>	<b>-</b>
<b>TOTAL ASSETS</b>	<b>5,128,691</b>	<b>5,272,358</b>	<b>5,453,403</b>	<b>5,856,005</b>	<b>8,760,321</b>	<b>9,812,783</b>	<b>10,123,999</b>	<b>11,721,080</b>	<b>17,284,963</b>	<b>19,872,924</b>	<b>11,823,485</b>
<b>Liabilities &amp; Shareholders' Equity</b>											
<i>Current liabilities</i>											
Accounts payable	-	-	-	-	-	-	-	-	-	-	-
<b>Total Current Liabilities</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<i>Other liabilities</i>											
Long term debt	2,564,346	2,182,143	1,743,557	1,240,269	662,734	-	-	-	-	-	-
<b>Total Long Term Liabilities</b>	<b>2,564,346</b>	<b>2,182,143</b>	<b>1,743,557</b>	<b>1,240,269</b>	<b>662,734</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<i>Shareholders' equity</i>											
Paid-up capital	2,564,346	2,564,346	2,564,346	2,564,346	4,585,320	4,585,320	4,585,320	4,585,320	7,397,896	7,397,896	7,397,896
Gain/ (Loss) on revaluation of anim	-	188,500	411,000	641,495	1,239,780	1,907,033	3,213,361	5,046,402	7,497,939	9,495,948	-
Retained earnings	-	337,370	734,501	1,409,896	2,272,487	3,320,430	2,325,317	2,089,358	2,389,129	2,979,081	4,425,589
<b>Total Equity</b>	<b>2,564,346</b>	<b>3,090,216</b>	<b>3,709,847</b>	<b>4,615,737</b>	<b>8,097,587</b>	<b>9,812,783</b>	<b>10,123,999</b>	<b>11,721,080</b>	<b>17,284,963</b>	<b>19,872,924</b>	<b>11,823,485</b>
<b>TOTAL CAPITAL AND LIABILITI</b>	<b>5,128,691</b>	<b>5,272,358</b>	<b>5,453,403</b>	<b>5,856,005</b>	<b>8,760,321</b>	<b>9,812,783</b>	<b>10,123,999</b>	<b>11,721,080</b>	<b>17,284,963</b>	<b>19,872,924</b>	<b>11,823,485</b>

## 10.3 Cashflow Statement

<b>Statement Summaries</b>										<b>SMEDA</b>	
<b>Cash Flow Statement</b>											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Rs. in Year 9	actuals Year 10
<i>Operating activities</i>											
Net profit	-	337,370	397,131	675,395	862,590	1,047,943	1,330,205	1,853,399	2,688,900	3,569,033	5,872,097
Add: depreciation expense	-	66,993	66,993	66,993	66,993	196,178	196,178	196,178	196,178	354,336	354,336
amortization expense	-	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100	8,100
Raw material inventory	(72,680)	(6,974)	(7,579)	(17,921)	(15,789)	(31,201)	(38,856)	(75,702)	(104,535)	(160,394)	531,631
Cash provided by operations	(72,680)	405,489	464,646	732,567	921,894	1,221,020	1,495,627	1,981,975	2,788,643	3,771,075	6,766,164
<i>Financing activities</i>											
Change in long term debt	2,564,346	(382,203)	(438,586)	(503,288)	(577,534)	(662,734)	-	-	-	-	-
Change in short term debt	-	-	-	-	-	-	-	-	-	-	-
Add: land lease expense	-	540,000	540,000	540,000	540,000	540,000	594,000	594,000	594,000	594,000	594,000
Land lease payment	(540,000)	(540,000)	(540,000)	(540,000)	(540,000)	(594,000)	(594,000)	(594,000)	(594,000)	(594,000)	-
Issuance of shares	2,564,346	-	-	-	2,020,975	-	-	-	2,812,575	-	-
Cash provided by / (used for) financing	4,588,691	(382,203)	(438,586)	(503,288)	1,443,440	(716,734)	-	-	2,812,575	-	594,000
<i>Investing activities</i>											
Capital expenditure	(4,436,011)	-	-	-	(2,020,975)	-	-	-	(2,812,575)	-	-
Cash (used for) / provided by investing	(4,436,011)	-	-	-	(2,020,975)	-	-	-	(2,812,575)	-	-
<b>NET CASH</b>	<b>80,000</b>	<b>23,286</b>	<b>26,059</b>	<b>229,279</b>	<b>344,360</b>	<b>504,286</b>	<b>1,495,627</b>	<b>1,981,975</b>	<b>2,788,643</b>	<b>3,771,075</b>	<b>7,360,164</b>
Cash balance brought forward		80,000	103,286	129,346	358,625	702,985	1,207,271	377,581	270,198	669,712	1,461,706
Cash available for appropriation	80,000	103,286	129,346	358,625	702,985	1,207,271	2,702,898	2,359,556	3,058,841	4,440,787	8,821,870
Dividend	-	-	-	-	-	-	2,325,317	2,089,358	2,389,129	2,979,081	4,425,589
Cash carried forward	80,000	103,286	129,346	358,625	702,985	1,207,271	377,581	270,198	669,712	1,461,706	4,396,280

## 10.4 Revenue Assumptions

Sales										
Selling Assumptions										
	Unit									
Milk/Cow/Day	14	Ltrs.								
Milk/Buffalo/Day	10	Ltrs.								
Wet Cows as % Total no. of	80%	%								
Wet Buffalos as % Total no	70%	%								
No. of Days in Year	365	Days								
Sale Price of developed progeny										
Cow	60,000	Rs.								
Buffalo	70,000	Rs.								
Female calf(cow) older than	20,000									
Female calf(buffalo) older than	20,000									
Sale Price/Culled cow	30,000	Rs.								
Sale Price/Culled Buffalo	30,000									
Sale Price/Low yielder cow	16,000	Rs.								
Sale Price/Low yielder buffalo	20,000									
Sale Price/Male calf	5,000	Rs.								
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	1	2	3	4	5	6	7	8	9	10
<b>Animals</b>										
Average # of cows	35	35	37	40	44	51	60	74	91	113
# of lactating cows	28	28	30	32	35	41	48	59	73	90
Average# of buffalos	15	15	15	15	16	17	21	30	42	56
# of lactating buffalos	11	11	11	11	11	12	15	21	29	39
# of calves	25	20	31	32	41	49	61	75	96	121
Calve older than one year	0	9	7	12	13	17	20	25	32	43
Calve older than one year	0	4	3	3	8	11	12	22	26	32
Total animals older than	50	62	62	70	81	96	113	151	192	243
<b>Total Animals</b>	<b>75</b>	<b>82</b>	<b>92</b>	<b>102</b>	<b>122</b>	<b>145</b>	<b>174</b>	<b>226</b>	<b>288</b>	<b>364</b>
<b>Animals Sold During the Year</b>										
# of Cow Progeny sold	0	0	0	0	0	0	0	0	0	0
# of Buffalo Progeny sold	0	0	0	0	0	0	0	0	0	11
# of culled cows sold	-	-	4	5	5	5	6	6	6	8
# of culled buffalos sold	-	-	2	2	2	2	4	5	5	8
# of low yielders (cows)	-	-	-	-	-	-	-	-	-	-
# of low yielders (buffalos)	-	-	-	-	-	-	-	-	-	-
# of Male Calve sold	13	10	15	16	20	24	30	38	48	61
<b>Total Animals Sold</b>	<b>13</b>	<b>10</b>	<b>21</b>	<b>23</b>	<b>27</b>	<b>31</b>	<b>40</b>	<b>49</b>	<b>60</b>	<b>87</b>

<b>Production of milk (ltrs)</b>	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cows	392	392	414	448	493	571	672	829	1,019	1,266
Buffalos	105	105	105	105	112	119	147	210	294	392
Milk for calve	8	6	9	10	12	15	18	23	29	36
Net Annual milk produ	178,668	179,215	186,236	198,352	216,289	246,562	292,280	370,930	468,766	591,768
<b>Revenue from Sale of Milk (Rs.)</b>										
Daily	7,770	7,770	8,106	8,610	9,408	10,710	12,726	16,212	20,580	26,040
Annual	2,836,050	2,836,050	2,958,690	3,142,650	3,433,920	3,909,150	4,644,990	5,917,380	7,511,700	9,504,600
<b>Other Revenue (Rs.)</b>										
Sale of Developed Progeny	-	-	-	-	-	-	-	-	-	753,427
Sale of Culled Cows	-	-	128,250	163,080	145,410	150,150	169,328	192,923	186,484	233,333
Sale of Culled Buffalos	-	-	45,000	49,805	66,253	57,076	108,121	149,344	160,762	229,102
Sale of Low Yielder Cow	-	-	-	-	-	-	-	-	-	-
Sale of Low Yielder Buffal	-	-	-	-	-	-	-	-	-	-
Sale of Calves	62,500	50,000	76,375	79,750	101,906	122,406	151,938	187,938	240,922	302,641
	<b>62,500</b>	<b>50,000</b>	<b>249,625</b>	<b>292,635</b>	<b>313,569</b>	<b>329,632</b>	<b>429,386</b>	<b>530,204</b>	<b>588,167</b>	<b>1,518,502</b>
<b>Total Annual Revenue</b>	<b>2,898,550</b>	<b>2,886,050</b>	<b>3,208,315</b>	<b>3,435,285</b>	<b>3,747,489</b>	<b>4,238,782</b>	<b>5,074,376</b>	<b>6,447,584</b>	<b>8,099,867</b>	<b>11,023,102</b>

## 11 ANNEXURE 1

**Table 11-1: Vital Statistics of Cattle & Buffaloes**

Parameters	
Rectal Temperature	101.5 degrees F (38.5 degree C)
Heart Rate	60-70 beats/minute
Respiratory Rate	30 breaths/minute

**Table 11-2: Traits of Farm Animals**

Parameters	Buffalo	Cattle
Age at puberty	40 months or 3 yr, 4 months	24-28 months
Estrous duration	25 hrs	17 hrs
Estrous cycle length	21 days	21 days
Gestation length	315+ <sub>5</sub> days	282+ <sub>5</sub> days
Dry period	5-6 months	8-9 months
Service period	4-5 months	2-3 months
Age at first calving	3 to 3.5 yr.	2.5 to 3 yr.
Calving interval	1.5 yrs	1 yr. 3 months

**Table 11-3: Common Diseases of Livestock**

Infectious Diseases			
Disease	Symptoms	Preventive measures	Medication
Anthrax	Fever, grinding of teeth, release of blackish blood from natural openings, which doesn't clot.	Vaccination in February. Dead animal should be buried in 6 feet deep pit without any postmortem.	Antibiotic therapy
Foot and mouth Disease	Excessive salivation, Pustules on lips, tongue and between the cleft of hooves, staggering gait weakness due to inability of ingestion.	FMD vaccine after every 4 months especially before the onset of rainy season.	FMD Serum, cleaning of pustules by potassium permanganate solution, cleaning of hooves by phenyl solution
Non Contagious Diseases			
Indigestion	Loss of appetite, watering from mouth, stiffening of rumen, bloating, severe pain in stomach		5 grams Stomach powder (mixed in feed or dissolved in water) twice a day
Bloating (air trapped in stomach)	Difficult breathing due to air trapped in stomach, animal may die due to suffocation	Avoid grazing early in morning especially on fodder with dewdrops.	Mustard (Sarson) oil & turpentine oil mixed with chloral hydrate mixed in drinking water.
Dysentery	Diarrhea, smelling feces, weakness	Avoid excessive intake of milk especially in newborn kids. Avoid wheat straw or stiff feed during dysentery	Calcium carbonate, magnesium carbonate and bismuth carbonate dissolved in water OR entox tablets OR

			nimkol with sulfadmadine (4-5 cc). Offer rice groule to affected animals
<b>Internal Parasites</b>			
Liver flukes	Weakness, off feed, jaundice in severe cases, swelling on joints	No grazing around stagnant water	Zanil or Carbon tetra chloride OR nilzan plus, oral administration
Round Worms	Weakness, diarrhea, anemia, hair fall from body coat	Fecal samples should be examined for roundworms.	Systemax or rental, oral administration
<b>Ectoparasites</b>			
Flies/ ticks/ maggots	Irritation on body coat, sometimes holes in skin, loss of hair from body coat	Cleanliness in sheds, Spray of DDT in shed	Apply sulfur oil, tetmasol or ecoflax on wounds and dipping of whole herd with a 0.15 % solution of negavan.

**Table 11-4: Vaccination Schedule**

Name of Disease	Name of Vaccine	Qty administered (ml)	Time for Vaccination	Duration of Immunity	Preventive Measures
Foot & Mouth Disease (FMD)	Foot & Mouth Vaccine	5 ml	Start of spring	4 months	Should be given 4 months prior to the expected symptoms of disease.
Anthrax	Anthrax spore vaccine	0.5 ml	March-April or monsoon season	One year	Every year vaccination should be done every year.
Rabies (Bowla Pun)	Anti rabies vaccine	10 ml	According to need	One year	Vaccine should be used right after preparation.
Hemorrhagic Septicemia (HS)	HS vaccine	5-10 ml	Start of Spring	4 months	Should be given 4 months prior to the expected symptoms of disease.



## 12 ANNEXURE 2

**Table 12-1: Calving Register**

Sr. no	Dam No.	Sire No.	Date of calving	Sex of calf	Wt. of calf	Remarks
1.						
2.						

**Table 12-2: Disposal of Death**

Sr. no	Animal/Dam	No.	Date of birth	Sex	Mode	Cost	Remarks
1.							
2.							

**Table 12-3: Reproduction/Insemination/Pregnancy Diagnosis/Follow up/Treatment**

Sr. no	Animal No.	Date of last calving	No. of services	Last date of service	Sire No.	Result	Remarks
1.							
2.							

**Table 12-4: Daily Milk Production**

Sr. no	No. of animals	Milk prod.	Milk sold	Income from sale	Day's wet average	Herd average	Remarks
a. Morning							
b. Evening							

**Table 12-5: Details of Purchase / Sale of product/byproduct (Feed and fodder's, medicines, ingredients, animal, etc.)**

Sr. no	Particulars	Quantity	Per unit rate	Total cost	Remarks
1.					
2.					

**Table 12-6: Calving & Calf Disposal**

Sr. no	Date of birth	Dam No.	Sire No.	Sex of calf	Wt. of calf at birth	Disposal Date	Remarks

**Table 12-7: Reproduction Performa**

Brand No.....Date of birth.....Dam No.....Date of 1st heat.....

History sheet-----

Sr. no	Particulars	1st calving	2nd calving	3rd calving	4th calving	5th calving
1.	Service (Date/Sire No.)					

**Table 12-8: Conception Record**

Date of Pregnancy Diagnosis-----Result-----Date of conception---  
-----  
Expected date of calving-----Actual date of calving-----Sex of  
calf-----

**Table 12-9: Reproductive Health**

Disorder-----Treatment-----Follow-up-----

**Table 12-10: Individual Milking Record**

Sr. no	Order of calving	Cow No.	Date of calving	Weekly recording		Date when dried	Days in milk	Total milk yield
				Morning	Evening			

**Table 12-11: Herd Health Register**

Date	Animal	History	Symptoms	Diagnosis	Treatment	Detail of vaccination or hygiene	Cost of treatment

**Table 12-12: Monthly Expenses & Income Report**

Sr. no	Particulars	Quantity	Rate (per unit)	Total cost

**Table 12-13: Periodical Weighing Register**

Sr. no	Tattoo No. (Dam's)	Brand No. (Animal)	Date of birth	Wt. at weeks	Wt. at months	Wt. at Service/ Calving	Remarks
				0,1,2...11,12	3,6,9,12,18,24		

### 13 ANNEXURE 3

**Table 13-1: Contacts of Different Livestock Breeders**

S. No	Name	Contacts	Farm	Postal Address
1	Malik Abdul Sattar Dogar	Mob.03004108537 Res. 04931-406561 Off. 04931-50185	Sheikhupura	Malik Sardar Ali Dogar & Sons, Grain Market, Sheikhupura
2	Naeem Ullah Malik	Res. 042-5838993 0632 002710 Mob. 0300-4858290	Bhawalnagar	128-B, Garden Block, New Garden Town, Lahore.
3	Syed Faisal Imam	Res. 06512-440121 06512-440123	Kabirwala (Khanewal)	18-Off, Zafar Ali Road, Gulberg V Lahore.
4	Hafiz Wasi Muhammad Khan	Mob. 0320-5572643 0300-6500223 Res. 0471-621697	Jhang	169-Block B, Awais Chowk, Satellite Town, Jhang Saddar.
5	Amir Gill	Mob. 0320-5573577 Res. 0471-671313 0471-671260 (Ext. 202)	Jhang	Gill Livestock Farm, Post Office Khewa, Chiniot Road, Tehsil & District Jhang.
6	Safdar Saleem Sial	Mob. 0320-5572572 Res. 0471-622660	Jhang	F-Block, Near MCB, Satellite Town, Jhang.
7	Mumtaz Khan Manaise	Mob 0320-5600231 0673-692000	Tibba Sultan Pur, Vehari	Tibba Sultan Pur Vehari
8	Mr. Fazal Ghaffar Raja	051-2653141-3 0300-8541903	Tehsil Fteh Jang, District Attock	H#40, St# 20, Sector F-7/2, Islamabad.
9	Ch. Omar Nazir	042-5757136	Sarsabz Dairy Farms, Renala Khurd, District Okara	7-Aziz Avenue, Canal Bank Road, Gulberg v, Lhr

**Table 13-2: Livestock Experimentation Stations, Livestock & Dairy Development Department, Punjab**

Sr. No.	Name of LES / GLF	Total Area (acre)	Designation of farm Incharge	Farm Address
1.	Khushab	968	Superintendent	Livestock Experiment Station, Khushab Tehsil & District Khushab
2.	Khizerabad	7669	Superintendent	Livestock Experiment Station, Khizarabad Chak No. 60-NB, via Bhalwal, Tehsil & District Sarghoda.
3.	Jahangirabad	3373	Superintendent	Livestock Experiment Station, Jahangirabad via Kacha Khuh, Tehsil & District Khanewal.
4.	Shah Jewena	597	Manager	Livestock Experiment Station, Shah Jewena Tehsil & District Jhang.

5.	Rakh Mahni	9171	Superintendent	Government Livestock Farm, Rakh Mahni Camp Office, Hyderabad Thall, Tehsil Mankara, District Bhakkar
6.	Rakh Khairewala	14472	Officer Incharge	Livestock Experiment Station, Khairewala, (Angora Goat) P.O. Khairewala, Tehsil Choubara, District Layyah
7.	TDA / 205	926	Manager	Fine Wool Sheep Farm, 205 / TDA Chak No. 205/TDA, Sarai Mahajar, Tehsil Mankara, District Bhakkar
8.	Kallurkot	3592	Superintendent	Government Livestock Farm, Kallurkot Tehsil Kallurkot, District Bhakkar
9.	Rakh Ghulaman	10273	Superintendent	Government Livestock Farm, Rakh Ghulaman Tehsil Kallurkot, District Bhakkar
10.	Allahdad	2117	Manager	Livestock Experiment Station, Allahdad via Jahanian, Tehsil & District Khanewal
11.	Sher Garh	1451	Manager	Livestock Experiment Station, Sher Garh via Renala Khurd, Tehsil & District Okara
12.	Darkhana	2810	Manager	Livestock Experiment Station, Darkhana Tehsil Kabirwala, District Khanewal
13.	Fazilpur	3501	Officer Incharge	Livestock Experiment Station, Fazilpur Tehsil Fazilpur, District Rajanpur
14.	Chak Katora	1304	Officer Incharge	Livestock Experiment Station, Chak Katora via Hasilpur, Tehsil Hasilpur, District Bahawalpur
15.	Jogaitpeer	5200	Superintendent	Government Livestock Farm, Jogaitpeer Tehsil & District Bahawalpur
16.	Haroonabad	627	Manager	Livestock Experiment Station, Haroonabad Tehsil Haroonabad, District Bahawalnagar
17.	Kot Amir Shah	198	Manager	Livestock Experiment Station, Kot Amir Shah Tehsil Chiniot, District Jhang
18.	Rakh Dera Chahl	705	Manager	Livestock Experiment Station, Rakh Dera Chal Bedian Road, Tehsil & District Lahore

**Table 13-3: List of vaccines and their prices at Veterinary Research Institute, Ghazi Road, Lahore.**

Vaccines/Sera/Antigens	Packing With Bottles	Price
Haemorrhagic Septicaemia	Bottle of 300 ml (60 doses)	Rs.90.00
Black Quarter Vaccine	Bottle of 300 ml (60 doses)	Rs.80.00
Enterotoxaemia	Bottle of 300 ml (100 doses)	Rs.67.00
Foot and Mouth Vaccine	Bottle of 320 ml (64 doses)	Rs.484.00
Foot and Mouth Vaccine	Bottle of 300 ml (60 doses)	Rs.454.00
Foot and Mouth Serum	Bottle of 300 ml (6 doses)	Rs.380.00
Foot and Mouth Vaccine	Bottle of 100 ml (20 doses)	Rs.165.00
Anti Rinderpest Serum	Bottle of 300 ml (20 doses)	Rs.374.00
Anthrax Spore Vaccine	Bottle of 50 ml (100 doses)	Rs.70.00
Rinderpest Vaccine (TCRV/CTV)	Ampoule of 100 doses	Rs.21.00
Brucella Abortus Antigen	Ampoule of 25 ml	Rs.571.00
Anti Rabies Vaccine	440 cc bottle for Cow/Horse	Rs.840.00

For further inquiry contact:

Director General (Research), Veterinary Research Institute, Ghazi Road, Lahore.

(Ph) 042-9220143

Details of forage crops varieties, seed production, and availability for purchase in various parts of the country are presented in following Table.

**Table 13-4: Location of seed production and multiplication**

Crop	Main areas for seed production
Berseem ( <i>Trifolium alexandrinum</i> )	Sheikhupura district, parts of Gujranwala and Faisalabad districts, Bahawalnagar, Mirpurkhas, and Peshawar and Mardan.
Oats ( <i>Avena sativa</i> )	Islamabad (NARC), Sargodha, Faisalabad, Chakwal, Sheikhupura, and Kasur Districts.
Lucerne ( <i>Medicago sativa</i> )	Rahim Yar Khan, Bahawalpur, Sheikhupura, Gilgit, Ghizer, and Quetta districts.
Maize ( <i>Zea mays</i> )	Sahiwal, Okara, Lahore, Mardan, Swabi, Peshawar, Swat, Manshera, Rawalpindi, Muzafarabad, Rawalakot, Hyderabad, Larkana, Diamer, Gilgit, and Ghizer districts.
Sorghum ( <i>Sorghum bicolor</i> )	D. I. Khan. D. G. Khan, Bukkar, Sahiwal, Dadu, Islamabad, and Sibi districts
Sorghum-Sudan Grass Hybrid x <i>Sorghum sudanense</i>	Okara, Sahiwal, Chichiwatni, Faisalabad, Lahore districts
Bulrush millet ( <i>Pennisetum americanum</i> )	Layyah, Bhakkar, Mianwali, Khushab, Bahawalpur, and Rahim Yar Khan Districts

**Table 13-5: Forage Cultivars Released by Various Institutes**

Crop	Cultivar	Institution	Year
Oats ( <i>Avena sativa</i> )	Avon	FRI, Sargodha, Punjab	1983
	PD2-LV65	FRI, Sargodha, Punjab	1983
	Sargodha-81	FRI, Sargodha, Punjab	1983
Barley ( <i>Hordeum sativum</i> )	Frontier-87	CCRI, Pirsabak, NWFP	1988
	Jau-83	AARI, Faisalabad, Punjab	1985
	Jau-87	AARI, Faisalabad, Punjab	1985
Berseem ( <i>Trifolium alexandrinum</i> )	Agaiti	FRI, Sargodha, Punjab	1986
	Pachaiti	FRI, Sargodha, Punjab	1986
Maize ( <i>Zea mays</i> )	Akbar	MMRI, Sahiwal, Punjab	1972
	Azam	CCRI, Pirsabak, NWFP	1973
	Kisan-90	CCRI, Pirsabak, NWFP	1990
	Sultan	MMRI, Sahiwal, Punjab	1986
Mazenta Maize x Teosinte		FRI, Sargodha, Punjab	1991
Millet ( <i>Pennisetum americanum</i> )	Barani baja	RARI, Bahawalpur, Punjab	1986
	Hairy dwarf	RARI, Bahawalpur, Punjab	1986
	Composite-75	RARI, Bahawalpur, Punjab	1986
	MB-87	FRI, Sargodha, Punjab	1991
Sorghum ( <i>Sorghum bicolor</i> )	Jowar-86	RARI, Bahawalpur, Punjab	1986
	BR-307	RARI, Bahawalpur, Punjab	1986

	BR-319	RARI, Bahawalpur, Punjab	1986
Sorghum Sudan grass Hybrid			
	Pak-sudax	FRI, Sargodha, Punjab	1986
	SSG-988	Pioneer Seed Pvt. Ltd.	1992
	RasBheri	Cargill Seeds Pvt. Ltd	1993

*FRI: Fodder Research Institute*

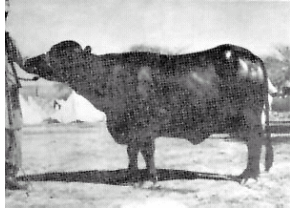
*AARI: Ayub Agriculture Research Institute*

*MMRI: Maize & Millet **R**esearch Institute*

*CCRI: Cereal Crop **R**esearch Institute*

## 14 ANNEXURE 4

### Different Breeds of Buffaloes and Cows



**Kundi**



**Nili Ravi**



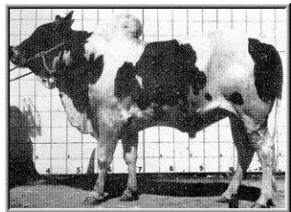
**Sahiwal Cows**



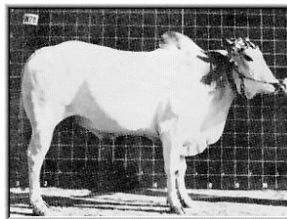
**Red Sindhi Bull**



**Sahiwal Cow**



**Rojhan**



**Dajal**



**Tharparker**



**Australian Friesian Sahiwal**



provided by Hoard's Dairyman

**Holstein**



provided by Hoard's Dairyman

**Jersey**