CLUSTER DEVELOPMENT BASED AGRICULTURE TRANSFORMATION PLAN VISION-2025

Beef Cluster Feasibility and Transformation Study

Planning Commission of Pakistan, Ministry of Planning, Development & Special Initiatives

February 2020

FOREWORD

To improve enhance Pakistan's competitiveness in the agriculture sector in national and international markets, the need to evaluate the value chain of agricultural commodities in the regional contexts in which these are produced, marketed, processed and traded was long felt. The Planning Commission of Pakistan was pleased to sponsor this study on the **Feasibility Analysis for Cluster Development Based Agriculture Transformation** to fill this gap**.** The study aims to cover a large number of agriculture commodities spread in various clusters throughout the country.

I truly hope that the policies, strategies, and interventions suggested in this report will facilitate the federal and provincial governments to chalk out and implement plans for cluster-based transformation of the agriculture sector.

Zafar Hasan,
Secretary,
Ministry of Planning Development and Special
Initiatives
Government of Pakistan

FOREWORD

In many developed and developing countries, the cluster-based development approach has become the basis for the transformation of various sectors of the economy including the agriculture sector. This approach not only improves efficiency of development efforts by enhancing stakeholders' synergistic collaboration to resolve issues in the value chain in their local contexts, but also helps to gather resources from large number of small investors into the desirable size needed for the cluster development. I congratulate the Centre for Agriculture and Bioscience International (CABI) and its team to undertake this study on **Feasibility Analysis for Cluster Development Based Agriculture Transformation.** An important aspect of the study is the estimation of resources and infrastructure required to implement various interventions along the value chain for the development of clusters of large number of agriculture commodities. The methodology used in the study can also be applied as a guide in evaluating various investment options put forward to the Planning Commission of Pakistan for various sectors, especially where regional variation is important in the project design.

Muhammad Jehanzeb Khan,
Deputy Chairman
Planning Commission of Pakistan
Ministry of Planning Development and
Special Initiatives
Government of Pakistan.

FOREWORD

This is part of the series of studies on 33 agriculture commodities undertaken for the purpose of preparing a cluster-based transformation plan based on the regional realities in the entire value chain including production, processing, value addition, and marketing. I congratulate the whole team of the project especially the Team Lead, Dr. Mubarik Ali to undertake and successfully complete this monumental study. We are thankful to all commodity specialists who have contributed to this assignment. The CABI Project officers Mr. Yasar Saleem Khan and Ms. Aqsa Yasin deserve appreciation. I truly believe that this study will serve as a basis to make and implement plans for cluster-based agriculture transformation. I hope you will enjoy reading the study and it can help you making your investment decisions along the value chain of various agriculture commodities.

Dr. Babar Ehsan Bajwa
Regional Director
CAB International

FOREWORD

This report is part of the series of studies on 33 agriculture commodities to prepare the agriculture transformation plan by incorporating regional realities at the cluster level. In the report, the clusters of various commodities are identified and characterized, and viable investment options along the value chain of each cluster are proposed. For this purpose, the study team has analyzed macro data, reviewed the literature, and made extensive consultation with stakeholders along the value chain. Foreign and local internationally reputed consultants, Dr. Derek Byerlee and Dr. Kijiro. Otsuka and national consultant Mr. Sohail Moghal were also engaged to understand the cluster-based development approach and conduct cluster-based feasibility analysis. An EXCEL-based Model was developed which was validated by our national consultants. Separate viabilities for individual technologies and products suggested in each commodity are also estimated. This humongous task would not have been possible to complete without the excellent cooperation and facilities provide by CABI, the hard work of commodity specialists and our research team especially Mr. Yasar Saleem Khan and Ms. Aqsa Yaseen. The true reward of our hard work is the implementation of the proposed policies, strategies and interventions to develop agriculture commodity clusters in the country.

Dr. Mubarik Ali
Team Leader
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Transformation Plan-Vision 2020
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Planning Commission of Pakistan and
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ACKNOWLEDGEMENT

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Citation:

Warriach Hassan Mahmood, Ali Mubarik, and Yasin Aqsa. (2020) Beef Cluster Feasibility and Transformation Study. In Ali Mubarik (ed.) (2020) *Cluster Development Based Agriculture Transformation Plan Vision-2025*. Project No. 131(434)PC/AGR/CDBAT-120/2018. Unpublished Report, Planning Commission of Pakistan, Islamabad, Pakistan and Centre for Agriculture and Biosciences International (CABI), Rawalpindi, Pakistan.

DISCLAIMER

This report is prepared by using the data from various published and unpublished sources and that obtained during the consultations with stakeholders. The research team took utmost care to arrive at the figures to be used, but is not responsible for any variation of the data in this report than those reported in other sources. Moreover, the views expressed in this report are purely of the authors and do not reflect the official views of the Planning Commission of Pakistan, Ministry of Planning Development and Specisl Initiatives or the Centre for Agriculture and Bioscience International (CABI).

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ACRONYMS

CDG	City District Government
CPEC	China Pakistan Economic Corridor
FEG	Farmers Entrepreneur Group
FMD	Foot and Mouth Disease
GCC	Gulf Cooperation Council
Kg	Killogram
HS	Haemorrhagic Septicemia
ICARDA	International Center for Agricultural Research in the Dry Areas
IRR	Internal Rate of Return
ITC	International Trade Center
LUMS	Lahore University of Management Sciences
M.	Million
NRDC	National Research Development Corporation
NPV	Net Present Value
PARC	Pakistan Agriculture Research Council
PHDA	Punjab Halal Development Agency
PNAC	Pakistan National Accreditation Council
PSQCA	Pakistan Standards and Quality Control Authority
TMA	Tehsil Municipal Administration
USA	United States of America
UAF	University of Agriculture, Faisalaba
UVAS	University of Veterinary and Animal Sciences
UET	University of Engineering and Technology
IBA	Institute of Business Administration

EXECUTIVE SUMMARY

Pakistan is one of the largest beef producing countries of the world by slaughtering about 12 million animals and producing 1.88 million metric tonnes of beef annually which claims about 2.89% share in the total world beef production of US$ 270 billion. The major buffalo beef countries are India, Pakistan and China, while major cattle beef producing countries are USA, Brazil and China.

In Pakistan, Punjab province has the biggest share of large animals, contributing 57% of the total population followed by Sindh having 25% share. The beef sector in the country is largely informal and based upon smallholder farmers raising uneconomically two to three animals. These farmers keep their animals under the traditional system achieving much lower average carcass weight than the world average.

While animals slaughtered and beef production in the country are growing at a quite high rate of over 4% per annum, the country has performed very poorly in the international market. Great opportunities in the beef sector are emerging in the domestic and international markets as beef prices in these markets remained largely high and increasing overtime. In addition, the value of beef, its related products and large ruminant live animal exports internationally have reached to over US$40 billion and growing at an annual rate of 8% per annum during 2008-17. Pakistan can benefit from its geographical proximity with big beef market like China where, relatively low-price beef is demanded. However, Pakistani share in the world beef market valued at US$70 billion remained less than 0.1%, it exports only 0.2% of its production while globally 9% of the production is traded and its beef export price is only 70% of the world average. Moreover, the country is generally uncompetitive in international market because of its higher farmgate prices than the world average and its lower beef value chain development as suggested by lower export prices than the world average.

To overcome this situation and improve the competitiveness of the beef sector in national and international market, Planning Commission of Pakistan (PCP) funded this feasibility study to analyse the whole value chain of the sector, identify gaps and potentials at various segments of the value chain, suggest the beef sector upgradation plan and strategies, identify interventions along the value chain and estimate feasibility of these intervention to attract public and private sector interventions. The PCP also believes that such upgradation and investment plan would be more effective if the analysis of the value chain is conducted at beef cluster level.

For this purpose, three existing beef producing clusters have been identified in this study: 1. South Eastern Punjab and North Western Sindh 2. Southern Western Sindh and 3. Western Punjab. Several performance gaps and constraints are identified in the production, processing and trading components of the beef value chain in these clusters, which include the high mortality of calves, poor growth rate of animals, insufficient monitoring and control mechanism for FMD, inefficient marketing channels, lack of cold chain infrastructure for trading the beef to high end markets and ineffective research and development on the beef value chain without involving the private sector. On the export side, the beef sector needs to overcome supply side challenges like irregular supply, lack of traceability and halal

branding, inability to tailor the supply to market demands and poor market linkages. On the environmental side, the beef production may not only be a threat for the environment but poor regulatory framework in the beef sector is also impacting the health of the people and restricting its export.

In order to address multilevel challenges from production to product and market development, benchmarks and performance targets were set. Based on global average for yield, quality and export, policies were proposed, and the interventions were designed to meet these benchmarks over the period of next five years. The suggested policies to enhance the competitiveness of the beef sector of Pakistan include reforming the current regulatory framework in the country covering laws related to food safety & quality, pricing & taxation and investment; organization of stakeholders and provision of training to produce quality beef and manage its value chain efficiently; provision of quality related value chain infrastructure; efficient management of FMD with proper monitoring and control mechanism place, and strengthening linkages of stakeholders with national and international markets.

The suggested interventions to achieve the set targets include initiating of beef value chain research with the involvement of the private sector, introduction of improved management practices for reduced mortality rate of calves and enhanced daily growth rate of fattening of animals, provide quality related value chain infrastructure at the local level, strengthen market linkages to enhance export-production ratio and provide capacity building training of stakeholders for the improved value chain management for the purpose of enhancing prices for the value added beef in the local and international markets. These interventions should be initiated by the government in close collaboration with the private sector and research organizations. A time-horizon of five years has been set for realizing the intended outcomes of the cluster development interventions. A feasibility model was developed to estimate the Internal Rate of Return (IRR) and Net Present Value (NPV) for the society at large of making investments on these interventions in total. In addition, a detailed feasibility was also worked out for the key intervention of provision of small-scale abattoir at union council level, including both private and public sector investments in the calculations.

It is estimated that these cluster interventions will require a total of US$57.22 million investment spent over five-year project period. About 40% of this investment will come from the public sector in terms of strengthening the beef value chain research, capacity building of stakeholders to follow good animal management practices and handle quality beef value chain, incentivizing the value chain and processing infrastructure like calf fattening units, modernized abattoirs, establishing the feed mills, and modernize the cattle markets and providing interest free loans for the first year of establishing these infrastructures. These investments will encourage the private sector to bring the remaining 60% investment to upgrade the beef value chain at the central points of beef clusters.

The program will increase production by 38 thousand tonnes and enhance gross revenue (undiscounted) by US$272 million during the last year of the project just in the central points of all clusters. But this will also increase the operational costs of various activities along the value chain of beef to US$157.25 million. The net cash flow (undiscounted) after deducting all the production, processing, and marketing costs would be US$57.22 million. The Net Present Value of the net cash flow over the five-year period would be US$244

million. The estimated overall IRR for the three cluster is about 123%. The detail parameters values on added beef production and its value, operating and investment costs, net return, and infrastructure requirement of each cluster is produced in the cluster summary sheet given below.

These interventions are expected to produce far reaching economic and social impacts, including reducing calf mortality, increased productivity, profitability of producer, improved beef quality, employment opportunities and benefiting for all the stakeholders of clusters. The key for the success of the cluster development Up-gradation Plans are the organization of stakeholders at local level to resolve the production, processing, and marketing issues in groups on daily basis, establishment of a vibrant beef research system with the involvement of the private sector to resolve issues along the value chain and capacity building of stakeholders to produce and manage the quality beef. Enforcing regulations related to beef quality would also be critical to ensure consumers the quality they demand.

Summary Sheet of Beef cluster

Item	Cluster 1	Cluster 2	Cluster 3	Overall
Animals for slaughter in the focal point (No.)	403,407	146,538	164,366	714,311
Production of beef (tonnes)	32,908	11,954	13,408	58,270
Default Beef yield per animal per day (gm)	192.49	192.49	192.49	577
Number of calves saved after intervention	125,056	95,749	67,888	220,805
Gain in weight of saved calves (tonnes)	13,819	10,580	7,909	24,399
Additional value from saved calves (M. US$)	38.488	29.469	22.028	33.978
Additional production from enhanced yield (ton)	17,713	10,952	8,181	14,333
Additional value from increased yield (M. US$)	49.335	30.503	22.787	79.837
Total additional volume of to be exported (tonnes)	6,612	3,389	3,012	
Additional value from enhanced exports (M. US$)	27.770	14.236	12.649	
Additional value from improved value chain-export (M. US$)	6.142	3.149	2.798	
Quantity produced for high-end domestic market (ton)	2,699	1,383	1,229	5311
Revenue from value addition-domestic market (M. US$)	8.476	2.388	2.122	12.985
Animal fattening units required	333	205	145	683
No. of animals to be fattened	256218	156939	176806	589962
Feed mill required to feed fattening (No.)	167	106	36	302
No. of animals to be slaughtered in modern abattoirs	130574	220291	12422	363288
No. of Slaughter houses required	22	37	30	89
Modernized cattle markets (number)	5	2	5	12
Investments (Million US$)				
Strengthening of research	2.593	2.593	0.000	5.185
Capacity building of stakeholders	5.185	8.392	8.392	21.969
Calf fattening unit	3.441	3.441	3.441	10.323
Village level feed mills	0.593	0.593	0.593	1.778
Village level modern slaughter houses	2.460	4.138	3.362	9.960
Investments on establishment of cattle markets	7.778	3.333	7.778	18.889
Investment on export promotion	0.050	0.050	0.050	0.150
Interest free loans for one year	0.747	0.940	0.850	2.537
Total investments	22.88	17.09	17.26	57.22
Economic Analysis (Million US$)				
Total increase in production (tonnes)	31,532	21,532	16,090	38,732
Increase in gross revenue (undiscounted) in 5th year	130.211	79.743	62.384	272.338
Increase in operational costs	77.431	44.792	35.024	157.247
Net cash flow after deducting all costs during the 5th year	52.780	34.951	27.360	115.091
NPV	79.148	45.794	32.749	244.086
Internal Rate of Return	143.11%	111.53%	103.23%	123.00%

1. INTRODUCTION

1.1. Beef sector in Pakistan

The role of the livestock sector in the rural economy of Pakistan is very critical as 30-35 million population derive their livelihood from livestock production as a primary or secondary activity. During 2017, the livestock sector contributed 58.9% to the agriculture value added produce and 11.1% to national GDP, which is higher than the contribution made by the entire crop sector (Economic Survey 2017-18).

Table 1: Distribution of animals' population by provinces of Pakistan during 2016-17

Item	Punjab		Sindh		KP		Baluchistan		Pakistan	
	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo
Animal head (000)	22652	25134	8958	9327	10084	3230	2714	473	44406	38163
Available for slaughtering (000)	6795	7540	2687	2798	3025	969	814	141	13321	11448
Regional share in animal heads (%)	51	66	20	24	21	8	6	1	98	99
Regional share in beef (%)	45		30		18		5		98	

Source: Animal population by province is extrapolated from the figures reported in Agricultural Statistics of Pakistan for the year 1996 and 2006 and beef production at country level reported in the same sources was proportionately allocated to each province depending upon the share of the respective province in the total population. This assumes the constant beef animal share in the total animal population and animal yield across the province.

The beef production in the country has more than doubled during 2001-17 from 0.91 million tonnes in 2001 to 1.88 million ton in 2017 with an annual rate of 4.8% per annum, while total number of animal slaughtered increased at a rate of 4.3% per annum. The highest growth came from cattle both in the cattle number slaughtered as well as in beef production (Table 2). The contribution of beef from camel (not shown in the table) contributes less than one %.

Table 2: Trend in beef production in Pakistan by animal species during 2001-17

Year	Buffalo		Cattle		Overall		
	Animal slaughtered	Quantity	Animal slaughtered	Quantity	Animal slaughtered	Quantity	Yield
	(M. heads)	(M. Tonnes)	(M. head)	(M. Tonnes)	(M. heads)	(M. Tonnes)	(Kg/ animal)
2001	4.00	0.48	2.23	0.43	6.23	0.91	145.7
2002	4.10	0.49	2.27	0.44	6.37	0.93	146.2
2003	4.20	0.51	2.31	0.45	6.51	0.95	146.4
2004	4.37	0.52	2.36	0.46	6.73	0.98	145.5
2005	4.50	0.54	2.40	0.46	6.90	1.00	145.5
2006	5.57	0.67	3.30	0.63	8.87	1.30	146.6
2007	5.73	0.69	3.40	0.66	9.13	1.34	147.2
2008	5.90	0.71	3.50	0.68	9.40	1.39	147.7
2009	6.08	0.73	3.63	0.71	9.71	1.44	148.0
2010	6.27	0.75	3.77	0.73	10.04	1.49	148.0
2011	6.46	0.78	3.91	0.76	10.37	1.54	148.2
2012	6.71	0.80	4.05	0.79	10.76	1.59	147.5
2013	6.42	0.83	4.19	0.82	10.61	1.65	155.3
2014	6.61	0.84	4.33	0.85	10.93	1.69	155.0
2015	6.80	0.87	4.42	0.88	11.22	1.75	156.0
2016	7.06	0.90	4.56	0.92	11.63	1.81	155.7
2017	7.30	0.93	4.70	0.95	11.99	1.88	156.5
Growth rate (%)	3.89	4.31	5.14	5.41	4.35	4.84	0.49

Source: FAOSTAT down loaded on June 10, 2019.

Beef accounted for roughly 56% of the total meat production in Pakistan (Agriculture Statistics of Pakistan, 2016-17). The per capita beef supply in the country has gradually increased from 6 kg in 2005 to about 9 kg in 2013 while at world level it has almost stagnated, rather showed a slight declining trend after reaching a maximum level of 9.8 kg in 2007 (Figure 1). Argentina is the highest beef consuming country in the world with a consumption of 55 kg per capita per annum followed by Brazil and United States at 36 and 35 kg, respectively. The increasing beef consumption over the years in Pakistan is due to changing consumer preferences and opening of fast food chains in the country while at world level the health consciousness resulted in the decline in consumption.

Figure 1: Pakistan vs world average per capita beef availability (kg/annum)
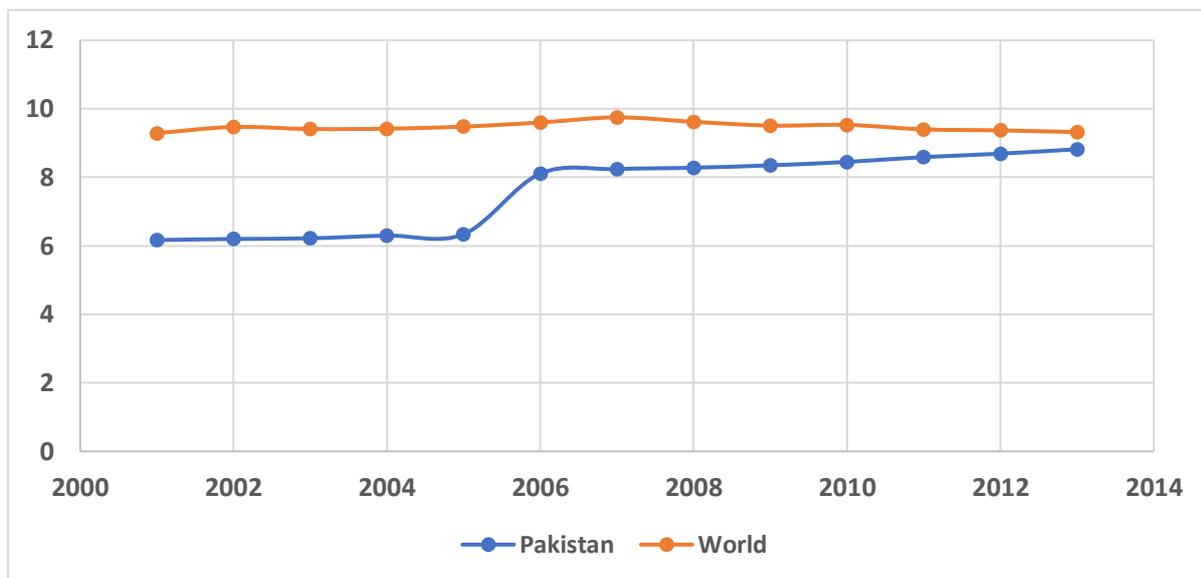
Source: FAOSTAT-Food Balance Sheet –downloaded on June 10, 2019.

Beef production is spin-off of conventional dairy farming in Pakistan. There are innumerable small farmers spreading all over the irrigated area of the country. Main feed base of livestock is crop residues. These farms are operated mainly by the private sector on various scales, in both urban and rural settings. The farms are generally characterized as fragmented and subsistence.

The beef production growth per animal is much lower in field conditions: 50-150 gm/ day although maximum average beef production could be achieved at 700-1200 gm/day (Jabbar et al., 1993; Pasha, 1986). Potential reasons of low-beef production per animals include poor availability of nutrients, low genetic potential, poor management practices, high environmental stresses and animal health issues.

In the domestic market, urban butchers, super markets and retailers are the direct suppliers of beef to the consumers. All cater to different market segments having different needs and preferences. At the traditional butcher and retail shops, the customers are the masses. They demand quality assessed primarily by the looks of meat at the lowest possible price. Beef is also available at super markets such as Jalal Sons, Carrefour and Metro. Their customers demand better quality than that available at the traditional meat shops. Recently, the specialty meat shops have started attracting high end, quality conscious customers. These customers pay a premium for a more hygienic and pleasant meat buying experience at these shops.

The prices of all types of meat are increasing, but the increases in mutton and beef prices are the highest, higher than the CPI, while the increase in poultry price is lower than that in CPI (Figure 2). The high increase in beef prices suggests that despite the increase in beef supply, there is unmet demand for beef which is pushing its prices up.

Figure 2: Trends in the price's indices of various meats and CPI during 2001-2017
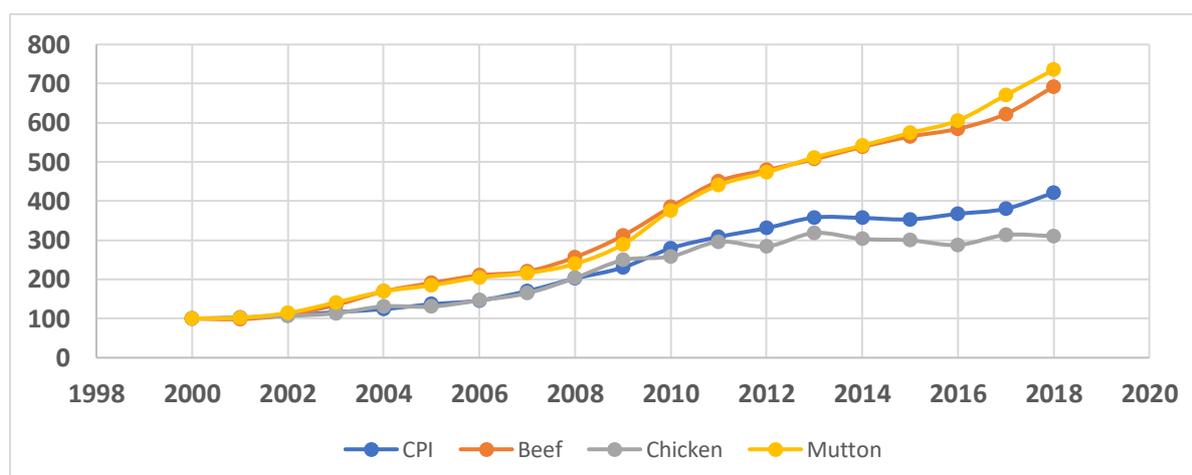
Source: Indices were developed based on the retail prices reported in Pakistan Economic Survey 2018-19, Base 2000=100

It is interesting to note that mutton prices are about 100% higher than beef prices whereas poultry prices are 50% lower than the beef (Table 3). This price trend has induced the poultry meat consumption while discouraged the mutton and beef consumption during the period.

Table 3: Trends in the prices of meats and CPI in Pakistan during 2001-2019

Year	CPI	Beef	Poultry	Mutton
2001	100	56	51	109
2002	102	55	52	112
2003	108	61	54	125
2004	116	75	58	154
2005	124	95	66	185
2006	137	107	66	202
2007	146	118	74	224
2008	170	123	83	236
2009	202	144	103	262
2010	230	174	126	317
2011	279	215	131	411
2012	308	252	150	482
2014	358	284	161	559
2013	331	268	144	518
2015	357	302	154	593
2016	353	316	152	628
2017	368	328	146	663
2018	380	349	159	734
2019	421	388	157	804
Growth rate (%)	9.1	11.7	7.6	11.8

Source: Pakistan Economic Survey, 2018-19.

Partly beef and mainly poultry can fill the gap created by the declining mutton consumption in the country because of the exorbitant increase in price of the latter and relatively cheaper prices of the former two meats. A common observation is that the red meat butcher shops have added chicken to their offering.

Bovine meat in local market is sold in wet form (99%). Animals are slaughtered during late night hours and transported to shops without a cold chain and during early hours of day beef is sold wet. It is important to note that local beef consumption is primarily based on dairy culled animals, as local population cannot afford to pay high price of calf or bulls of less than 4 years of age specifically reared for beef purpose. With the increase in dairy farming, more cow and buffalo calves will be available for fattening. Development of feedlot system is vital to exploit the growth potential of male calves and to develop high value products for the local markets.

Large animals are exported to Afghanistan and Iran mostly illegally. Exports of beef from Pakistan are in chilled carcass form and mainly to the Gulf countries. However, compared to the size of the global market, the country's export performance in beef and live large ruminant has been dismal. Although, it has slightly picked up since 2010, but again dropped in 2016.

Table 4: Pakistan export of live large ruminant and beef during 2001-2016

| Year | Beef | | Live animal | | Total |
| | Quantity | Value | Heads | Value | Value |
	Tonnes	000 US$	Number	000 US$	000 US$
2001	0	0	13125	1360	1360
2002	0	0	29147	3644	3644
2003	0	0	63928	14421	14421
2004	159	286	9331	2807	3093
2005	28	42	3	1	43
2006	55	88	276	88	176
2007	15	33	14	11	44
2008	10	29	28	11	40
2009	146	416	1518	432	848
2011	575	1847	47262	17463	19310
2010	760	1980	51179	17653	19633
2012	1143	5056	45261	14312	19368
2013	2743	8151	41988	12437	20588
2014	6801	22601	NA	NA	22601
2015	8061	28957	NA	NA	28957
2016	3541	12703	NA	NA	12703

Source: FAOSTAT down loaded on June 10, 2019

Despite challenges discussed throughout this report, Pakistan world beef market share was 0.90% during 2016 (FAS/USDA, 2017). Exports are restricted in chilled carcasses supplied to the GCC countries, where Pakistani exporter receives only 60% of the world average

price[1]. Additionally, there are indications that this market segment may be reaching a point of saturation. This does not mean that Pakistan turns to lower-value frozen products that make up about half of the world market in meat. Rather, Pakistan can continue to exploit its comparative advantages in the chilled bovine meat sector by targeting higher value chilled boneless cuts, which make up 24% of the world market as opposed to chilled carcasses which represent only 6% of world trade (USAID, 2012).

Pakistan's overall share in beef export in three key Middle East markets, i.e., UAE, KSA and Kuwait is 35% although currently it claims 98% share in all chilled carcasses in these markets. Pakistan's share in chilled bone-in-cuts is also significant in these markets. However, its share in frozen carcass and bone-in-cuts, where the major demand segment lies, is insignificant (Table 5).

Table 5: Pakistan beef share in 3 largest exporting countries during (2008-2012)

	UAE	KSA	Kuwait
Chilled			
Carcass	98%	98%	98%
Bone-in cuts	50%	87%	66%
Boneless cuts	0%	0.02%	0.1%
Frozen			
Carcass	7%	5%	0%
Bone-in cuts	9%	0.1%	6%
Boneless cuts	0.01%	0%	0%
Total Pak Export (Ton)	13674	6044	5560
Pak overall share (%)	16	5	14

Source: USAID, 2012

The major challenge faced by the beef sector of Pakistan is it is not treated as an independent commercial sector and generally dealt as a by-product of the dairy sector. Lack of proper initiatives by the government restricted the development of beef industry in the country. There are various constraints at each level of the value chain that hamper the growth of the industry and realizing its full trade potential which will be discussed and analyzed throughout this report.

No Pakistani *halal* meat standards are recognized internationally, and Pakistan has not been able to develop and implement beef standards within the country, which has made it difficult for the exporters to penetrate the international markets. Pakistan is not an FMD free country, thus it cannot enter the European market. On average, the weight of carcass exported from Pakistan is 100-120 kg whereas the carcasses exported from countries like Australia, Brazil and New Zealand weigh around 350 kg. This means that about 3 to 4 animals are slaughtered in Pakistan for every one animal slaughtered by the traditional meat exporters.

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[1] For 2012, according to ITC in Geneva, based on UN COMTRADE data.

Pakistan is in the chilled carcass market and does not export special cuts of beef resulting in very low margins. The trade of beef exporting nations like Australia is mostly in the form of cuts and not carcass. Also, the beef from Pakistan is sent to the wholesalers catering to the demands of diaspora and Asian communities residing in the Gulf region who typically demand carcass of small animals. The international consumers, however, do not buy beef from Pakistan as the market is an unreliable source of regular meet supply and does not meet the requirements of the premium markets.

1.2.   Global Context

During 2017, the world beef production stands at 70 million tonnes obtained from 331 million animal slaughtered during the year (Table 6). This gives an average carcass size of 212 kg which is about 35% higher than the average carcass size in Pakistan. Globally, beef production is growing at an annual rate of 1.10%, which is lower than the global human population growth of 1.19%, hinting towards a declining beef consumption globally. However, it is interesting to note that both number of buffalo slaughtered and quantity of beef from buffalo has increased at much higher rate as compared to those in cattle (which is even higher than the human population growth). Although currently, cattle are the major source of beef supply (more than 90%), but if these trends continue, this might change in the future.

Table 6: International trends in animal slaughtered and beef production by animal type during 2001-2017

| Year | Buffalo | | Cattle | | Total | | |
	Animal Head[1] (million)	Quantity (M. Tonnes)	Animal Head1 (million)	Quantity (M. Tonnes)	Animal Head1 (million head)	Quantity (M. Tonnes)	Yield (Kg/animal)
2001	20.37	2.86	267.10	55.40	287.47	58.27	202.7
2002	20.76	2.96	272.35	56.46	293.11	59.42	202.7
2003	20.05	2.90	276.93	57.37	296.98	60.27	202.9
2004	20.68	2.99	281.22	58.97	301.90	61.96	205.2
2005	21.28	3.09	283.38	59.30	304.66	62.38	204.8
2006	22.04	3.21	288.70	60.49	310.74	63.70	205.0
2007	22.88	3.33	293.83	62.35	316.71	65.67	207.4
2008	23.18	3.36	294.09	62.50	317.27	65.87	207.6
2009	23.62	3.43	295.64	62.88	319.26	66.30	207.7
2010	24.55	3.58	296.08	63.13	320.63	66.71	208.1
2011	24.88	3.62	295.51	62.95	320.39	66.57	207.8
2012	25.56	3.67	298.76	63.58	324.32	67.25	207.4
2013	25.29	3.71	304.09	64.73	329.37	68.44	207.8
2014	25.55	3.72	302.75	65.27	328.30	68.99	210.1
2015	25.65	3.76	302.36	65.18	328.01	68.93	210.2
2016	26.11	3.80	302.57	65.66	328.68	69.46	211.3
2017	26.44	3.84	304.41	66.25	330.85	70.09	211.8
Growth	1.86	1.98	0.76	1.05	0.84	1.10	0.26

rate (%)							

[1] The number of animals slaughtered.
Source: FAOSTAT downloaded on June 12, 2019

India followed by Pakistan are the major buffalo meat producing countries in the world, while USA, Brazil and China are the major cattle meat producing countries (Table 7).

Table 7: Major beef producing countries of the world during 2017

Rank No.	Country	Buffalo meat (000 tonnes)	Country	Cattle meat (000 tonnes)
1.	India	1635	USA	11907
2.	Pakistan	929	Brazil	9550
3.	China	363	China	6898
4.	Egypt	360	Argentina	2842
5.	Nepal	180	Australia	2049
6.	Philippines	102	Mexico	1927

Source: FAOSTAT down loaded on June 19, 2019

During 2017, total export of beef and live large ruminant (cattle and buffalo) export stands at US$40.6 billion, which has been growing at 7.5% per annum during 2001-17, much higher than the growth in beef production or animal slaughtered during this period suggesting that beef sector is commercializing at a fast rate. Pakistan seems to have missed the train as it's share in world beef export is only 0.03%. The highest export growth comes from beef and veal sausages which has been growing at 21% and 26% in terms of quantity and value, respectively (Table 8).

Table 8: Global export of beef, beef products, and live large ruminant during 2001-16

Year	Beef & veal Sausages		Beef preparations		Beef		Live cattle		Total
	Quantity	Value	Quantity	Value	Quantity	Value	Animal	Value	
	000 tonnes	M. US$	000 tonnes	M. US$	000 tonnes	M. US$	M. Head	(M. US$)	M. US$
2001	3.0	8.4	377.2	842.5	3783.9	9858.6	8715.0	3772.5	14482.0
2002	20.7	32.4	427.7	963.9	4164.5	10660.1	9048.0	4255.5	15911.9
2003	9.5	18.9	471.6	1148.5	4408.9	12617.9	7901.7	4136.4	17921.6
2004	2.9	6.1	523.7	1450.5	4568.3	14558.9	8031.5	4351.4	20367.1
2005	4.2	8.8	552.1	1677.4	4914.7	16471.1	8316.3	5083.2	23240.5
2006	5.6	12.7	558.6	1832.9	5054.9	18344.4	9613.5	6086.6	26276.7
2007	7.0	17.9	583.5	2029.4	5175.4	20041.1	9234.0	6591.1	28679.4
2008	12.3	34.7	588.8	2435.4	5026.4	24154.9	9073.6	6822.9	33447.9
2009	10.3	39.0	540.7	2140.5	5158.5	21505.1	9576.5	6595.8	30280.3
2010	10.5	40.9	482.1	2052.5	5286.5	24313.2	10930.8	7563.9	33970.5
2011	14.8	62.7	498.8	2503.0	5028.0	27281.5	10409.3	8391.9	38239.1
2012	26.8	114.3	504.1	2536.8	5064.1	28112.3	10228.3	8890.5	39653.9
2013	25.9	108.7	477.9	2436.2	5409.9	29615.0	10818.3	8736.5	40896.4
2014	110.4	414.3	499.0	2568.7	5840.3	33690.5	10957.3	9611.2	46284.7

2015	112.1	360.1	488.5	2413.0	5844.2	31725.2	10363.4	8531.1	43029.4
2016	121.0	387.4	479.4	2266.4	5748.9	29912.5	10282.0	8040.2	40606.6
Growth rate (%)	21.0	26.0	0.5	6.6	2.3	8.0	1.9	6.2	7.5

FAOSTAT down loaded on June 19, 2019.

Beef trade is in two forms, fresh/chilled and frozen. The world market for chilled beef meat is growing at 1% per year in volume terms, and at 4% in value terms during last few years. However, the market for frozen beef has achieved higher growth rates 5% per annum in terms of volume and 11% in terms of value. According to data from the ITC in Geneva, in terms of volume, frozen meats have already surpassed chilled/fresh exports.

Pakistan's beef sector is performing poorly when compared with international performance in the sector (Table 9). Currently world is producing 70 million tonnes of beef worth of US$270 billion. The average carcass weight in Pakistan is only 75% of the world average weight. Pakistan contributes 3.6% in world animal population (buffalo and cattle) slaughtered every year, while its contribution in production is only 2.7% because of low weight of carcass (Table 9). The farmgate prices of beef in Pakistan in 2016 was 5% higher than the average world prices suggesting that Pakistan has low comparative advantage in international market when compared at the farmgate level. While world exports about 9% of its production, Pakistan exports only 0.2% of its production despite it being in proximity to big beef markets like Middle East and China. On the other hand, the export prices in Pakistan earns only 70% of the world average export price suggesting poor quality and low value chain development in beef.

Table 9: Comparison of performance of Pakistan with global beef sector, 2016

Parameter	World	Pakistan	Pakistani Share (%)
Animal slaughtered (million head)	330.85	11.99	3.63
Production (mil tonnes)	70.09	1.88	2.68
Average carcass weight (kg)	212	157	74.0
Value of production (bill US$)	270.21	11.99	4.44
Farm gate price (US$/tonne)	3855	4084.6	105
Quantity of international trade (000 ton)	6349	3.5	0.056
Value of international trade (Million US$)	32566	12.7	0.039
Export quantity as% of production	9.0	0.19	2.11
Export value as% of production value	12	0.11	1.26
Average export prices (US$/tonne)	5129	3587	70

FAOSTAT down loaded on June 19, 2019.

The global Muslim spending on halal food and beverage was estimated at US$ 1,128 billion in 2014, accounting for 16.7% of the global food and beverage market. The market is expected to grow to US$ 1,585 billion by 2020, accounting for 16.9% of the global expenditure, at a CAGR of 5.8% (2014-20). Based on 2014 data, Indonesia is the largest halal food market with market value of US$ 157.6 billion, followed by Turkey having a

market value of US$ 109.7 billion and Pakistan at US$ 100.5 billion (Thomson Reuters, 2016). Pakistan has done little to capture big halal international market.

Global beef exporting and importing countries have been presented in (Table 10). In terms of export quantity, Poland is the major cattle beef exporting country followed by Germany, France and Netherlands. While USA is at 7th rank in terms of exporting cattle beef but at 4th rank in term of value because of its higher prices and best quality.

On the other hand, Italy followed by Netherlands, Germany, and South Korea are the major cattle beef importing countries. It should be noted that Netherlands and Germany are among the major importing as well as importing countries of the world. China is at 6th and 10th rank in terms of beef quantity and value of beef import, respectively. It seems that China imports lower price beef. Pakistan may attempt to enter Chinese cattle beef market and may have certain comparative advantage because of its proximity with China and low quality demanded by the Chinese market.

Table 10: Major cattle beef exporting and importing countries of the world, 2016

Rank	Exporting				Importing			
	Country	Quantity (000 tonnes)	Country	Value (M. US$)	Country	Quantity (000 tonnes)	Country	Value (M. US$)
1.	Poland	240	**Poland**	**777**	**Italy**	**233**	**Italy**	**1081**
2.	Germany	174	France	745	Netherlands	226	Netherlands	672
3.	France	165	USA	737	Germany	140	Korea	627
4.	Netherlands	165	Netherlands	728	Korea	134	Germany	543
5.	Spain	122	Germany	630	Russia	110	USA	520
6.	Belarus	121	Spain	489	China	102	France	385
7.	USA	119	Belgium	395	U.SA.	94	Russia	325
8.	Belgium	88	Mexico	353	France	75	Greece	301
9.	Australia	86	Belarus	351	Greece	75	Spain	276
10.	Mexico	69	Australia	281	Spain	60	China	269

FAOSTAT down loaded on June 19, 2019.

Internationally, the cattle beef producers' prices, except for the last 2-3 years, have been improving during 2001-17 in major beef producing countries of the world suggesting demand pressure on the product despite a high growth rate in its production. However, there was a consistent decline in the beef cattle prices at the farmgate level in China since 2012, perhaps because of the 10% improvement in beef production in the country during the last five years.

Figure 3: Annual producers' price for cattle beef (US$/tonne) in selected major beef producing countries, 2001-17
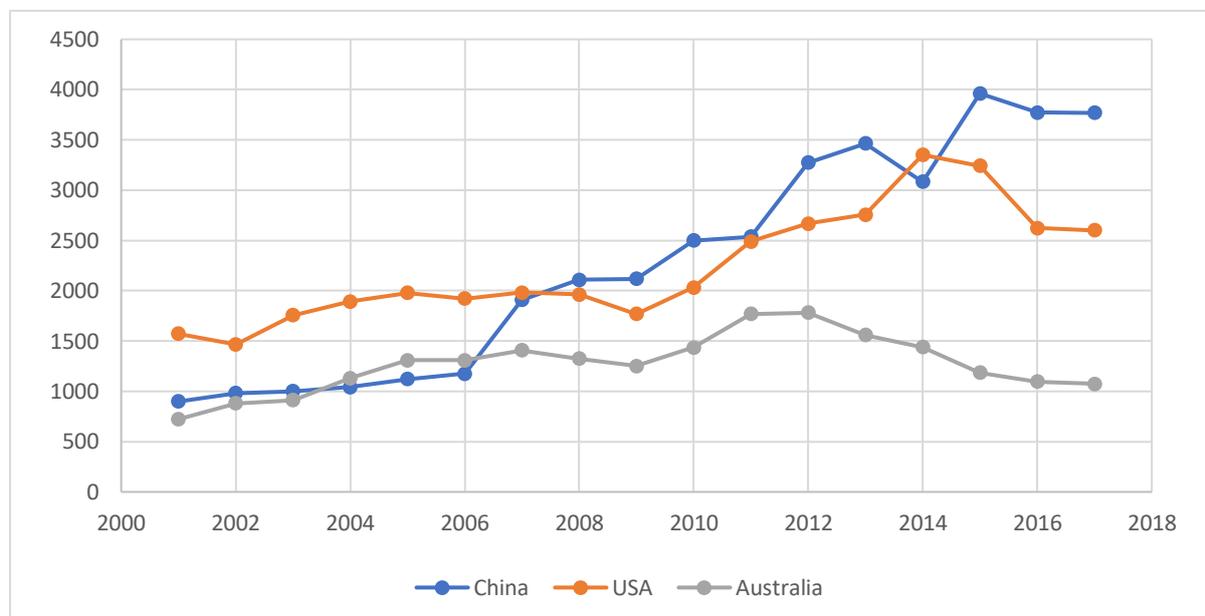
Agricultural Statistics of Pakistan (various issues)

1.3.　　Need of the Study

Analysis of the macro level data for the beef sector suggests that there is a tremendous scope for Pakistan to benefit from the booming beef sector in the national and international markets. Although, international production of beef is not growing fast enough at only 1.1% per annum, but the value of the exports of beef, its related products, and live animal have reached at over US$40 billion per annum and it has been growing at a very fast rate of 8.05% per annum. Similarly, beef prices within the country and internationally have been continuously growing for the last eighteen years. Beef consumption in Pakistan has increased over 50% during 2004-13, and is continuously on the rise, although it has been stagnated internationally because of the health consciousness in major beef consuming countries. Despite these developments in the national and international beef sector, however, Pakistan generally remains uncompetitive in beef production as reflected by its higher than the world average beef prices at the farmgate level. Its carcass yield is 26% lower than the world average weight both presumably achieved within one-year time, and its beef export fetches only 70% of the world average export prices.

To make Pakistan competitive in beef sector in national and international markets and transform the rural economy of the country, the PCP has initiated this feasibility study for the purpose of identifying the gaps and potential. It suggests economically viable interventions based on these potentials along the value chain. It was suggested to identify

the clusters where beef production is concentrated and analyze the sector at these cluster levels so that the suggested interventions and investment plan match to the needs of the local conditions. Moreover, it is believed that such interventions implemented at beef cluster level will be much more effective.

2. GOAL AND PURPOSE

The overall goal of this study is to contribute to the cluster development-based agriculture transformation plan -V2025. Specific objectives of the study are:

1. To identify the major clusters of beef production in Pakistan.
2. To conduct a detailed diagnosis and SWOT of the beef value chain in each cluster.
3. To identify technological, institutional, infrastructure and policy gaps in each cluster.
4. Assess the potential of beef production in each beef producing cluster.
5. Suggest technological, institutional, infrastructure and policy interventions to achieve the cluster potentials.
6. Conduct economic and social feasibility of the suggested interventions.

3. METHODOLOGY

The data and information related to the characteristics, gap, potential and needed interventions to meet the gaps in beef clusters were collected from three sources:

> I.   *Macro-Data*. Relevant macro data were collected from various published and unpublished reports of government and non-governmental organizations and internet search on beef value chain (Annexure 1).
>
> II. *Stakeholders Consultations*. Primary information was collected through meetings, consultations, key informant interviews, surveys and focus group discussions using structured tools and open-end questionnaires (Annexure 2).
>
> III. *Literature Review.* The literature related to the functioning, gaps, and interventions in beef value chain is reviewed and synthesized (Annexure 3).

Following generic parameters and indicators were used in collecting the data:

- Global context of beef sector;
- Production potential and review of beef sector;
- Cost of production, harvesting, processing of beef from the growers and grower associations;
- Marketing, trading, and processing from traders, wholesalers, retailers, and processors;
- Issues and constraints relating to production, marketing, trading, and processing from all stakeholders;
- Recommendations and benchmarks based on global parameters;

The author then used these data to first identify the beef clusters in the country and then used his subjective judgement in prescribing the characteristics of each cluster, identifying the cluster strengths, weaknesses, opportunities, and threats (SWOT), investigating the functioning of existing value chain, and quantifying the cluster potentials. Based on the above analysis, we then suggested the interventions for improvement in each cluster. The cost and benefits of each intervention are also estimated to finally work out the Internal Rate of Return of the whole package. A beef Transformation Plan is also formulated which identifies sustainable cluster upgrading strategies for the development of the beef sector that can help create significant economic opportunities for producers, processors and all the stakeholders participating at different points of the value chain.

4. LITERATURE REVIEW

4.1. Beef Animal Producer

There are five main type of livestock producers: Smallholder subsistence, Smallholder market-oriented, Rural commercial farms, Peri-urban commercial dairy farms and Corporate dairy farms (Annexure 4). There is no-specific beef breed but by-product of dairy farms. Beef is mainly resourced from two types of animals: buffalo and cattle. In 2017-18, the livestock population was estimated at 38.1 million buffaloes and 44.4 million cattle (Table 1). Majority 80-85% of them are small farmers spreading all over the irrigated and semi-arid districts of the country. They usually kept these animals as a source of wealth to be used during times of need like child education, marriage, payment of loan installments, etc.

Animals are mainly kept for dairy purposes. Female calves are well-treated and well-fed as they are the future dairy replacements (Ahmad et al., 2009). On the other hand, young male calves are neglected, and their nutritional requirements are not fully met. Male calves are only kept with their mothers for letdown of milk and they get only residual feeding or very little nutrition The problem is exacerbated with male calves in commercial enterprises across Pakistan, as the market for a weaned male buffalo is usually less than half the beef feeding cost to weaning (Ahmad et al. 2009). This leads to many male calves being sold on the day of birth to save weaning beef (Ahmad et al. 2009) and majority of them being slaughtered when they are just 5-15 days old (Khan and Mirza, 2002). Slaughter of male calves have huge impacts in terms of the economic losses to dairy farmers across the country.

4.2. Calf Mortality

Lack of proper care results into calve mortality which is associated with the type of housing, feeding, management practices, weather conditions, external and internal parasitic infestation and bacterial infections especially those causing septicemia and enteritis (Blood et al., 1994).

It is estimated that a calf mortality of 20% can reduce the net profit of an enterprise roughly by 60% (Blood and Radostits, 1994). Ideally calf mortality should be less than 5% with growth rates of 0.5-0.7 kg/d (Blood and Radostits, 1994). Very high mortality rates of over 50% have been reported in buffalo calves to one month of age. Foot and Mouth Disease (FMD) and Haemorrhagic Septicemia (HS) are endemic to Pakistan and account for up to 31 and 21.5% respectively of deaths in buffalo calves aged from 6-12 months (Ramakrishna, 2007). On other farms extreme mortality rates of up to 80% have been recorded (Tiwari et al., 2007). Calves in Pakistan are generally neglected because of their high feeding costs and low-returns from their sale at weaning (Bhatti et al., 2009).

Neonatal calf morbidity and mortality are major causes of economic losses in livestock production. Although disease contributed to this statistic, the failure to provide colostrum, to deworm, to disinfect naval cords and to provide an adequate beef substitute and

appropriate shelter and water all played their role in the etiology of these mortalities. Other causes of calf mortality include the greater susceptibility of crossbred and primiparous animals (Rao and Nagarcinkar, 1980). The failure to provide colostrum has also often been implicated (Afaq et al., 1992). The giving of colostrum to friends is a custom found in some regions and as such the calf is inevitably deprived. Overall farmers in many regions consider calf rearing a very low priority, as the commercial value of this practice is not apparent to them. Maternal nutrition during gestation also plays a very important role in the subsequent life of the calves (Wynn et al., 2009).

According to Afzal et al., (1983) the mortality in cattle and buffalo calves ranged from 29.1% to 39.8% resulted in reduction of profit of a livestock farm. A minimum mortality rate of 5% is usually acceptable to dairy farm having standard management conditions. Young male calves are usually neglected by the farmers particularly in the commercial dairy production system where the owners are interested to sell maximum beef rather than to feed it to calves to earn more profit. The growth potential of livestock remains underutilized because of underfeeding and poor management.

Although disease contributed to calf mortality, the failure to provide colostrum, deworm, disinfect the naval cords and provide an adequate beef substitute, appropriate shelter, and water all played their role in the etiology of these mortalities. Other causes of calf mortality include the greater susceptibility of crossbred and primiparous animals (Rao and Nagarcinkar, 1980). The failure to provide colostrum has also often been implicated in calf mortality (Afaq et al., 1992). The giving of colostrum to friends is a custom found in some regions and as such the calf is inevitably deprived. Overall farmers in many regions consider calf rearing a very low priority, as the commercial value of this practice is not apparent to them.

4.3.   Save the Calf Program

Government of Pakistan has rightly identified the key jargon of 'save the calves' and funded many projects to LDDB, PAMCO and L& DDD Punjab and spent millions of rupees in last ten years. All these projects were incentive based where money was paid to the producers to rear the calves however, the aspect of sustainability was completely ignored. At the end of the gestation of each project/program no one continued the practices because there is no incentive to do that activity. There is need to device a national level strategy to 'save the calves' by involving every stakeholder in most appropriate way. All the provincial livestock departments should introduce an aggressive extension campaign explaining the commercial viability of rearing male calves for meat production irrespective of their origin. Research organizations should develop applied research programs that refine appropriate calf rearing strategies to minimize the cost of production and maximize returns to the producers. Government should attract private industry support to build small to medium-capacity high quality abattoirs, improve marketing facility for the smallholder producers and initiate a commercial campaign extolling the virtues of meat consumption particularly to meet the needs for iron particularly for women and young growing children. Without increased demand the subsequent steps cannot be delivered.

4.4.   Animal Weight Growth Rate

In the field condition, average weight gain of calves is about 100-200 gm/day. There are many evidences from scientific literature that by providing them balanced nutrition, high growth rate (840 and 970 gm/day) were achieved (Pasha, 1987). Another study found the daily growth rate of 780 to 1010 gm/day in calves (Jabbar et al., 1993). Yearling male calves from Sahiwal and (Friesian x Sahiwal) crossbreds having initial body weight of 180 kg, grew at a rate of (940 and 970 gm/day) respectively (Asrar, 1986). Basra, (1992) reported that crossbred (839-869 gm/day) calves perform better than Sahiwal (795-805 gm/day) than buffalo (751-781 gm/ day) calves when grown on similar fattening diet in a trial.

4.5.   Livestock Extension Services

Provision of improved extension and veterinary services could play a vital role to increase the beef production and profitability of smallholder producers. The Agriculture Sector Linkages Program (ASLP) dairy project[2], in close collaboration with the provincial livestock departments in Punjab and Sindh, has successfully demonstrated the extension model to enhance livestock productivity in the field situation. It was found that improved extension services have significant impact on awareness, knowledge, adoption rates and productivity of smallholder dairy farmers in Pakistan (Warriach et al., 2018). Project did not offer any financial incentives to the farmers for their participation. A 'whole-family approach' was used in the extension program, where comprehensive interdisciplinary training overall dairy-farming system was provided to the males, females and children of the farming household. The complete extension material including modules and fact sheets on 'whole farming system' was developed (Annexure 5).

4.6.   Beef Value Chain

Detailed study on meat value chain assessment of the livestock sector in Pakistan has been conducted by USAID (2012). The objective of this assessment study was to obtain a detailed understanding of the role of various stakeholders and actors, the activities of various sectors within the value chain, the costs within various structures and market opportunities within the livestock and meat sector of Pakistan. The assessment considered the current consumption, market demand, challenges faced by each sector and the availability through the commodity chain to come-up with recommendations and business models to add to the meat value chain.

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[2] The project was run in five districts (Bhakkar, Jhelum, Kasur, Okara, Pakpattan) Punjab and two districts (Thatta, Badin) of Sindh province from 2010-2015. The project was funded by the Australian government and run with close collaboration with UVAS, Lahore. The total number of the registered farmers were 1560 including male and female farmers (Warriach et al., 2018). There were 426 total technical messages were delivered to the registered farmers in monthly meetings over the five years duration. The cost of per technical message was Rs. 76/farmer

4.6.1.   Demand side of the value chain

The demand projections for the year 2020, corresponding to the scenario of 2.7% GDP growth (low-income growth), and 3.6% GDP growth (moderate income growth) and of 4.0% GDP growth (high-income growth) are 2183, 3300 and 3797 thousand tones, respectively. During 2012-2020, the demand for beef will grow at annual compound growth rates of 4.0, 9.6 and 11.5%, respectively under low, medium and high-income growth scenarios, respectively. The current beef consumption per capita in Pakistan is about 9 kg per year (FAS/USDA). According to the latest FAO report, global meat consumption is projected to increase 73 % by 2050.

The USAID study concludes that beef industry is affected by demand related factors. Low domestic demand for beef relative to other meat products, limited demand for high quality beef, and the non-competitive Pakistani exports have hampered the development of the beef industry in Pakistan. Consumer demand, both domestic and international, for quality beef will act as a catalyst for change along the value chain. Once there are quality conscious customers, willing to pay for better quality beef. The impact will trickle down to the producers to consumers. Producers will be rewarded with the better price and on the other end consumer have the quality of product. The entire beef value chain has 'bigger pie' to share. Information will flow backwards in the value chain, demanding changes at each stage of the value chain. However, the information flow process is slow and only high demand would trigger bigger and effective changes. Although the consumption patterns are changing and the local community is beginning to demand beef, there are still very few quality conscious consumers. The opening of fast food chains and specialty meat shops has triggered the demand for quality beef in the local market but there is still a long way to go. Entrepreneurial ventures and investments in promoting and marketing of quality beef would be required to shift the customers from the traditional wet market to a more organized setting.

There are seasonal trends in the prices of beef animals. On the supply side, factors like floods, fodder scarcity, sowing season and inadequate winter housing for animals increase the turnout of beef animals in the markets with corresponding contraction in prices. On the demand side, permits to export live animals and large-scale export demand of certain type results in price increases of animal.

Eid is a seasonal market in which cow bull or heifer are sold once a year to affordable population for sacrificial purpose. Eid bull or heifers are raised by the subsistence farmer of far flung areas where beef prices are lower. The value added throughout the chains is US$0.88/kg of meat but having a slower turn over as animals are sold once a year and they have to be at least 2.5 to 4 years of age. Moreover, oversupply of Eid animals either plunge the price drastically down or press on both trader and farmer to sell the animal at next Eid. The feeding costs of Eid animal increases with age; contrarily market demand of Eid animal drops significantly, after 4 years of animal age. These Eid surplus animals could be a source of exporting quality meat as chilled boneless cuts in the existing markets (USAID, 2012).

4.6.2. Beef value chain structure

The USAID study describes four main beef value chains: butcher retailer, processor/exporter, Eid and roadside vendor (Figure 4). All of these four main beef value chains originate from small producers and pass through 2 or 3 middle-men, livestock market and get to the end market actor. Small farmer sells to fulfil his immediate big cash needs such as expenditure on marriage, education, etc. Local middle-men understand the urgent cash needs of the farmers and get the advantage. Trades dealing with beef animals generally avoid purchasing dairy animals. Typically, the farmer allows the trader to take the animal and trader pays back the settled amount after selling animal in the open market. A beef trader avoids investing his own money except when he has supply order of specific type of animals.

Trader to trader deals are common when a trader has an order of supplying specific type of animals to exporter or processor. These deals are either carried out through a bargaining process or at a certain fixed profit/animal if trust exists. Traders supply animals to abattoirs. It is common for exporters to have developed a network of traders in which one trader coordinate between 10-20 local traders for an efficient supply of specific type of beef animals from different areas of the country. Later, the coordinating trader receives the price of animals after slaughtering and weighing of their carcasses (3 to 7 days process). The exporter prefers to deal with one trader, who is also responsible to take back the rejected animals after ante-mortem examination.

Butcher retails approximately 91% of total beef production, which originates from culled dairy buffalo or cows which are not (no longer) productive for dairy purposes. Culled animal is sold at 1/3rd value of beefing animal.

The USAID study estimated that processor and exporter value chain make up 2% of all animals slaughtered annually. This value chain exhibits the highest value added per kg about US$1.52/kg of meat. Exportable meat can only be slaughtered and processed in approved abattoirs. Criteria of age, breed (% of exotic blood) and sex of animals are set by importer. More than 98% cow calf/bull is supplied by the small farmers and a few come from feedlots. The dressing % in fattened calves is 4% higher (i.e., 48-50%) than non-fattened ones. Uniformity of weight, age and size can only be ascertained by developing the feedlot system, which holds the potential of allowing the exporter to seek more sophisticated markets. However, feedlot operations are having a hard time making viable margins, partly because market linkage to higher value cuts are absent.

Beef Value Chains of Pakistan
(Approx. % Animal heads

V.A $0.92/kg meat V.A/kg $0.88/kg meat V.A $0.42/kg meat V.A $1.52/kg meat

Road side vendors (city) **5.5%**

Eid (city) **1.5%**

Butcher Retail (city) **91 %**

Export **2%**

Peri-urban Market

Butcher (illegal

Processor +Exporter

Abattoir (Municipal)

Feed lot

Livestock Markets (Primary/secondary)

Feed lot Farmer

Newborn Buff. calf   Eid I & II or III –Trader Animal   Old Animal Cow Calves

Corporate farmer

Small farmer (kg live wt.)
Newborn Male Calf (30kg); bull/heifer (350kg); Old Animal (450kg); Calf for export (250Kg)

Corporate & Large farmer

Figure 4: Beef value chains of Pakistan (USAID, 2012)

5. CLUSTER IDENTIFICATION AND CHARACTERISTICS

5.1. Identification of clusters

As per the most recent Punjab and Sindh livestock department census 2018, the district wise population and comparison of cattle and buffalo is presented in (Annexure 6). However, estimated population of beef animals available for slaughtering/year in each of the following three clusters have been presented in (Annexure 7). Based on the number of animals, three existing beef producing clusters are identified in this study. These areas:

Cluster 1: (South Eastern Punjab and North Western Sindh). Comprises of Punjab **(**Sahiwal, Bahawalpur, Pakpattan, Vehari, Okara, Bahawalnagar, Rahim Yar Khan, Muzaffargarh, and D.G. Khan); Sindh (Ghotki, Sukkur, Khairpur, Larkana, Shikarpur) districts mainly irrigated areas and along rivers. The focal district is Rahim Yar Khan because located in the centre of the cluster. It is composed of 19% and 24% of total beef produced in Punjab and Sindh provinces, respectively.

Cluster 2: (Southern Western Sindh). Comprises of Tharparkar, Umarkot and Sanghar districts of Sindh province. The focal district is Umarkot because having large number of dairy animals.

Cluster 3 (Western Punjab). Comprises of Chakwal, Attock, Mianwali, Bhakkar, Layyah, Rajanpur and D.G Khan. The focal district is Bhakkar because located in the center of the cluster and close to the big urban markets. It supplies 13% of total beef produced in Punjab.

The Faisalabad district in Punjab and Hyderabad district in Sindh having highest number of animals were not included in any cluster, because we believe that these districts mainly supply beef to big Faisalabad urban center, and does not concentrate much on beef production.
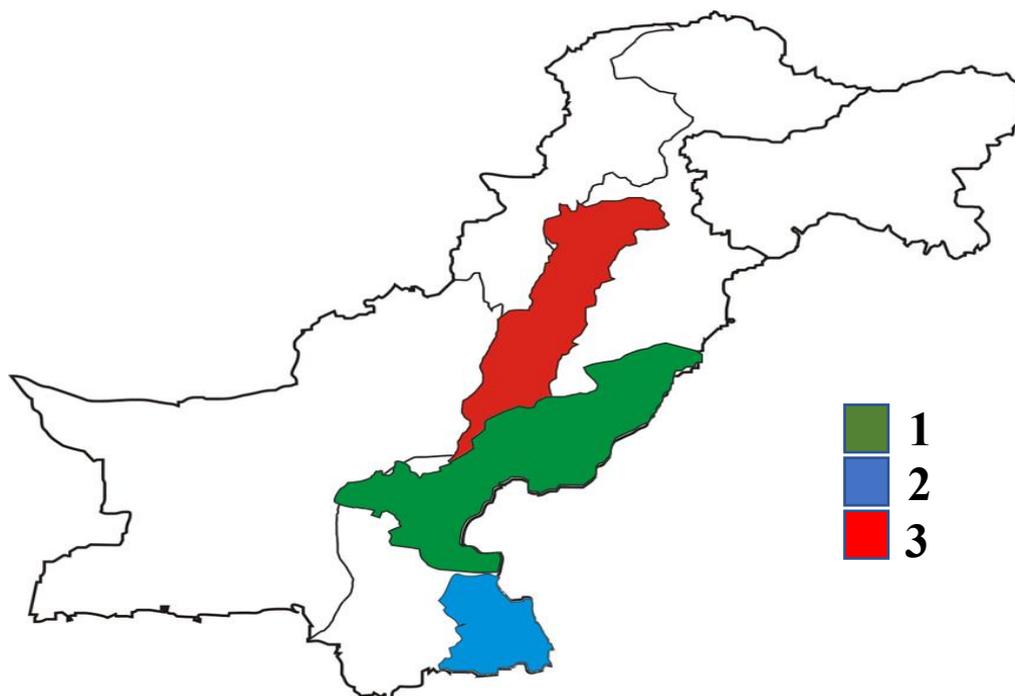
Figure 5: Map of Pakistan showing all the three beef production clusters

5.2. Comparison of clusters characteristics

The detail comparison of the silent features of beef clusters have been presented in (Annexure 8).

Cluster 1. There are innumerable smallholder producers spreading all over the irrigated areas and along rivers. In this cluster, farmers usually have better quality animals. However, animals are kept under the traditional husbandry practices, i.e., animals are tied-up and drinking water are offered 2-3 times per day. Most farmers offer about 40 kg/day/animal of green fodder with addition of wheat straw depending upon the nature of green fodder available. Fodder availability throughout the year is one of the strengths in this cluster. Calves are retained during lactation, and then the males are disposed of and females are kept as replacements. Male calves in villages are reared on a low-input system mainly on crop residues along with other livestock and are not given any concentrate feed or extra care. The network of roads and logistics of transportation are very well established. The beef producers have satisfactory access to animal markets because major cattle markets are also located in this cluster. The farmers have good access to resources and input-supplies. Government livestock departments have very well-established veterinary services network including treatment, vaccination and A.I services. However, the quality of extension services is poor, and it lack community approach. Thus, farmers are not able to maximize the productivity and profitability in the cluster.

Cluster 2. Comprising of 10% total beef produced in Sindh. The average herd size is 3-6 adult animals having 73% cattle and 27% buffalo population. The native cattle breeds are

Thari, Red Sindhi and Kankrej. Due to low beef production of animal's calves received limited amount of beef lead to daily average weight gain 60-80 gm/day. However, very well adapted in this harsh environment. Lowest-cost system farmers are heavily depending upon grazing on the natural grasses/pasture through family labor. The cost of beef production is minimum in this cluster. Animals have free access to water only 1-2 times in a day during the grazing. Animals travel a long distance for drinking water. Due to server shortage of water farmers have limited options for fodder production. Guar, millet and sorghum are the main fodders cultivated in this area. Calves rearing is one of the major strengths of this cluster. They did not offer them required amount of beef and concentrate feed to these calves. They sold these calves on urgent need of cash anytime of the year.

Cluster 3. The native cattle breed in this cluster are Dhanni, Dajal, Bhagnari, Rojhan in this cluster. Animals have poor beef production potential and due to limited share of beef calves has daily average weight gain 80-100 gm/day. However, very well adapted in that Arid environment. Low-cost system where grazing provides more than half of the feed requirement and remaining requirement is fulfilled with self-cultivated fodders. Berseem, barley, mustard, oats in winter and guar, millet, sorghum, cowpea, during the summer season are the major fodders of this cluster. Farmers usually stall feeding of green fodder, roughages and very limited use of cotton seed cake and concentrate feed only to the lactating animals. Animals have free access to water only 1-2 times in a day. This cluster is playing a major contribution to beef production for the Eid markets.

5.3.   SWOT Analysis

The SWOT analysis was carried out in focus group discussions conducted in major beef-producing areas with the consultation and participation of different stakeholders of beef sector. The results are organized around the value chain functions, including inputs, production, marketing, strengths and opportunities are coupled together and likewise weaknesses and threats are combined. The details of SWOT analysis of all these three beef clusters have been presented in (Annexure 9).

Cluster-1, large number of the farmers have better quality of animals, agriculture land is very good, green fodder available throughout the year and access to grazing resources along rivers. The network of roads and logistics of transportation are very well established. The beef producers have satisfactory access to animal markets because major cattle markets and export quality of slaughter houses are also located in this cluster. The farmers have good access to resources and input-supplies. Government livestock departments have very well-established veterinary services network including treatment, vaccination and A.I services. However, the quality of extension services is poor, and it lack community approach.

Cluster 2, lowest-cost system of beef production, green fodders are not available throughout the year, farmers have to rely only on grazing through their family labor and crop residues. Drought conditions is the serious threat in this cluster. The road infrastructure is very poor. The growth rate in calves is very poor and high mortality rate. The cost of beef production is minimum in this cluster. Calves rearing is one of the major strengths of this cluster. They did not offer them required amount of beef and concentrate

feed to these calves. They sold these calves on urgent need of cash anytime of the year. Due to the geographical location of the cluster farmers have better access to private slaughter houses near Karachi port and availability of industrial waste products. Pakistan largest meat processing unit by Fauji Meat Ltd. is also closely located near this cluster.

Cluster 3, low-cost system where grazing provides more than half of the feed requirement and remaining requirement is fulfilled with self-cultivated fodders. The native cattle breed very well adapted in that Arid environment. However, the growth rate in calves is very poor and high mortality rate. Farmers usually stall feeding of green fodder, roughages and very limited use of concentrate feed to their animals. This cluster is playing a major contribution to beef production for the Eid markets. The road infrastructure is good enough and farmers have the access to big market like Bahawalpur, Lahore etc. however, the cost of the transportation is quite high. Drought conditions is the serious threat in this cluster. There is tremendous potential of beef production in this cluster.

5.4. Value Chain Analysis

In these clusters, beef value chain can be divided into three broad categories: production, processing, and marketing. Animals are being reared by the smallholder farmers throughout these clusters. Beef production is spin-off of conventional dairy farming. No special beef breed exists as such in any cluster. Majority of the farmers have adopted the traditional management and nutritional practices resulted into high calf mortality and poor growth rates that affect the entire value chain. Lack of information flow across the value chain leads to production of low-quality meat. A major chunk of livestock is wasted when young malnourished male calves are slaughtered, and their full potential is not fully exploited.

Male calves in villages are reared on a low-input system mainly on crop residues along with other livestock and are not given any concentrate feed or extra care. Farmers rear the calve having good phenotypical features and growth rate for Eid. They sell beef to meet their day to day expenditures but sells beef animals to fulfil their urgent big cash needs. Local traders understand the urgent cash needs of the farmers and deals accordingly. Trades dealing with beef animals generally avoid purchasing dairy animals. Typically, the farmer allows the trader to take the animal and trader pays back the settled amount after selling animal in the open market. A beef trader avoids investing his own money except when he has supply order of specific type of animals.

The major problem throughout the beef value chain is lack of weight-based trading of live animals. Animals are sold based on appearances and rough estimates. This leaves little or no incentives for the smallholder farmers to enhance the animal meat production and quality by adopting modern methods and rearing practices. Moreover, the small farmers are exploited by the middle-men who squeeze their margins and make money out of small farmer immediate needs. The middle-men have developed a strong relationship of trust with small farmers who willingly sell their animals to them even at rates much lower than the market ones because these middle-men meet farmers urgent cash needs.

Improper transport and mishandling of animals by middle-men affect the quality of meat produced. The animals are transported from across the country to processing plants either

in Lahore or Karachi, the transport time varies and can badly affect the health of the animals. Overloading of trucks, loading and unloading of animals more than once, lack of loading docks and maltreatment of animals during loading and unloading affect the mental and physical health of the animals which in turn affects the quality of meat produced.

Processing facilities for beef are lacking in all these clusters. The storage facilities are improper and unhygienic. However, many players from the private sector have entered the formal meat industry using modern slaughtering and processing facilities. But these are few and mostly cater to the export segment. Exports of beef from Pakistan are in carcass form and mainly to the Gulf countries. Lack of grading and standardization leads to poor marketing of beef in the international markets. Generally, good quality Pakistani beef is sold along with the low-quality beef in the international markets hurting the image and future potential of the industry. The Pakistani exporters market the premium quality beef with the low quality in the premium markets resulting in Pakistani beef ending up in lower end international markets. Moreover, since Pakistan is not an FMD free country, it cannot enter the European market. Pakistan has not been able to develop and implement meat standards, which has made it difficult for the exporters to penetrate in other international markets.

On average, the weight of carcass exported from Pakistan is 150 kgs whereas the carcasses exported from countries like Australia, Brazil and New Zealand weigh around 350 kgs. This means that about 2 animals must be slaughtered in Pakistan for every one animal slaughtered by the traditional meat exporters. There are various problems in the export of beef. Firstly, Pakistan is in the carcass market and does not export special cuts of beef. The trade of meat exporting nations like Australia is mostly in the form of cuts and not carcass. The beef exported from Pakistan is to cater the demand of Pakistani communities residing in the Gulf region who typically demand carcass of small animals with hump. The international consumers, however, do not buy beef from Pakistan as the market is an unreliable source of regular meet supply and does not meet the requirements of the premium markets. The meat industry of Pakistan is struggling to compete with major meat exporting nations despite a huge potential across the value chain. Pakistan entered the export market without comprehensively building its capacity and addressing the key challenges facing the sector. It is exporting beef to the Middle East without much value addition which results in very low margins.

5.5.   Cattle Markets

All livestock populated areas have weekly and monthly livestock markets which are regulated by local government through contractors. Market days are fixed diligently to avoid any overlap between the markets of comparable size and/or locations. Larger beef markets are scheduled for meatless days. Three to five % of the animal price is charged as a market fee from buyer for each deal. Market contractors encourage livestock transporters by offering various service and cash incentives, which are partly shared with the local traders, as well.

Typically, no weighing of animals is done at any stage of the animal life cycle and the animals are traded based on their appearances, rough estimates, and negotiated prices

between the buyers and sellers. Most of the farmers are uneducated and do not have weighing scales, so much so that even the mandis lack any sort of weighing facilities. Hence, the farmers do not know the exact weight of their animals at different stages of maturity and as a result many times the animals are sold without fully realizing the growth potential.

5.6. International Quality Standards

International quality standards are presented in Annexure 10. These include guiding principal for best farming practices; animal health (Annexure 10-A), animal nutrition (Annexure 10-B), animal welfare (Annexure 10-C), good animal environment (Annexure 10-D).

In Pakistan, these standards are rarely practiced on small farmers resulting in poor quality of beef. Lately, however, international beef processing companies are contracting with large farmers and providing them training to adopt these practices. They have set-up strict monitoring system for the implementation of these standards. However, these companies are making contract with large farmers because the cost of providing training and monitoring of small farmers for beef quality are too high. Therefore, unless some mechanism is developed to organize small farmers for the training and monitoring purposes, the small farmers will not benefit from the merging opportunities of quality beef in the domestic and international market and beef quality will largely remain poor.

6. GAPS AND CHALLENGES FACED BY CLUSTERS

Several performance gaps have been identified in the production, processing, policy and trading components of the value chain, specifically with the technology, market structure and availability of input supplies in each cluster. These include the constraints of high mortality, poor growth rate and insufficient marketing channels and cold chain for trading the beef to high end market. Following are the details of those gaps and challenges faced by these clusters:

6.1. Policy Constraints

Beef sector development has been badly hampered by the non-conducive government policies that have gradually shaken the interest of beef farmers in Pakistan. Following are the major policy issues:

6.1.1. Price capping

Beef price is being regulated by the local governments in the city's despite of the fact that there is no price control mechanism for the input's livestock farmers use. Such control is irrational and unjustified. In the absence of a demand and quality driven price mechanism, there is less focus on quality and ultimately farmers suffer by getting low price of their produce and consumer suffers because of paying high price for poor quality beef. The supply shortages and inefficient market are fundamental outcomes of such policies. Moreover, the price capping results into an economic loss to the producer while, at the same time, it triggers black market, adulteration and ultimately net economic loss for the consumers. This effectively means that price capping is leading to the decrease of total economic surplus/welfare in the country on both ends.

The price capping is being done with the purpose of helping urban consumers by supplying beef to them at a low price in their reach. However, in the end they don't benefit with this approach as urban consumers are not able to get the quality product and they are forced to pay more for the inferior quality through widely practiced adulteration, malpractices and supply shortages. At the same time, they are overcharged in the name of quality and consumers are paying high prices considering the so-called 'quality'. If prices are de-capped and consumers are made aware of the quality, the demand for the quality products will rise, leading towards short-term price increase that will attract more investments in the farming sectors and eventually rationalize the pricing in the medium to long term. Poultry sector is a very good example to study where price capping is not applicable, and the prices are determined based on demand and supply.

6.1.2. Fattening is not treated as agriculture

Agriculture sector is being provided with various supports including subsidies, reduced electricity tariffs, reduced/exempted import duties on livestock related inputs and

equipment, income tax exemption, etc. Despite of enormous contribution of livestock within the agriculture sector (58.3% of agriculture GDP), fattening is not treated as agriculture farming, hence aforementioned benefits that are provided to the agriculture sector are not applicable to the livestock sector, which is counter-productive for the beef production. This is evident by the fact that majority of raw material particularly feed items used for animal fattening (and even for dairy purposes) are subject to substantial duties and taxes which are overburdening the livestock farmers.

It is important to note that with increasing population, the landholding per family continues to be decreased and the crop production is no longer a viable and preferred source of income for the farmers. On the other hands, vast majority of the livestock farmers are landless or owns a small piece, hence dependence on livestock farming is increasing day by day. The performance of livestock sector and its increasing role within agriculture sector, despite of the discrimination, can further be enhanced once livestock farming is treated as agriculture. If livestock farming is treated as prime agriculture sub-sector, it can provide adequate employment to the rural youth as well as contribute in massive way in economic development of the country and more particularly in rural economy.

6.1.3. Standardization, compliance and traceability issues

To increase competitiveness and export potential of Pakistan's beef products in the world market, it is essential that the Federal Food Safety, Animal and Plant Health Authority bill may be converted into legislation at the earliest since the federal food control system will have a positive and speedy impact on the revision of foods laws and regulations in the provinces as well. The issue of traceability is central to the provision of safe and hygienic beef products not only in the international markets but also for the safety of domestic consumers.

6.1.4. Poor research on beef value chain

There are various veterinary facilities and associated institutions in Pakistan. However, there is complete lack of applied research on beef value chain in Pakistan. Moreover, most the research focused on the production and animal treatment aspect almost completely ignoring the preventive aspects of animal health. Recently, ACIAR has funded one project being run in close collaboration with The University of Veterinary & Animal Sciences, Lahore and The University of Melbourne, Australia. But a comprehensive domestic research system on beef to resolve the merging issues in the beef sector is lacking.

During many discussions with the stakeholders as part of this study, many participants expressed the concern on the absence of an effective body or association supporting development of the sector. They cited the example of Australia and the UK, where the government matches funds from the private sector to conduct R&D, disseminate improved practices and many other activities in support of the sector in and in benefit of all value chain participants.

6.1.5. Poor livestock services

The sole purpose of public veterinary service is to support access of animals and animal products to the regional, national and international markets with the objective to control animal diseases, minimize the risk along the food chain and maintain animal welfare (Afzal, 2009). However, the health status of the animals is not up to the international standards and Pakistan is not considered an FMD free country. The loss due to this disease is estimated to exceed US$ 692 million in terms of loss of beef production, treatment cost, body weight loss and mortality in calves. Due to which beef exports are currently limited to Gulf and to expand into markets like China, Indonesia, Malaysia and Russia, it needs an OIE endorsed FMD control programme and FMD free zone compartments. This endorsement will expand meat export market to several countries. There is a dire need to develop local production of multiple serotype FMD vaccine along with international standards with the help of private sector.

Government agencies and many NGOs that provide services to the livestock sector focus mainly on animal health treatment, vaccination and artificial insemination. Although useful, these programs do not address the whole-farm system and have major limitations including a lack of needs based applied research, poor monitoring and evaluation procedures and a low proficiency among extension workers (Abbas et al. 2009).

The government invests in infrastructure and human resources in their departments of agriculture, livestock and research institutions as a high priority. However, other equally important aspects for profitable beef farming and extension services are being neglected. There is a dire need to run a countrywide extension program including both mass awareness and 'one to one' extension processes without offering any incentives. These programs need to be tailored to meet the differing needs of farming communities across the farming regions of the country. The private sector should be encouraged to provide the quality inputs supplies and services to the farming communities.

6.1.6. Poor regulatory framework

The West Pakistan Animals Slaughter Control Act, 1963 is a federal legislation governing the regulations regarding slaughtering practises and slaughterhouses in the country. It prohibits the slaughtering of 'useful' animals and aims to regulate the slaughtering of other animals. It also imposes meat holidays on particular days, such as Tuesdays and Wednesdays, when no slaughtering of animals is to be carried out.

The suitable animal as per rules shall not be slaughtered unless first examined by an approved Veterinary Officer and would then be slaughtered within the premises of the slaughterhouse. It defines the slaughterhouse as "any building or premises used for slaughtering and approved by the local authority." The local authorities in Pakistan, such as the Tehsil Municipal Administration (TMA) or City District Governments (CDGs), have been delegated to adopt relevant regulations for the opening of slaughterhouses within their jurisdictions under the Local Government Ordinance, 2001. However, this leads to differences in enforced regulations throughout the country which subsequently causes a lack of standardization.

<u>Import Policy Order 2009</u> states that the import of live animals, including sheep, goats, cattle and buffaloes, meat, bone meal and tallow containing protein and feed ingredients are prohibited from BSE infected countries such as the UK, Ireland, Belgium, Denmark, Falkland, France, Germany, Italy, Luxembourg, Holland, Spain, Brazil, Czech Republic, Austria, Poland, Slovakia, Slovenia, USA and the Alberta Region of Canada. The ban is however, not applicable to import of feed ingredients such as growth promoters, concentrates, beef enhancers, enzymes and fish meal replacers that have originated from vegetable, poultry, mineral and sea sources from the above-mentioned BSE-infected countries.

<u>The Punjab Livestock Breeding Bill, 2014</u> to regulate the livestock breeding services in the Punjab provides for regulation of livestock breeding services, to improve genetic potential of breeds and protect indigenous breeds of livestock in the Punjab and to deal with ancillary matters. Livestock breeding services authority was established (a) to regulate provision of breeding services in accordance with the provisions of the Act (b) raise awareness regarding standards and quality of breeding services and (c) conserve and develop local genetic resources.

<u>The Punjab Animals Feed Stuff and Compound Feed act, 2016</u> is used to regulate the manufacture, storage, supply, transport for sale and marketing of feed stuff and compound feed in the Province of the Punjab; to ensure standards of production and quality of feed stuff; to check adulteration and misbranding of poultry and livestock feed stuff and compound feed ingredients; and, to deal with ancillary matters.

In the above paragraphs, there is an overview of regulatory frameworks, few of them needs upgradation however, few are only restricted for Punjab province. There is an emergent need to formulate and adopt federal level regulations regarding rearing beef animals, transportation, slaughtering, processing and retailing beef quality standards under the umbrella of one body, to be enforced by the provincial and district authorities, in ensuring the supply of safe and quality beef for the domestic and overseas consumers.

6.1.7.   Poor FMD control

Pakistan is not considered an FMD free country. The loss due to this disease is estimated to exceed US$ 692 million in terms of loss of beef production, treatment cost, body weight loss and mortality in calves. Due to which beef exports cannot enter the European market. They are currently limited to Gulf and to expand into markets like China, Indonesia, Malaysia and Russia, it needs an OIE endorsed FMD control programme and FMD free zone compartments. This endorsement will expand meat export market to a number of countries. There is a dire need to develop local production of multiple serotype FMD vaccine along with international standards with the help of private sector.

6.2.   Production Level Constraints

Cluster-level production constraints are summarized and compared in Table 11.

Table 11: Gaps and constraints at production level in various beef clusters of Pakistan

Parameter	South Easter Punjab and North Western Sindh (cluster-1)	South Western Sindh (cluster-2)	Western Punjab (cluster-3)
Genetic potential of animals (growth rate)	Good	Very poor	Poor
Calf mortality	Low	High	High
Farming practices	Poor	Poor	Poor
Availability of green fodder throughout the year	Yes	No	No
Seasonality in beef supply	Poor	High	High
Availability of concentrate feed	Yes	No	No
Quality veterinary and A.I services	Yes	No	Yes
Quality of extension services	Poor	Poor	Poor
Beef farmers entrepreneurs' organization	No	No	No

6.2.1.   Low-genetic potential of animals

There are no specific beef breeds in Pakistan and the industry sources its supply mostly from the dairy animals that are close to the end of their lactation period. Nili-Ravi and Kundi breeds are the major buffalo breeds. The cattle are being used as multiple purposes breeds for beef, beef and draught purposes. The leading dairy cattle breeds are Sahiwal, Red Sindhi, Cholistani, and Tharparkar. About 43 % of the cattle population are purebred, 13 % cross-bred and the remaining are non-descript (Khan et. al., 2008).

The selection of cattle and buffalo breeds by farmers is influenced by various factors including the availability of water, green forages, the production system and environmental conditions. The genetic potential of these native breeds of the animals is very low which mean less beef production, and poor growth rates. Artificial insemination in cattle and buffaloes can be used to improve the genetics potential of these animals. Government should device the appropriate strategies to involve the private sector to improve the genetic potential of these native breeds. Furthermore, non-descript cattle could be inseminated with well-renowned beef semen like Angus and Simmental could produce valuable animals have significantly better beef production potential. It may lead to increase the profitability of beef producer farmers. Rising international demand for beef, there is a shift towards production of quality beef animals will be the first most important step to improve the beef industry of Pakistan.

6.2.2.   High calve mortality and poor growth rates

Animals are mainly kept for dairy purposes. Female calves are relatively well-treated and well-fed as they are the future dairy replacements. On the other hand, young male calves are neglected, and their nutritional requirements are not fully met. Male calves are only kept

with their mothers for letdown of beef and they get only residual feeding or very little nutrition resulted into high calve mortality of more than 20% in field conditions of Pakistan. Average weight gain is 50-150 gm/day. The problem is further exacerbated with male calves in commercial enterprises across Pakistan, as the market for a weaned male buffalo is usually less than half the beef feeding cost to weaning. This leads to many male animals being sold on the day of birth, and majority of them being slaughtered when these are just 5-15 days old. Slaughter of male calves has huge impacts in terms of losing the genetic potential and economic losses to livestock farmers across the country.

6.2.3. Management practices and animal feeding

Beside genetic potential, animals are kept under the traditional system where they are tied-up and have limited access to clean water and feed round the clock. In field conditions, due to these factors buffalo exhibit many issues including delayed onset of puberty, poor estrus expression, longer postpartum ovarian quiescence, and most importantly lowered conception rates particularly when bred artificially. Higher fertility could be achieved through better feeding and management practices.

Adequate and balanced feed is probably the most neglected area in Pakistan. Both quality and quantity of the feed and fodder are important for getting optimum growth rates in beef animals, but little attention is paid on the issue by farmers, researchers, and development workers.

General feeding practice by smallholder producers is offering animals with seasonal fodder and concentrate consisting of soaked cottonseed cakes and wheat bran mixed with wheat straw. This does not offer a balanced nutrient supply to the beef animals and thus the animal is not able to yield growth rate according to its genetic potential.

6.2.4. Fodder production and preservation

Fodder is the cheapest source of nutrients for animals. Five commonly used fodders in the country are oats and berseem in winter and maize, sorghum and millet in summer. Berseem is rich in protein but low in energy, while all other fodders are deficient in proteins but are good source of energy. Thus, concentrate feed formulation are complemented to meet the nutrient deficiency from various fodders. Nutrient availability also depends upon the stage of growth of the fodder. Generally, most fodders have higher protein contents in early stage of their life and the contents of indigestible nutrients increase as the plant matures. Furthermore, minerals are given to beef animals for optimum productive performance. This are normally done either by offering mineral mixture daily in the concentrate ration or by placing the mineral blocks in mangers for the animals to lick at their will.

Good quality fodder in enough quantity is usually available to the beef animals in smallholders set up for about 4 months in a year i.e. mid-February to mid-April and then July-August. For the rest of the year, either quantity or quality become an issue. The fodder deficiency becomes particularly acute in May-June and November- December. This situation is compounded by the cut and carry system of fodder smallholders normally

follow. The situation could be improved significantly following silage and hay making techniques.

6.2.5. Seasonality

Beef production in Pakistan is affected by seasonal fluctuations that are at relative odds with each other. Growth rate is associated with the availability of green fodder and is at its maximum between February and April, hitting a low from May to August. The beef production has been badly hampered by the extreme weather particularly in hot summer.

6.2.6. Beef farmer's entrepreneurs' organizations

Smallholder beef producers having small number of calves to sell are not able to bargain for the fair price with middle-men. Similarly, bringing technical and behavioral changes in the large population of smallholders is a major challenge for any government and non-government organization. The evidence has shown that organizing smallholders beef producers into groups or associations can bring many advantages to them and effectively improve the transfer of technical knowledge and skills. Moreover, producers' organizations as a group can assure the beef quality to processor thus make them equally attractive for the processors as large farmers by reducing the monitoring and training costs of the processors on small farmers. No such organization of small-scale beef farmers exists in the country, nor government has ever attempted to organize them in such groups. There is no program where smallholder beef farmers can directly get the benefit of training, information dissemination and sharing their resources opportunities.

6.3. Beef Value Chain Level Issues

Cluster-level value chain constraints are summarized and compared in Table 12.

6.3.1. Market exploitation

Beef value chains originate from small producers and pass through 2 or 3 middle-men, livestock market and get to the end market actors. Small farmer sells beef animals to fulfil his immediate big cash needs. Trades dealing with beef animals generally avoid purchasing dairy animals. Typically, the farmer allows the trader to take the animal and trader pays back the settled amount after selling animal in the open market. A beef trader avoids investing his own money except when he must supply order of specific type of animals. These middle-men not passing on gains when prices are seasonally high in response to lower supply. Due to small number of calves, limited market opportunities, high animal transportation expenditures, limited knowledge about the market provided the opportunity to middle-men to exploit the small beef producers.

Table 12: Gaps and constraints at value chain level in various beef clusters of Pakistan

Parameter	Cluster-1	Cluster-2)	Cluster-3
Weight basis trading	No	No	No
Big cattle markets	Yes	No	No
Export quality slaughter houses	Yes	No	No
Financial services	Not-Available	Not-available	Not-available
Traders' association	No	No	No
Beef quality parameters	No	No	No
Training opportunities	No	No	No
Animal transportation facilities	Poor	Poor	Poor
Value chain infrastructure	Poor	Poor	Poor
Access to input supplies	Good	Poor	Fair
Road infrastructure	Good	Poor	Good

6.3.2. Lack of weight-based trading

The major problem throughout the beef value chain is lack of weight-based trading of live animals and negotiated prices between the buyers and sellers. Animals are sold based on appearances and rough estimates. This leaves little or no incentives for the smallholder farmers to enhance the animal meat production and quality by adopting modern methods and rearing practices. Most of the farmers are uneducated and do not have weighing scales, even the mandis lack any sort of weighing facilities. Hence, the farmers do not know the exact weight of their animals at different stages of maturity and as a result many times the animals are sold without fully realizing the growth potential.

Animals from the regional mandis are transported to big cities. Recently, the exporters have started approaching the regional mandis for direct buying of animals. However, there is no culture of weighing of animals even at regional mandis. The animals are typically transferred from the mandi to the exporter fattening farm or slaughterhouses by agents generally in stressful conditions.

6.3.3. Lack of financial services

Selling of beef animals is the only regular way of cash for the smallholder farmers in case of emergency. In the absence of financial services, such as insurance and credit, they do not have a financial recourse in times of emergency, such as livestock disease or mortality. Similarly, smallholders do not have ready access to credit that enables them to improve their bargaining power in marketing.

6.3.4. Marketing constraints

The specific constraints are discussed in the following section and summarized and compared across cluster in the Table 13.

Table 13: Gaps and constraints at marketing level in various beef clusters of Pakistan

Parameter	Cluster-1	Cluster-2)	Cluster-3
Beef quality parameters	No	No	No
Consumer awareness regarding beef quality	Poor	Poor	Poor
Cold chain	No	No	No
Regulations	No	No	No
Financial services	Not-Available	Not-available	Not-available
Marketing chain infrastructure	Poor	Poor	Poor
Training opportunities	No	No	No
Information flow from consumer to producer	No	No	No

6.3.5. Disconnect between consumers and producers

The major problem with marketing is that farmers do not have direct contact with consumers thus do not know what the consumers' demand is and what they consider as quality. This lack of information about market is being exploited by various value chain actors.

6.3.6. Lack of consumer awareness

Lack of awareness amongst domestic consumers on the traceability of beef products results in weak beef bio-security in the country, thus lacking the subsequent demand for the safe and traceable beef (and other food products) which otherwise would have created an environment for a strong demand for bio-safe beef in the country.

6.3.7. Processing level constraints

Cluster-level value chain constraints are summarized and compared in Table 14.

Table 14: Gaps and constraints at processing level in various beef clusters of Pakistan

Parameter	Cluster-1	Cluster-2	Cluster-3
Access to private slaughter houses for export	Limited	Limited	Limited
Cold chain	No	No	No
Regulations	No	No	No
Availability of credit	Not-Available	Not-available	Not-available
Processing training opportunities	No	No	No
Beef quality parameters	No	No	No
Traders' association	No	No	No

6.3.8. Limited beef value addition facilities

Pakistan is in the carcass market and does not export special cuts of beef. Very limited beef value addition facilities are available in the country. In the international markets, there is ever increasing demand of beef value addition products which are sold at high prices. As beef cattle are raised by smallholders mainly in rural settings, small scale processing infrastructure at village level is missing which can collect several beef cattle from smallholders and process the beef for high-end market.

6.3.9. Limited access to global markets

There is no mechanism in the country to collect and disseminate information regarding the changing beef quality parameters and transformation of beef value chain in key potential international beef markets relevant for Pakistan. Moreover, Pakistan beef exports is limited to six countries in the GCC and Iran. Likewise, the excessive concentration in exporting carcasses only provides access to certain types of intermediaries in the country of destination, which in most cases are traders who may not be provide valuable feedback for product improvement.

6.3.10. Lack of processing skills

Lack of worker's skills is a constraint to produce valuable quality cuts for current and future markets. Abattoirs workers, supervisors needed to comprehend basic concept of meat hygiene and best practices of meat technology are not easily available.

6.3.11. Halal beef and traceability

As noted earlier, there is huge halal food markets among the Muslim population spread all over the world. While Halal certification is essential for the high-end markets of East Asia and North Africa. Recently, Punjab Halal Development Agency (PHDA), owned by Government of Punjab, is a Halal development and certification body accredit by Pakistan National Accreditation Council (PNAC.

Development of feedlot farming can play an important role in documentation and traceability of beef. Typical slaughtering of animals yielding 45% of meat and 40% by-products such as blood, casings, leather and tallow, and the remaining 15% is wastage. Halal processed-food, personal and health care products are a new attraction for customers of Muslim countries as demand for Halal cosmetics and drugs is on rise and becoming critical all over the world. Gelatin is used in yogurt, ice cream, candies, shampoos and tallow are an ingredient of soaps and body lotions. Consumers are showing their concern about the origin of these ingredients. There must be a cold chain facility at abattoir for the Halal raw by-products such as tallow and gelatin storage, before using them into an economic value Halal and Hygienic products. Development of Halal by-products and their marketing can substantially enhance the value of a carcass. Effective regulatory body can enforce the hygienic standards to assure Halal raw by-products of animal slaughtering in order to provide Halal products of high quality and value to the customers. Halal accreditations of by products will enhance margins of abattoir and exporters.

7. CLUSTER DEVELOPMENT POTENTIAL

7.1. Overview

In this section an attempt has been made to evaluate the potential gaps in terms of production, quality and market side of beef value chain, and quantify the potential for incremental improvements in the cluster performance. Both quantitative and qualitative analyses are presented to explain the nature of active, dormant and inactive segments of the beef value chains in theses main clusters.

7.2. Reduced Mortality Rate in Calves

Presently, average calf mortality is more than 20% in field conditions of Pakistan. After the discussion with stakeholders, it was agreed that the mortality rate can easily be reduced to 5% in each of the three clusters and estimated gap of the number of the animals have been shown in (Figure 6). Colostrum feeding, improved husbandry practices, vaccination and adopting improved feeding practices during pre-weaning stage of calves could easily reduce the calve mortality from 20% to 5% in the field conditions of Pakistan.

7.3. Improved Growth Rate

In the field condition, average weight gain of calve is about 100-150 gm/day. There are many evidences from scientific literature that by providing them balanced nutrition high growth rate (840 and 970 gm/day) were achieved (Pasha, 1987), whereas another study found the daily growth rate of (780 to 1010 gm/day) in calves (Jabbar et al., 1993). Yearling male calves from Sahiwal and (Friesian x Sahiwal) crossbreds having initial body weight of 180 kg, grew at a rate of (940 and 970 gm/day) respectively (Asrar, 1986). Basra, (1992) reported that crossbred (839-869 gm/day) calves perform better than Sahiwal (795-805 gm/day) than buffalo (751-781 gm/day) calves when grown on similar fattening diet in a trial.

The weight of carcass exported from Pakistan is 150 kg whereas the carcasses exported from countries like Australia, Brazil and New Zealand weigh around 350 kgs. This means that at least 2 animals are being slaughtered by the traditional meat exporters in Pakistan for every animal slaughtered by international exporters. So, there is a quite big gap between global and Pakistan carcass beef yields. Our discussion with stakeholders suggests that yield current weight gain from 150 kg can easily and conservatively be improved to 300 kg in one year if farmers adopt appropriate feeding and animal caring management practices. Achieving the gap is also quite possible because progressive farmers in the vicinity are achieving much higher yield than the world standard carcass weight.

There is tremendous potential to manifold the beef production, additional value of export, employment opportunities, farm profitability and big economic change at national level.
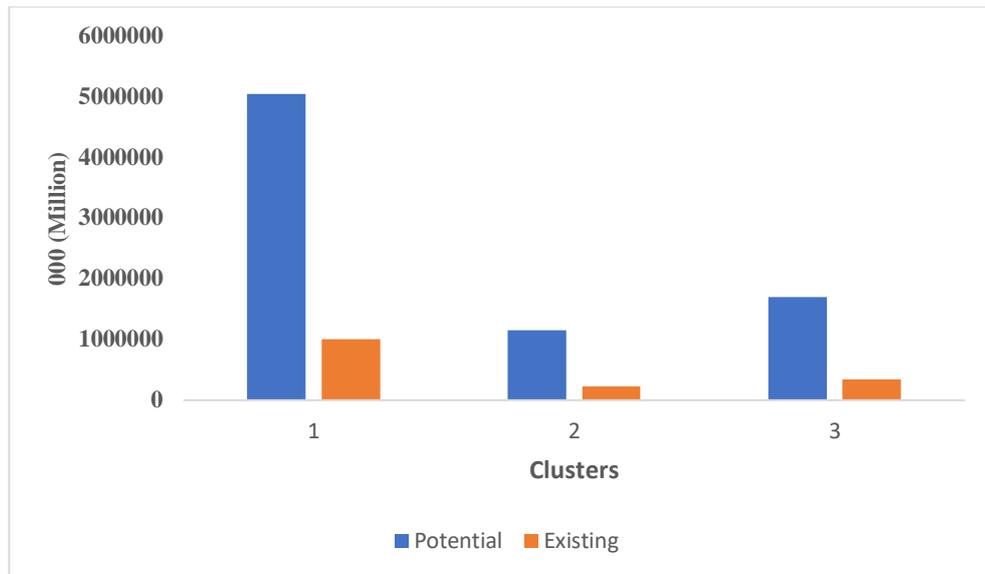
Figure 6: Estimated calves saved from mortality in each beef clusters

7.4. Demand Potential

As suggested by our macro analysis situation in Section 1 and the beef demand potential estimated by the FAS/USDA study, the demand for beef in the domestic and international markets will remain high and it will grow at substantially high rate. According to the latest FAO report, global meat consumption is projected to increase 73 % by 2050. In Pakistan, the high growth in beef demand has put pressure on its prices thus beef is one of the highest food-price increasing commodity in the country. Therefore, additional supplies of beef by harnessing the potential in beef sector as indicated above can be absorbed in domestic as well as international market. However, to contribute in international market, Pakistan has to improve the beef value chain and enhance the beef quality according to match it with international standards.

7.5. Improvement in Value Chain

If the issues of the value chain, as discussed in the previous section, are addressed it can resolve the issue of lower prices in international market than the world average and meet the increasing demand of the quality special-cut beef in urban market thus fetch higher prices in the domestic market. It will improve the beef exportability thus can also help to improve export-production ratio. It is expected that the strategies suggested in the next section to improve beef value chain will improve the overall efficiency of the entire value chain. Technologies are available to improve the value chain of beef which will be discussed in the strategies section.

7.6. Control of FMD

Food and Agriculture Organization of the United Nations has been working for the control of FMD in Pakistan since, 2008. On FAO-OIE FMD Progressive Control Pathway (FMD-PCP), Pakistan has moved from stage 0 to stage 1 in 2009 and to stage 2 in 2015. Recently, FAO and Ministry of National Food Security and Research, Pakistan has signed a US$ 6.6 million project agreement in Islamabad titled "Risk-based control of Foot and Mouth Disease in Pakistan".

Hopefully, this project will move Pakistan to stage 3, opening-up further international markets for the export of beef and other livestock products. FAO will implement this project over the next 6 years to help control FMD in Pakistan. The project will address the FMD laboratory diagnosis, outbreak investigation and speedy response, delivering high-quality vaccines for prevention, refining legal framework, and capacity building of the stakeholders.

8. UPGRADATION PLAN, POLICIES AND STRATEGIES

In order to enhance competitiveness of these clusters, it is imperative to take a developmental approach to enhance the productivity and quality. It is foreseen that the beef industry can only be developed through organizing the large majority of smallholder beef producers into 'Farmers Entrepreneur Groups (FEGs), which has gained much success in many developing countries. The government will incentivize the establishment of value chain and processing infrastructure, and implement policies favourable for the development of beef sector in Pakistan. In the following sections, a plan is laid out with fixed targets, and policies and strategies are elaborated to achieve these targets.

8.1. Plan

Looking at the constraints and potential of the beef sector discussed above, following targets are fixed for a five-year development plan (Table 15).

Table 15: Targets of beef clusters plan

Sr. No.	Targets
1.	Reduce average calf mortality from 20% to 5%.
2.	Increase average daily growth rate of beef animals from the present average rate of 192 gm/day to 500 gm/day.
3.	The export production ratio of beef and various beef cuts will be increased from 0.1% to 10% during the next five years.
4.	Improve the quality of beef for export so that it fetches the price equal to the world average export price and enhance the quality of 10% of the beef destined in local market to the export standard.

8.2. Policy Reforms

The **first** policy support needed from government is to withdraw their support from fixing and controlling the beef prices in the retail shops (this is not however applicable to superstores or elite meat shops). The intention behind price fixing is mainly to keep beef affordable to the local consumers. The same however can be achieved in a more effective and sustainable manner by introduction modern technologies in production and processing and opening competition in both the informal and formal sectors. The adoption of modern technologies will be encouraged if farmers get fair price of their produce. This will also have the impact on the production, marketing and processing efficiencies by encouraging competition in the market.

Second policy shift needed is to transform the prices setting of animals just on visual basis to live weight basis. Such a pricing mechanism ensures that farmers and livestock producers get the optimum price based upon the animal's actual weight. Currently, producers are unable to receive premium prices for their animals due to poor marketing structure and the exploitative role of middlemen in the selling of these animals.

Third policy is related to revamping food safety regime in the country. It is proposed that international accreditation of food testing laboratories should be undertaken at the federal level and capacity building & enhancement of the food inspection services be carried out under NAPHIS. The pure food ordinance should be amended in view of the codex standards to include 400 new food items including dairy products in addition to the existing 105 items currently being covered by the legislation. The food testing laboratories working under the PSQCA and provincial governments should be upgraded to enhance their capacity for microbiological analysis. Currently there are no laws governing and regulating sale of beef produced in unorganized sector in the domestic market. The regulations should include a mechanism to ensure enforcement of quality standards with the provision of applying prohibitive penalties (civil and criminal) by the local authorities. The truth-in-label monitoring system should be introduced and implemented for this purpose.

Fourth policy shift is to consider fattening as agriculture activity and supplying associated benefits in loaning and subsidies on inputs like electricity, water and machinery. Currently, majority of raw material particularly in feed items and machinery/equipment for hay/silage making used for animal fattening are subject to substantial duties and taxes which are overburdening the livestock farmers.

Fifth policy is the government makes a commitment to strengthen the beef research and extension activities. Mainly research is focused on animal diseases ignoring the preventive issues. Moreover, value chain issues are ignored. Capacity is a serious issue in beef research and extension.

8.3. Strengthening Research and Extension on Beef Value Chain

A National Beef Research and Development Centre (NBRDC) will be established to work on the value chain issues of beef and the promotion of young stock to be rare for beef purpose. The Centre will be an autonomous body to be run by the Board of Directors taken from the stakeholders' group along the whole value chain. The Board will arrange resources for the Centre from public and private resources and fix its research agenda with time bound targets.

The Centre will work on the farm management components and evaluate how they interact within the whole-farming system and value chain to determine how they impact production efficiency and overall farm profitability. The research will be carried out on the beef enterprises using a value-chain approach which considers both the efficiency on-farm and the markets they supply. The focus will be on how smallholder farming families (with fewer than 6 young stocks for beef purpose) can improve the profitability of their farming enterprises. Assessing the trade-offs between the familiar beef enterprise and new

opportunities in beef market will be a key research outcome of this work. Understanding these trade-offs around household labour, feed resources and how farming decisions are made at the household level will be an important step in determining the long-term viability of these two enterprises and the impact they have on livelihoods. Undertaking the value chain of beef production, marketing, and processing will identify opportunities that can be exploited to target different market segments. The outcomes of this research can be used to develop and strengthen farm extension material and decision support tools available to farming families.

There is also a need to establish an education and training programs for meat workers along the lines of the Mantric system developed for Australia's meat industry through meat and livestock Australia (www.mintrac.com.au) include subjects on meat science and production in every veterinary and agricultural science curriculum within universities and veterinary assistant training colleges. The National Research Development Corporation (NRDC) can support the emergence of such a body, whether it is composed of only private members or it could be a public-private body. If effective, this body could be a good interface with the government to improve regulations and negotiate freight space with the airlines and consolidate cargo, work to improve Pakistan's perception in export markets and support Halal branding, among many other worthy activities.

The public sector will develop training brochures on the solution for major beef value chain problems, and arrange specialized extension programs by engaging the private sector to train stakeholders along the value chain using these brochures. The training program will be initiated on the request of FEGs and cost of the training may be shared by the government and FEGs.

The NBRDC will also maintain the e-commerce portal which contains information and training materials on beef production, supply, price, production costs, quality requirements, beef related regulations and emerging technologies in the production, processing, packaging, transportation of beef in major beef producing markets related to Pakistan.

8.4.   F&MD Control Program

Massive vaccination involving 100% animal population including cattle, buffalo, sheep, goats and wild ruminants is suggested to minimize the risk of FMD spread from unvaccinated animals. Trivalent vaccines incorporating matching strains within serotypes O, A and Asia-1, as recommended by FAO. Progressive control of FMD in Pakistan should be used and be complemented with livestock movement control for the control of the disease. There is a dire need to develop local production of multiple serotype FMD vaccine along with international standards. The imported vaccine is out of the reach for the smallholder farmers. The vaccine production should be shifted in the private sector, while the public sector should provide the basic material and protocols developed through research for the local condition. The approval mechanism of vaccine should follow the international standards.

8.5. Organize Farmers' Entrepreneur Groups

Establishment of Farmers' Entrepreneur or Entrepreneur Groups (FEGs) has a very important role in the economic development in the beef clusters. It provides economies of scale in business operations thereby attracting efficient service providers for raw materials, transport, marketing etc. It also facilitates provision of infrastructure, training facilities, information, technology and human resources. Interaction among the members of a cluster encourages innovation and competition leading to quicker responses to market requirements. Their ability to take risks collectively is also enhanced. Increase in productivity leads to more efficient and economical use of resources.

The major constraint facing smallholder livestock producers wishing to participate in high-end value chains is accumulating enough volume of product. To overcome these constraints, the formation of a cohort of small farm entrepreneur groups consisting of members who are willing to make investments, have similar interests, values and vision for their farming enterprises.

The members of this farm entrepreneur group will be any farmer who is willing to participate and share resources for the development program of the government with substantial incentives for training, establishment of value chain and processing infrastructure, and group marketing. A capacity building program will be undertaken with farm entrepreneur groups covering topics like agribusiness management and farm financial analysis to give them a better understanding of the value chain(s). This will provide them the necessary skills needed to engage with value-chain personnel to help improve the overall value of their farm produce. The FEGs will be supported in building value-chain infrastructure, such as small-scale slaughter houses, calf fattening unit, village level feed mills, etc. on sharing basis with 20% share by the government and interest free loans. The government will initially provide trained manager to run these infrastructures, but the manager will be controlled by the FEGs.

The aims of FEGs are to achieve economic and social benefits from the improved value-chain approach. One of the major constraints facing smallholder livestock producers wishing to participate in high-value chains is accumulating enough volume of product. To formulation of FEGs will overcome this problem. The group will watch each other to follow the good agriculture practices to produce quality beef. They will negotiate with the traders and processors for contract farming to supply beef at predetermined quality and price. This approach will allow an organic group system to develop where plans, ideas and financial success can be shared. The FEG are expected to initially consist of 40-50 members and will provide a platform for planning and implementing value chain interventions through common resources with some support from the government.

8.6. Improved Extension and Veterinary Services

It is strongly recommended that extension and veterinary services should be provided by the private sector through FEGs with the financial and technical support from the provincial livestock departments. The veterinary institutes located in these clusters could play a major role for the capacity building of staff and research backup. The NOGs like NRSP, RDF, MDF can also be engaged to get farmers organized and provide capacity building training. The extension material developed by the ASLP dairy project could be effectively utilized which is available in both Urdu and Sindhi languages. The estimated monthly cost of extension and veterinary services will be Rs. 192/family (Annexure 11-A) and Rs. 73/family (Annexure 11-B) respectively.

8.7. Inputs and Support Services

It is recommended that quality input and support services should be provided by the private sector to these clusters. The private sector has started to invest in providing inputs such as concentrated feed, forage production and handling, veterinary support, and AI, the coverage of these services is often limited to peri-urban, market-oriented farmers. This low coverage is due to fragmented rural production systems, low levels of education among rural farmers and costs that are too high for many smallholders. Therefore, processors can also provide all the quality inputs to the producers and the cost of these inputs could be adjusted in animal sale.

8.8. Financial Services-Financing

Lack of physical assets serve as collateral restrictions on farmers' access to formal credit. In order to get the financial support, there is need to engage the entire value chain to invest in the long-term success of farmers. Bank, NGOs working in that area like NRSP, RDF, MDF can play an essential role within the value chain by providing loans for improved beef production and facilitating more efficient buying and selling relationships. Communities can also collaborate with the main stakeholders in each value chain, including input suppliers, extension service providers and output market buyers, to ensure that each component of the value chain is functioning properly.

8.9. Establishment of Feedlot Farms by FEGs

Feedlot farms are animal feeding operation which is used in intensive animal rearing for finishing beef animals according to the specification of market, prior to slaughter. The calves, preferably males, 6-8 months of age are fed on concentrated feed and green fodder. Balanced feed is given to calves for a period of two to three months to get higher weight gain. Live weight of these calves is between 80-100 kg. If these calves are fed properly on the formulated fattening feed, their weight can be raised up to 200-240 kg during the fattening period. The daily weight gain of fattened calves varies between 400-600 gm/day depending on the quality of feed given to them.

In beef clusters indicated in present study, FEGs (group of market oriented 15-20 farmers) will establish feedlot farms. The members of FEG will utilize their own herd and purchase the animals from other sources like neighbouring, villages, cattle markets. Facilitating contractual farming with feedlots is a promising activity that could improve the reliability and traceability of meat supply while improving its quality. FEGs will supply the beef animals in large qualities to slaughter house, traders and FEGs can ensure the quality through self-monitoring with each other.

FEG will modify their existing farms into feedlot farms where improved husbandry and feeding practices will be provided to the animals to achieve the optimum growth rate in beef animals. All the technical assistance will be provided by the private sector/processors and government agencies to these feedlot farms. These feedlots farms will also adopt all the standards practices regarding the disease control, traceability and meat quality. These feedlot farms of FEGs will be able to provide the beef animals on sustainable basis to the processors to cater the domestic and export demand. Government will support the establishment of small-scale feed mills on cost sharing basis (with 50% share of the cost from government) in each FEGs to solve the availability of concentrate feed issue at the village level.

Development of feedlot farming through FEGs can also play an important role in documentation and traceability of beef. Typical slaughtering of animals yields 45% of meat and 40% comprising by-products such as blood, casings, leather and tallow and the remaining 15% is wastage. Halal accreditations of by products will enhance margins of abattoir and exporters. The complete feasibility study of fattening has been presented in Annexure 12.

8.10. Upgradation of cattle markets

Mostly livestock populated areas have weekly and monthly livestock markets which are regulated by local government through contractors. Market days are fixed diligently to avoid any overlap between the markets of comparable size and/or locations. Larger beef markets are scheduled for meatless days. Three to five % of the animal price is charged as a market fee from buyer for each deal. Market contractors encourage livestock transporters by offering various service and cash incentives, which are partly shared with the local traders, as well.

Typically, no weighing of animals is done at any stage of the animal life cycle and the animals are traded based on their appearances, rough estimates, and negotiated prices between the buyers and sellers. Most of the farmers are uneducated and do not have weighing scales, so much so that even the mandis lack any sort of weighing facilities. Hence, the farmers do not know the exact weight of their animals at different stages of maturity and as a result many times the animals are sold without fully realizing the growth potential. Secondly, most of these cattle markets have lack of the water availability, green fodder, access to shed and quarantine measures. Due to these factors animals are in stress resulted into loss of weight and badly effect on the quality of meat. The cattle markets in these clusters will be up-graded and basic facilities will be provided that will lead

to increase the profit to the smallholder farmers by measuring accurate weight of their animals and the quality of meat.

8.11. Meat Value Addition and Human Resource Development in Processing

There is need to establish village level slaughter house in Southern Western Sindh and Western Punjab clusters identified in this study. The complete feasibility study of small beef slaughterhouse has been presented in Annexure 13.

Lack of skill in meat processing is the main reason for not exporting boneless and other cuts. Inadequate design and use of existing infrastructure in abattoirs are another reason for inability to develop further cuts out of carcass and maintain cold chains. There is not a single institute in the country where applied beef value addition research/trainings are being conducted. In the traditional meat sector, butchery skills have been based on the family experience in which animals were slaughtered early in the morning and meat has been sold in next 5 to 7 hours; a time in which the meat quality does not deteriorate significantly. After slaughtering meat has a definite age unless it is processed efficiently; there is a chance that it may lose its quality moreover, as we develop further cuts more efficient abattoir and skilled workers and managers are needed. Short courses and meat technology diploma and/or degrees can be conducted through institutional collaboration with modern abattoirs (demo center) to train workers and professionals in the areas of; i) pre-slaughter handling of animals; ii) meat inspection; for food safety of meat products, ii) abattoir's technical operations, iii) development of meat cuts and various products and iv) good hygiene practices and sanitary control of meat can ensure a significant increment in both local beef consumption and its exports.

8.12. Revamping Food Safety Regime

It is proposed that international accreditation of food testing laboratories should be undertaken at the federal level and capacity building & enhancement of the food inspection services be carried out under NAPHIS. The pure food ordinance should be amended in view of the codex standards to include 400 new food items including dairy products in addition to the existing 105 items currently being covered by the legislation.

The food testing laboratories working under the Pakistan Standards and Quality Control Authority (PSQCA) and provincial governments should be upgraded to enhance their capacity for microbiological analysis. Currently there are no laws governing and regulating sale of beef produced in unorganized sector in the domestic market. The producers need to be incentivized through this cluster approach to produce better quality meat. The regulations should include a mechanism to ensure enforcement of quality standards with the provision of applying prohibitive penalties (civil and criminal) by the local authorities.

8.13. Establishment of advisory platform and e-commerce platform

Development of advisory council/platform stimulating regular meetings between stakeholders including representatives of farmers' organizations, traders, processors, input-suppliers, academic institutions, livestock department and policy makers could play an important role to run these clusters efficiently. It is suggested that NBRDC and veterinary institutes in each of the cluster could play a major role to establish and coordination of these advisory platforms.

An e-commerce portal will be established where all the information related to beef supply, demand, prices, quality requirements, production costs, beef related regulations, emerging technologies in beef production, processing, packaging, and logistics in major beef markets related to Pakistan will be placed and regularly updated.

8.14. Interventions in the clusters

Table 16: Key interventions in clusters

Targets	Interventions	Implementing agency
Reduce the calve mortality from 20% to < 5%	It will be achieved through the execution of improved extension and veterinary services to the farmers. Extension modules on whole farming system will be delivered on regular basis resulted into improved overall efficiency of the farms. In these extension trainings farmers will be educated to reduce the calve mortality within the resources of farmers	Private sector and provincial livestock departments
Improve calve growth rate	Average growth rate 200gm/day in calves will be improved to 500gm/day in next five years through adopting better feeding, husbandry and improved genetic management practices	Private sector and provincial livestock departments
Increase export production ratio	Feedlot farm clusters will be established to produce the quality beef animals by adopting all the standards practices regarding the disease control, traceability and meat quality	FEGs and private sector
Improve human resource development in beef processing	Small village level abattoir will be established with the support of government and private sector. The capacity building of human resource in these slaughter houses will be carried out to process meat in boneless and other cuts so we can start exporting the beef cuts and earn more profit	UVAS, SAU, NBRDC, and meat exporter association
Up-gradation of cattle markets	The cattle markets will be up-graded and basic facilities (animal weight, sheds, proper loading and unloading place, availability of water, green fodder etc.) will be provided that will lead to increase the profit to the smallholder farmers by measuring accurate weight of their animals and reduce the stress of animals	Local governments

Establishment of meat research center	State of the art meat research center in cluster-1. It will conduct the applied research (1) beef value chain (2) beef value added products to enhance export (3) exploring trading/ marketing opportunities for beef nationally and internationally	NBRDC, UVAS
Establishment of advisory platform and e-commerce portal	Development of advisory council/platform stimulating regular meetings between stakeholders including representatives of farmers organizations, traders, processors, input-suppliers, academic institutions, livestock department and policy makers could play an important role to run the matter of this cluster efficiently	NBRDC, UVAS, SAU and meat exporter association
Provision of quality input supplies	Provision of quality input supplies like concentrate feed, semen, vaccine, medicines, silage, hay etc. will be provided through the private sector	Private sector
Establish market linkages and Halal branding	Establish the market link with new customers markets in the GCC and East Asia. Support could be provided to attend trade missions and promote the Halal element of Pakistan beef. The project could employ a marketing consultant to set up meetings with more sophisticated buyers that can in turn provide valuable feedback to Pakistan exporters	NBRDC, LUMS, IBT, UVAS SAU, meat exporter association and private sector

9. BENEFITS AND COSTS OF CLUSTER DEVELOPMENT

Interventions are being proposed to reduce calf mortality, increase beef yield by promoting calf fattening, increasing beef exports, improving beef export price and producing value added beef cuts for high-end domestic market. These interventions will increase the overall value of the produce for the farmers and for other sector stakeholders. Cost and benefit analysis have been completed separately for each of the three clusters.

The economic and financial analysis of beef clusters has been carried out by identifying the benefits of the proposed interventions and their associated costs. Cost and benefit analysis have been completed in a six-year timeframe; separately for each of the three clusters. Discounted cash flow analysis has been carried out to work out the economic viability of the proposed interventions in terms of NPV and IRR.

9.1. Interventions and Key Benefits and Costs

Following key interventions have been proposed for transformation of Beef sector of Pakistan.

i) Introduction of Improved Management to Reduction Calf Mortality
ii) Introduction of Modern Calf Fattening Practices
iii) Improvement in beef export value chain infrastructure
   These interventions will have following advantages:
   a. Increase in export of carcasses (chilled meat)
   b. Improvement in price export prices
   c. Improvement in the beef value in high end domestic market

The expected benefits by implementing the proposed interventions have been based on certain assumptions which have been decided in discussion with beef sector experts. Expected benefits have been calculated with reference to the baseline situation of each of the three clusters. Based on those assumptions, the value addition by implementing these interventions has been calculated in a six-year timeframe.

The resources required for the implementation of the proposed interventions package includes (i) additional operational costs of improved beef production, value chain development, and processing, and (ii) sector development investments like R&D by the government, (iii) fixed capital investment in machinery, etc. by government and private sector. The whole analysis has been based on incremental costs and benefits of the proposed interventions.

9.2. Beef cluster-1

9.2.1. Current situation

The focal point in beef cluster-1 has a total 1,451,106 buffaloes and cows older than three years. Of these, 403,407 animals are available for slaughtering which can produce 32,908 tonnes of beef at the default beef yield of 192.5 gm per animal per day. The cluster's current production performance has been shown in (Table 17). Low beef yield in cluster-1 can be attributed to lack of modern cattle farming practices which have been discussed in previous chapters.

Table 17: Current beef production in cluster-1

Current situation	
Number of cows and buffaloes older than three years	1,451,106
Total number of animals for slaughter in cluster's focal point (no.)	403,407
Growth rate of no. of animals for slaughter	4.35%
Total beef production (ton)	32,908
Default beef yield per animal per day (gm)	192.5
Annual growth rate without intervention	0.49%
Wholesale price (US$/tonne)	2,785

Beef production and its value at the current wholesale price in the next five years in a no-intervention scenario is shown in 18).

Table 18: Beef production without intervention scenario in cluster-1

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Default yield (gram/animal/day)		192.49	193.44	194.38	195.34	196.29
Annual expected production without intervention (Tonnes)		29,721	31,166	32,681	34,270	35,936
Total value of production at farm gate (000 USD)		82779.2	86803.4	91023.2	95448.1	100088.1

9.2.2. Proposed interventions and key benefits

9.2.2.1. *Intervention 1-Introduction of Improved Management to Reduce Calf Mortality*

High calf mortality is a major reason of low performance of the local beef sector. Improved cattle farming and management practices and R&D in beef cluster will lead to reduction in calf mortality. This will be achieved by execution of improved extension and veterinary services to the farmers. Extension modules on whole farming system will be delivered on regular basis that will lead to reducing the calf mortality to 5% from the existing value of 20% over a period of six years. However, it is assumed that cattle farmers will gradually

adopt new practices; and thus, this reduction will be achieved at a rate of 3.75% per year starting from the second year. Based on these assumptions, the value of increased beef production at the existing wholesale rate of US$ 2,785 per tonne is shown in (**Error! R eference source not found.**19).

Table 19: Increased beef value by reduction in calf mortality in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
Calf mortality after intervention (%)	3.75%	7.50%	11.25%	15.00%	15.00%
Number of calves born every year (44.5% of total population)	703,144	733,730	765,648	798,953	833,708
Number of calves saved every year	26,368	55,030	86,135	119,843	125,056
Expected gain in weight of saved calves (ton)	2,950	6,139	9,578	13,285	13,819
Expected additional value from reduction of losses at farm gate price (000 US$)	8217.6	17097.0	26677.7	37001.0	38488.2

9.2.2.2. Intervention 2 – Introduction of Modern Calf Fattening Practices

Improved beef fattening practices will be adopted to increase the beef yield. The calves of around six to eight months will be fed on concentrated feed and green fodder produced from the agricultural land. Balanced feed will be given to calves for a period of two to three months to get higher weight gain. If these calves are fed properly on the formulated fattening feed, their weight can be raised up from around 80 kg to 200-240 kg during the fattening period. The daily weight gain of fattened calves can go to 500 gm per animal per day depending on the quality of feed. Feed lot farms will be established in each FEG on smallholder farms, who will collectively adopt and learn the improved husbandry and feeding practices with the help of extension agents to achieve the optimum growth rate. Technical assistance will be provided by the private sector/processors and government agencies through FEGs. A total of 333 feed lot units will be established in this cluster over the period of five years. These feedlot units will also adopt all the standards practices regarding the disease control, traceability and meat quality. The farms will be able to provide the beef animals on sustainable basis to the processors to cater the domestic and export demand.

It has been assumed that interventions will be started in the first year and the first lot of fattened animals will be obtained during the second year. It is assumed that with focused efforts, it will be possible to fatten around 20% of the total animals available for slaughtering in the cluster. It is assumed that weight growth will increase from the existing 192.5 gm per animal per day to 500 gm per animal per day. Two types of investments will be required for this intervention. Feedlot farms will be established by the farmers and feed mills will have to

be established to ensure the supply of cattle feed for these animals. Based on these assumptions, the value of increased meat yield in beef cluster-1 at a rate of US$ 2,785 per tonne is shown in Table 20).

Table 20. Table 20: Increased beef value by improvement in growth rate in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
% of animals to be fattened	5.00%	10.00%	15.00%	20.00%	20.00%
Number of animals fattened	35,157	73,373	114,847	159,791	166,742
Additional production from enhanced yield (ton)		3,934	8,185	12,771	17,713
Expected additional value from increased yield at wholesale price (000 US$)		10956.7	22796.0	35570.3	49334.6

9.2.2.3. Intervention 3 – Improved Value Chain Infrastructure

The main reason for low export-production ratio, low export price and low beef value in domestic market is poor value chain infrastructure for beef processing. It is expected that the interventions of establishing feedlots and village level slaughterhouses along with strict regulatory framework and monitoring will lead to resolve this issue. It is estimated that a total of 167 small feed mills and 22 slaughter houses will be supported by the government to be established at village level on 20% subsidy and interest free loans in the focal point of this cluster with first priority given to FEGs. This will have the following advantages:

9.2.2.4. Enhance Exports of Beef Carcass

Currently, the exports from Pakistan are restricted to chilled carcasses supplied to the Gulf Cooperation Council (GCC) countries, and the average price Pakistani exporter receives only 60% of the world average price. Pakistan generally remains uncompetitive in beef production as reflected by its higher than the world average beef prices at the farm gate level. Its carcass yield is 26% lower than the world average weight and its producers and traders are largely remain disconnected with international markets.

With the focused interventions of achieving higher calf growth rates, reduced calf mortality, improved value chain infrastructure along with strategies of linking farmers with the markets by providing information about beef markets and technologies, sending delegates in key international beef markets, and attending major beef related international workshops and food festivals, it will be possible to increase beef exports from the current 0.2% to 10% of the total beef production in the cluster.

It is assumed that this achievement will be made in a period of five years; starting from Year 2. Additional value attained through this intervention has been calculated at the existing export price of US$ 4,200 per tonne. Increase in export is shown in Table 21.21).

Table 21. Table 21: Increased beef value by increase in exports in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
Expected export with no intervention	65.3	82.5	100.9	120.7	134.9
Export to production ratio over five years (%)	1.96%	3.92%	5.88%	7.84%	9.80%
Total additional volume of to be exported (ton)	640	1,617		4,730	6,612
Expected additional value from improvement in export-production ratio (000 US$)	2689.5	6789.5	12457.7	19864.2	27769.9

9.2.2.4.1. Improvement in Beef Prices in International Market

The current beef export from Pakistan fetches only 70% of the world average export price. With focused efforts, mentioned in the previous sections, export value chain can be strengthened to increase the average export price. The current average international export price is US$ 5,129 per tonne. It is assumed that the Pakistani exporters will match this price gradually in a period of five years; starting from Year 2. Additional value through this intervention is shown in Table 22).

Table 22. Table 22: Increased beef value by improvement in export value chain in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
Incremental improvement in export price due to improvement in value chain (US$/tonne)	232	465	697	929	929
Expected additional value from improved export value chain (US$)	148.7	750.9	2066.7	4393.8	6142.4

9.2.2.4.2. Improvement in value chain for high-end domestic market

A key intervention is increasing the production of beef to capture the growing high-end domestic market. Specialty meat shops have opened during the last decade; which are competing with the traditional meat shops. The demand for high quality, hygienic beef is increasing, and the customers are willing to pay a higher price for this premium product. For the purpose of projections, it has been assumed that the share of beef to be sold as high-priced premium product will be increased from the current 1% to 5%. The additional value has been calculated at US$ 5,926 per tonne (PKR 800 per kg). Calculations are shown in (Table 23).

Table 23: Increased beef value by improvement in value chain in domestic market in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
% age of production to be value added for domestic market over 5 years	0.8%	1.6%	2.4%	3.2%	4.0%
Total volume of Value added produced for high-end domestic market (ton)	261	660	1,211	1,930	2,699
Expected additional value from Value added Beef for domestic market (000 US$)	820.9	2072.3	3802.4	6063.0	8476.0

9.2.3. Total benefits summary

Summary of the value of the benefits of the proposed interventions is shown in Table 24).

Table 24: Summary of the value of benefits (000 US$) of interventions in cluster-1

Benefits Value (US$)	Year 2	Year 3	Year 4	Year 5	Year 6
Value of reduced calf mortality	8217.6	17097.0	26677.7	37001.0	38488.2
Value of calf fattening	0.0	10956.7	22796.0	35570.3	49334.6
Value of increased exports	2689.5	6789.5	12457.7	19864.2	27769.9
Value of export value chain improvement	148.7	750.9	2066.7	4393.8	6142.4
Value of high-end domestic market	820.9	2072.3	3802.4	6063.0	8476.0
Total value	11876.7	37666.5	67800.5	102892.2	130211.1

9.2.4. Enhanced costs of the proposed interventions

The above proposed interventions will add cost of producing, processing, and value addition of beef. The costs of the proposed interventions involve two types of costs i) value chain improvement costs and ii) sector support interventions costs.

9.2.4.1. Value chain improvement costs

The proposed sector transformation plan includes interventions both for on-farm and off-farm activities. Improvement entails spending more money for carrying out those activities on modern lines. Existing costs and the proposed incremental increases for different cost heads are shown in 25.

Table 25: Animal management incremental increases cost head in cluster-1

	Normal conditions cost (US$ per animal)	Incremental Increase

		198.7	38%
Cost of raising calves (US$)		198.7	38%

Based on the above unit costs, total increases in animal management costs for cluster-1 were calculated. It was assumed that costs will be incurred from the second year of implementation. Costs projections are shown in (**Error! Reference source not found.**26).

Table 26: Animal management improvement costs in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
Total operational cost of raising animals (000 US$)	2677.7	5588.3	8747.1	12170.1	12699.5

9.2.4.2. Processing costs

In addition to the farm level costs, the value addition costs of processing different beef products have also been estimated and are shown in (**Error! Reference source not f ound.**27).

Table 27: Value addition costs (000 US$) in cluster-1

Processing activity	Unit Cost (US$/tonne)	Year 2	Year 3	Year 4	Year 5	Year 6
Cost of additional production for sale in local market (US$/tonne)	74	2420.1	3054.7	3736.6	4468.6	4997.6
Value addition cost in Slaughter houses (US$/tonne)	2,181	1966.7	13544.4	26959.9	42378.6	58937.7
Additional cost of marketing in premium/export market (US$/tonne)	100	64.0	161.7	296.6	473.0	661.2
Additional cost of marketing in domestic high-end markets (US$/tonne)	50	13.1	33.0	60.5	96.5	134.9
Total Value Addition Costs		4463.9	16793.7	31053.7	47416.7	64731.4

9.2.4.3. Total value chain operational costs

Total value chain costs were calculated by adding the costs of improved animal management costs and the value-added products processing costs. The costs are shown in (Table **Error! Reference source not found.**28).

Table 28: Total value chain costs (000 US$) in cluster-1

	Year 2	Year 3	Year 4	Year 5	Year 6
Animal management costs	2677.7	5588.3	8747.1	12170.1	12699.5
Value addition costs	4463.9	16793.7	31053.7	47416.7	64731.4
Total value chain costs	7141.6	22382.1	39800.8	59586.8	77431.0

9.2.4.4. Cluster development investment costs

Beef cluster-1 has huge growth potential which can be tapped by implementing focused interventions in the areas of production, processing and marketing. To improve value chain on sustainable basis, the establishment of NBRDC is suggested with an annual cost of establishment of US$0.370 million for the first two years, and an annual operational cost of US$0.37 million for the remaining three years. Animal production will be improved by provision of improved extension and veterinary services to the farmers. For improving the production efficiency, extension modules on whole farming system will be delivered on regular basis. This will provide the basis to reduce calf mortality rate. Better feed, husbandry and improved genetic management practices will be implemented to improve fattening rate. Feedlot farms will be established to produce high quality beef animals by adopting the standard practices for disease control, traceability and meat quality control. State-of-the-art meat research center will be established in cluster-1 to conduct research on beef value chain and supporting production and marketing of value-added beef products. Advisory council/platform will be established to stimulate regular meetings between stakeholders; including traders, processors, input-suppliers, academic institutions, livestock department and policy makers.

At the processing level, cattle feed mills will be established at village level to ensure the supply of quality feed required to implement the production level interventions. Value added beef will be produced by establishing slaughterhouses at village levels. These will be small slaughterhouses where slaughtering and beef processing will be carried out through modern means to ensure the hygiene and safety of the meat. Capacity building of human resources will be carried out to process meat in boneless and other value-added cuts; which can be exported.

Interventions will be implemented on marketing front as well. New cattle markets will be established having upgraded facilities for weighing, animal shelter, loading/unloading, availability of fodder, etc. Market links will be established with new customer markets in GCC and East Asia regions. Support will be provided to participate in trade missions and promote Halal market segment of beef.

In line with the above-mentioned interventions, projections of production, processing and marketing costs are provided in (Table 29, 30 and 31).

Table 29: Production investments (000 US$) projections in cluster-1

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Investments on research strengthening	1111.1	370.4	370.4	370.4	370.4	2592.6
Capacity building of stakeholders	1481.5	1481.5	740.7	740.7	740.7	5185.2
Calf fattening unit	723.3	785.3	857.7	930.0	144.7	3441.0
Total production investments	3315.9	2637.2	1968.8	2041.1	1255.8	11218.8

Table 30: Processing investments (000 US$) projections in cluster-1

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Village level feed mills	723.3	785.3	857.7	930.0	144.7	592.6
Village level improved slaughter houses	129.6	140.7	155.6	166.7	0.0	2460.4
Interest free loans	111.0	132.2	168.0	203.3	132.4	746.8
Total Processing Investments	352.4	496.6	770.9	1041.0	1138.9	3799.8

Table 31: Marketing investments (000 US$) projections in cluster-1

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Establishment of modern cattle markets	1555.6	1555.6	1555.6	1555.6	1555.6	7777.8
Export promotion	20.0	15.0	7.5	5.0	2.5	50.0
Total Marketing Investments	1575.6	1570.6	1563.1	1560.6	1558.1	7827.8

Total investment projections are shown in **Error! Reference source not found.**32.

Table 32: Total investments (000 US$) projections in cluster-1

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Production Interventions	3315.9	2637.2	1968.8	2041.1	1255.8	11218.8
Processing Interventions	352.4	496.6	770.9	1041.0	1138.9	3799.8
Marketing Interventions	1575.6	1570.6	1563.1	1560.6	1558.1	7827.8
Total Investments	5243.9	4704.4	4302.7	4642.6	3952.8	22846.4

9.2.5. Economic viability development plan of cluster-1

Based on the benefits and the costs of the proposed interventions package in the above paragraphs, the economic viability of the proposition has been calculated in terms of project's NPV and IRR. Discounted cash flow analysis has been carried out using an annual discount rate of 8.5%. Calculations and results are shown in (Table 33).

Table 33: Economic viability of proposed interventions package in cluster-1

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Benefits of the	0.0	11876.7	37666.5	67800.5	102892.2	130211.1

Interventions (000 US$)					
Total operational costs of the Interventions (000 US$)	0.0	7141.6	22382.1	39800.8	59586.8	77431.0
Total investment costs of the interventions (000 US$)	5243.9	4704.4	4302.7	4642.6	3952.8	0.0
Net Cash Flows (000 US$)	-5243.9	30.8	10981.7	23357.1	39352.6	52780.2
NPV (000 US$)		**79,167.3**				
IRR		**143%**				

A positive NPV of US$ 79.16 million indicates that the interventions package proposed for uplift and transformation of Beef Cluster 1 is an economically viable proposition.

9.3. Beef Cluster-2

9.3.1. Key areas

Beef cluster-2 includes South Western Sindh and comprises of Tharparkar, Umarkot and Sanghar districts. The focal district is Umarkot because of having a large number of animals.

9.3.2. Current situation

The focal point in beef cluster-2 has a total 888,832 buffaloes and cows older than three years. Of these, 146,538 animals are available for slaughtering which can produce 11,954 tonnes of beef at the default beef yield of 192.5 grams per animal per day. The cluster's current production performance has been presented in (Table 34). Low beef yield in cluster-2 can be attributed to lack of modern cattle farming practices which have been discussed in previous chapters.

Table 34: Current beef production situation in cluster-2

Current situation in beef cluster-2	
Number of cows and buffaloes older than three years	888,832
Total number of animals for slaughter in cluster's focal point (No.)	146,538
Growth rate of no. of animals for slaughter	4.35%
Total Beef Production (tonne)	11,954
Default Beef yield per animal per day (gram)	192.5
Annual growth rate without intervention	0.49%
Wholesale Price (US$/tonne)	2,785

Beef production and its value at the current wholesale price in the next five years in a no-intervention scenario is shown in (Table 35).

Table 35: Beef production without intervention scenario in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Default yield (gram/animal/day)	192.49	193.44	194.38	195.34	196.29
Annual expected production without intervention (Tonnes)	10,796	11,321	11,871	12,449	13,054
Total value of production at farm gate (000 US$)	30.1	31.5	33.1	34.7	36.4

9.3.3. Interventions and key benefits

9.3.3.1. Intervention 1 – Introduction of Improved Management to Reduce Calf Mortality

High calf mortality is a major reason of low performance of the local beef sector. Improved cattle farming and management practices and R&D in beef cluster will lead to reduction in calf mortality. This will be achieved by execution of improved extension and veterinary services to the farmers. Extension modules on whole farming system will be delivered on regular basis that will lead to reducing the calf mortality to 5% from the existing value of 20% over a period of six years. However, it is assumed that cattle farmers will gradually adopt new practices; and thus, this reduction will be achieved at a rate of 3.75% per year starting from the second year. Based on these assumptions, the value of increased beef production at the existing wholesale rate of US$ 2,785 per tonne is shown in (Table 36).

Table 36: Increased beef value by reduction in calf mortality in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Calf mortality after intervention (%)	3.75%	7.50%	11.25%	15.00%	18.75%
Number of calves born every year (44.5% of total population)	430,690	449,425	468,975	489,375	510,663
Number of calves saved every year	16,151	33,707	52,760	73,406	95,749
Expected gain in weight of saved calves (tonne)	1,807	3,760	5,867	8,137	10,580
Expected additional value from reduction of losses at farm gate price (000 US$)	5,033.4	10,472.3	16,340.6	22,663.8	29,468.5

9.3.3.2. Intervention 2 - Introduction of high growth calf fattening practices

Improved beef fattening practices will be adopted to increase the beef yield. The calves of around six to eight months will be fed on concentrated feed and green fodder produced from the agricultural land. Balanced feed will be given to calves for a period of two to three months to get higher weight gain. If these calves are fed properly on the formulated fattening feed, their weight can be raised up from around 80 kg to 200-240 kg during the fattening period. The daily weight gain of fattened calves can go to 500 gm per animal per day depending on the quality of feed. Feed lot farms will be established in each FEG on smallholder farms, who will collectively adopt and learn the improved husbandry and

feeding practices with the help of extension agents to achieve the optimum growth rate. Technical assistance will be provided by the private sector/processors and government agencies through FEGs. A total of 205 feed lot units will be established in this cluster over the period of five years. These feedlots units will also adopt all the standards practices regarding the disease control, traceability and meat quality. The farms will be able to provide the beef animals on sustainable basis to the processors to cater the domestic and export demand.

It has been assumed that interventions will be started in the first year and the first lot of fattened animals will be obtained during the second year. It is assumed that with focused efforts, it will be possible to fatten around 20% of the total animals available for slaughtering in the cluster. It is assumed that weight growth will increase from the existing 192.5 gm per animal per day to 500 gm per animal per day. Two types of investments will be required for this intervention. Feedlot farms will be established by the farmers and feed mills will be required to ensure the supply of cattle feed for these animals. Based on these assumptions, the value of increased meat yield in Beef cluster-2 at a rate of US$ 2,785 per tonne is shown in (Table 37).

Table 37: Increased beef value by improvement in growth rate in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
% of animals to be fattened	5.0%	10.0%	15.0%	20.0%	20.0%
Number of animals fattened	21,534	44,942	70,346	97,875	102,133
Additional production from enhanced yield (tonne)		2,417	8,202	7,896	10,952
Expected additional value from increased yield at wholesale price (000 US$)		6,731.9	22,844.1	21,990.9	30,502.8

9.3.3.3.   Intervention 3 – Improvement in Value Chain Infrastructure

The main reason for low export-production ratio, low export price and low beef value in domestic market is poor value chain infrastructure for beef processing. It is expected that the interventions of establishing feedlots and village level slaughterhouses along with strict regulatory framework and monitoring will lead to resolve this issue. It is estimated that a total of 105 small feed mills and 37 slaughter houses will be supported by the government to be established at village level on 20% subsidy and interest free loans in the focal point of this cluster with first priority given to FEG. This will have the following advantages:

9.3.3.3.1.   Increase in exports of beef carcass

Currently, the exports from Pakistan are restricted to chilled carcasses supplied to the GCC countries, and the average price Pakistani exporter receives only 60% of the world average price. Pakistan generally remains uncompetitive in beef production as reflected by its higher than the world average beef prices at the farm gate level. Its carcass yield is 26% lower than the world average weight. It is expected that the interventions of establishing

feedlots and village level slaughterhouses will lead to increasing the exports of carcasses (chilled meat). It has been assumed that with focused interventions, it will be possible to increase beef exports from the current 0.2% to 10% of the total beef production in the cluster. It is assumed that this achievement will be made in a period of five years; starting from Year 2. Additional value attained through this intervention has been calculated at the existing export price of US$ 4,200 per tonne. Increase in export is shown in (Table 38).

Table 38: Increased beef value by increase in exports in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Expected export with no intervention	25.2	35.0	51.9	57.0	25.2
Export to production ratio over five years (%)	1.96%	3.92%	5.88%	7.84%	9.80%
Total additional volume of to be exported (tonne)	247	686	1,525	2,233	3,389
Expected additional value from improvement in export-production ratio (000 US$)	1,037.5	2,881.0	6,406.2	9,378.4	14,235.6

9.3.3.3.2. Improvement in export price

The current beef export from Pakistan fetches only 70% of the world average export price. With focused efforts, mentioned in the previous sections, export value chain can be strengthened to increase the average export price. The current average international export price is US$ 5,129 per tonne. It is assumed that the Pakistani exporters will match this price gradually in a period of five year; starting from Year 2. Additional value through this intervention is shown in (**Error! Reference source not found.** 39).

Table 39: Increased beef value by improvement in export value chain in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Incremental improvement in export price due to improvement in value chain (US$/tonne)	232	465	697	929	929
Expected additional value from improved export value chain (000 US$)	57.4	318.6	1,062.8	2,074.4	3,148.8

9.3.3.3.3. Improvement in value chain for high-end domestic market

A key intervention is increasing the production of beef to capture the growing high-end domestic market. Specialty meat shops have opened during the last decade; which are competing with the traditional meat shops. The demand for high quality, hygienic beef is increasing, and the customers are willing to pay a higher price for this premium product. For the purpose of projections, it has been assumed that the share of beef to be sold as high-priced premium product will be increased from the current 1% to 5%. The additional

value has been calculated at US$ 5,926 per tonne (PKR 800 per kg). Calculations are shown in (Table 40).

Table 40: Increased beef value by improvement in value chain in domestic market in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
% age of production to be value added for domestic market over 5 years	0.8%	1.6%	2.4%	3.2%	4.0%
Total volume of Value added produced for high-end domestic market (tonne)	101	280	623	911	1,383
Expected additional value from Value added Beef for domestic market (000 US$)	174.0	483.2	1074.5	1573.0	2387.7

9.3.4.   Total benefits summary

Summary of the value of the benefits of the proposed interventions is shown in Table 41.

Table 41: Summary of the value of benefits (000 U$) of interventions in cluster-2

Benefits Value (US$)	Year 2	Year 3	Year 4	Year 5	Year 6
Value of reduced calf Mortality	5033.4	10472.3	16340.6	22663.9	29468.5
Value of calf fattening	0.0	6731.9	22844.1	21990.9	30502.8
Value of increased exports	1037.5	2880.9	6406.3	9378.4	14235.6
Value of export value chain improvement	57.4	318.6	1062.8	2074.4	3148.8
Value of high-end domestic market	174.0	483.2	1074.5	1573.0	2387.7
Total Value	6302.3	20886.9	47728.3	57680.6	79743.4

9.3.4.1.   Enhanced costs of the proposed interventions

The above proposed interventions will add cost of producing, processing, and value addition of beef. The costs of the proposed interventions involve two types of costs i) value chain improvement costs and ii) sector support interventions costs.

9.3.4.1.1.   Value chain improvement costs

The proposed sector transformation plan includes interventions both for on-farm and off-farm activities. Improvement entails spending more money for carrying out those activities on modern lines. Existing costs and the proposed incremental increases for different cost heads are shown in (Table 42).

Table 42: Animal management incremental increases cost head in cluster-2

	Normal Conditions Cost (US$ per animal)	Incremental Increase
Cost of raising calves (US$)	198.7	38%

Based on the above unit costs, total increases in animal management costs for the cluster were calculated. It was assumed that costs will be incurred from the second year of implementation. Costs projections are shown in (**Error! Reference source not found.**43)

Table 43: Animal management improvement costs (000 US$) in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Total operational cost of raising animals (US$)	1,640.1	3,423.0	5,357.8	7,454.4	7,778.7

9.3.4.1.2. Processing costs

In addition to the farm level costs, the value addition costs of processing different beef products have also been estimated. Results are shown in (**Error! Reference source not found.** 44).

Table 44: Value addition costs (000 US$) in cluster-2

Processing Activity	Unit Cost (US$/tonne)	Year 2	Year 3	Year 4	Year 5	Year 6
Cost of additional production for sale in local market (US$/tonne)	74	933.6	1296.2	1921.5	2109.7	2561.9
Value addition cost in Slaughter houses (US$/tonne)	2,181	758.7	7378.0	22572.6	24077.8	34294.7
Additional cost of marketing in premium/export market (US$/tonne)	100	6.4	17.8	39.5	57.9	87.9
Additional cost of marketing in premium domestic high-end markets (US$/tonne)	50	5.0	14.0	31.1	45.6	69.2
Total value addition costs (000 US$)		1703.7	8705.9	24564.8	26291.0	37013.7

9.3.4.1.3. Total value chain costs

Total value chain costs were calculated by adding the costs of improved animal management costs and the value-added products processing costs are shown in (Table 45).

Table 45: Total value chain costs (000 US$) in cluster-2

	Year 2	Year 3	Year 4	Year 5	Year 6
Animal management costs	1640.1	3423.0	5357.8	7454.5	7778.7
Value addition costs	1703.7	8705.9	24564.8	26291.0	37013.7
Total value chain costs	3343.8	12128.9	29922.5	33745.4	44792.4

9.3.4.2. Cluster development interventions costs

Beef cluster-2 has huge growth potential which can be tapped by implementing focused interventions in the areas of production, processing and marketing. To improve value chain on sustainable basis, the establishment of NBRDC is suggested with an annual cost of establishment of US$0.370 million for the first two years, and an annual operational cost of US$0.37 million for the remaining three years. Animal production will be improved by provision of improved extension and veterinary services to the farmers. For improving the production efficiency, extension modules on whole farming system will be delivered on regular basis. This will form the basis to reduce calf mortality rate. Better feed, husbandry and improved genetic management practices will be implemented to improve fattening rate. Feedlot farms will be established to produce high quality beef animals by adopting the standard practices for disease control, traceability and meat quality control. State-of-the-art meat research center will be established in cluster-2 to conduct research on beef value chain and supporting production and marketing of value-added beef products. Advisory council/platform will be established to stimulate regular meetings between stakeholders; including traders, processors, input-suppliers, academic institutions, livestock department and policy makers.

At the processing level, cattle feed mills will be established at village level to ensure the supply of quality feed required to implement the production level interventions. Value added beef will be produced by establishing slaughterhouses at village levels. These will be small slaughterhouses where slaughtering and beef processing will be carried out through modern means ensuring hygiene and safety of the meat. Capacity building of human resources will be carried out to process meat in boneless and other value-added cuts; which can be exported.

Interventions will be implemented on marketing front as well. New cattle markets will be established having upgraded facilities for weighing, shelter, loading/unloading, availability of fodder, etc. Market links will be established with new customer markets in GCC and East Asia regions. Support will be provided to participate in trade missions and promote Halal market segment of beef.

In line with the above-mentioned interventions, projections of production, processing and marketing costs are provided in (Table 46, 47 and 48).

Table 46: Production investments (000 US$) projections in cluster-2

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Investments on research strengthening	1111.1	370.4	370.4	370.4	370.4	2592.6
Capacity building of stakeholders	740.7	740.7	740.7	740.7	740.7	3703.7
Calf fattening unit	444.3	485.7	527.0	568.3	93.0	2118.3
Total Production Investments	2296	1597	1638	1679	1204	8415

Table 47: Processing investments (000 US$) projections in cluster-2

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Village level feed mills	81.5	88.9	96.3	103.7	18.5	388.8
Village level improved slaughter houses	-	782.9	1,901.2	223.7	1,230.2	4137.9
Interest free loans	60.5	156.1	290.3	103.0	154.3	764.2
Total Processing Investments	142	1,028	2,288	430	1,403	5,291

Table 48: Marketing investments projections in cluster-2

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Establishment of modern cattle markets	1555.6	1555.6	74.1	74.1	74.1	3333.3
Export promotion	20.0	15.0	7.5	5.0	2.5	50.0
Total Marketing Investments	1575.6	1570.6	81.6	79.1	76.6	3383.3

Total investment projections are shown in (Table 49)

Table 49: Total investments projections in cluster-2

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Production interventions	2296	1597	1638	1679	1204	8415
Processing interventions	142	1,028	2,288	430	1,403	5,291
Marketing interventions	1575.6	1570.6	81.6	79.1	76.6	3383.3
Total investments	4014	4196	4008	2188	2684	17089

9.3.4.3. Economic viability of development plan

Based on the benefits and the costs of the proposed interventions package in the above paragraphs, the economic viability of the proposition has been calculated in terms of project's NPV and IRR. Discounted cash flow analysis has been carried out using an annual discount rate of 8.5%. Calculations and results are shown in (Table 50)

Table 50: Economic viability of proposed interventions package in cluster-2

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Benefits of the Interventions (US$)	0.0	6302.3	20886.9	47728.3	57680.6	79743.4
Total operational costs of the Interventions (US$)	0.0	3343.8	12128.9	29922.5	33745.4	44792.4
Total investment costs of the interventions (000 US$)	4013.6	4195.1	4007.5	2188.9	2683.7	0.0
Net Cash Flows (000 US$)	-4013.6	-1236.6	4750.4	1561.6	2125.1	34951.0
NPV (000 US$)		45,79.4				
IRR		**112%**				

A positive NPV of US$ 45.7 million indicates that the interventions package proposed for uplift and transformation of Beef Cluster 2 is an economically viable proposition.

9.4. Beef Cluster-3

9.4.1. Key areas

Beef cluster-3 includes Western Punjab and comprises of Chakwal, Attock, Mianwali, Bhakkar, Layyah, Rajanpur and D.G Khan districts. The focal district is Bhakkar because of being located in the center of the cluster and close to the big urban markets.

9.4.2. Current situation

The focal point in beef cluster-3 has a total 630,194 buffaloes and cows older than three years. Of these, 164,366 animals are available for slaughtering which can produce 13,408 tonnes of beef at the default beef yield of 192.5 gm per animal per day. The cluster's current production performance (Table 51). Low beef yield in cluster- 3 can be attributed to lack of modern cattle farming practices which have been discussed in previous chapters.

Table 51: Current production situation in cluster-3

Current situation	
Number of cows and buffaloes older than three years	630,194
Total number of animals for slaughter in cluster's focal point (No.)	164,366
Growth rate of no. of animals for slaughter	4.35%
Total Beef Production (tonne)	13,408
Default Beef yield per animal per day (gram)	192.5
Annual growth rate without intervention	0.49%
Wholesale Price (US$/tonne)	2,785

Beef production and its value at the current wholesale price in the next five years in a no-intervention scenario is shown in (Table 52).

Table 52: Beef production without intervention scenario in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Default yield (gram/animal/day)	192.49	193.44	194.38	195.34	196.29
Annual expected production without intervention (Tonnes)	12,110	12,698	13,316	13,963	14,642
Total value of production at farm gate (000 US$)	33,727.8	35,367.4	37,086.8	38,889.7	40,780.2

9.4.3.   Proposed interventions and key benefits

9.4.3.1.   Intervention 1 - Introduction of improved management to reduction calf mortality

High calf mortality is a major reason of low performance of the local beef sector. Improved cattle farming and management practices and R&D in beef cluster will lead to reduction in calf mortality. This will be achieved by execution of improved extension and veterinary services to the farmers. Extension modules on whole farming system will be delivered on regular basis that will lead to reducing the calf mortality to 5% from the existing value of 20% over a period of six years. However, it is assumed that cattle farmers will gradually adopt new practices; and thus, this reduction will be achieved at a rate of 3.75% per year starting from the second year. Based on these assumptions, the value of increased beef production at the existing wholesale rate of US$ 2,785 per tonne is shown in (Table 53).

Table 53: Increased beef value by reduction in calf mortality in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Calf mortality after intervention (%)	3.75%	7.50%	11.25%	15.00%	18.75%
Number of calves born every year (44.5% of total population)	305,365	318,648	332,510	346,974	362,067
Number of calves saved every year	11,451	23,899	37,407	52,046	67,888
Expected gain in weight of saved calves (tonne)	1,350	2,809	4,384	6,082	7,909
Expected additional value from reduction of losses at farm gate price (000US$)	3760.1	7824.3	12210.8	16938.7	22028.0

9.4.3.2.   Intervention 2 – Introduction of improved practices for high calf growth rate

Improved beef fattening practices will be adopted to increase the beef yield. The calves of around six to eight months will be fed on concentrated feed and green fodder produced from the agricultural land. Balanced feed will be given to calves for a period of two to three months to get higher weight gain. If these calves are fed properly on the formulated fattening feed, their weight can be raised up from around 80 kg to 200-240 kg during the fattening period. The daily weight gain of fattened calves can go to 500 gm per animal per day depending on the quality of feed. Feed lot farms will be established in each FEG on

smallholder farms, who will collectively adopt and learn the improved husbandry and feeding practices with the help of extension agents to achieve the optimum growth rate. Technical assistance will be provided by the private sector/processors and government agencies through FEGs. A total of 145 feed lot units will be established in this cluster over the period of five years. These feedlots units will also adopt all the standards practices regarding the disease control, traceability and meat quality. The farms will be able to provide the beef animals on sustainable basis to the processors to cater the domestic and export demand.

It has been assumed that interventions will be started in the first year and the first lot of fattened animals will be obtained during the second year. It is assumed that with focused efforts, it will be possible to fatten around 20% of the total animals available for slaughtering in the cluster. It is assumed that weight growth will increase from the existing 192.5 gm per animal per day to 500 gm per animal per day. Two types of investments will be required for this intervention. Feedlot farms will be established by the farmers and feed mills will be required to ensure the supply of cattle feed for these animals. Based on these assumptions, the value of increased meat yield in Beef cluster-3 at a rate of US$ 2,785 per tonne is shown in (**Error! Reference source not found.**54).

Table 54: Increased beef value by calf fattening in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
% of animals to be fattened	5.0%	10.0%	15.0%	20.0%	20.0%
Number of animals fattened	15,268	31,865	49,876	69,395	72,413
Additional production from enhanced yield (tonne)		1,805	6,007	5,897	8,181
Expected additional value from increased yield at wholesale price (000 US$)		5028.1	16729.3	16425.3	22786.5

9.4.3.3. Intervention 3 – Improved Value Chain Infrastructure

The main reason for low export-production ratio, low export price and low beef value in domestic market is poor value chain infrastructure for beef processing. It is expected that the interventions of establishing feedlots and village level slaughter houses along with strict regulatory framework and monitoring will lead to resolve this issue. It is estimated that a total of 74 small feed mills and 30 slaughter houses will be supported by the government to be established at village level on 20% subsidy and interest free loans in the focal point of this cluster with first priority given to FEGs. This will have the following advantages:

9.4.3.3.1. Increase in exports of beef carcass

Currently, the exports from Pakistan are restricted to chilled carcasses supplied to the GCC countries, and the average price Pakistani exporter receives only 60% of the world average price. Pakistan generally remains uncompetitive in beef production as reflected by its higher than the world average beef prices at the farm gate level. Its carcass yield is 26%

lower than the world average weight. It is expected that the interventions of establishing feedlots and village level slaughterhouses will lead to increasing the exports of carcasses (chilled meat). It has been assumed that with focused interventions, it will be possible to increase beef exports from the current 0.2% to 10% of the total beef production in the cluster. It is assumed that this achievement will be made in a period of five years; starting from Year 2. Additional value attained through this intervention has been calculated at the existing export price of US$ 4,200 per tonne. Increase in export is shown in (**Error! R eference source not found.**55).

Table 55: Increased beef value by increase in exports in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Expected export with no intervention	26.9	34.6	47.4	51.9	61.5
Export to production ratio over five years (%)	1.96%	3.92%	5.88%	7.84%	9.80%
Total additional volume of to be exported (tonne)	264	679	1,394	2,034	3,012
Expected additional value from improvement in export-production ratio (000 US$)	1108.0	2850.4	5854.5	8542.2	12649.4

9.4.3.3.2. Improvement in export value chain

The current beef export from Pakistan fetches only 70% of the world average export price. With focused efforts, mentioned in the previous sections, export value chain can be strengthened to increase the average export price. The current average international export price is US$ 5,129 per tonne. It is assumed that the Pakistani exporters will match this price gradually in a period of five year; starting from Year 2. Additional value through this intervention is shown in (**Error! Reference source not found.**56).

Table 56: Increased beef value by improvement in export value chain in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Incremental improvement in export price due to improvement in value chain (US$/tonne)	232	465	697	929	929
Expected additional value from improved export value chain (000 US$)	61.3	315.2	971.2	1889.5	2797.9

9.4.3.3.3. Improvement in value chain for high-end domestic market

A key intervention is increasing the production of beef to capture the growing high-end domestic market. Specialty meat shops have opened during the last decade; which are competing with the traditional meat shops. The demand for high quality, hygienic beef is increasing, and the customers are willing to pay a higher price for this premium product. For the purpose of projections, it has been assumed that the share of beef to be sold as

high-priced premium product will be increased from the current 1% to 5%. The additional value has been calculated at US$ 5,926 per tonne (PKR 800 per kg). Calculations are shown in (**Error! Reference source not found.**57).

Table 57: Increased beef value by improvement in value chain in domestic market in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
% age of production to be value added for domestic market over 5 years	0.8%	1.6%	2.4%	3.2%	4.0%
Total volume of Value added produced for high-end domestic market (tonne)	108	277	569	830	1,229
Expected additional value from Value added Beef for domestic market (000 US$)	185.8	478.1	982.0	1432.8	2121.7

9.4.3.4. Total benefits summary

Summary of the value of the benefits of the proposed interventions is shown in (**Error! R eference source not found.**58).

Table 58: Summary of the value of benefits (000 US$) of interventions in cluster-3

Benefits Value (US$)	Year 2	Year 3	Year 4	Year 5	Year 6
Value of reduced calf mortality	3760.1	7824.3	12210.8	16938.7	22028.0
Value of calf fattening	0.0	5028.1	16729.3	16425.3	22786.5
Value of increased exports	1108.0	2850.4	5854.5	8542.2	12649.4
Value of export value chain improvement	61.3	315.2	971.2	1889.5	2797.9
Value of high-end domestic market	185.8	478.1	982.0	1432.8	2121.7
Total value	5115.2	16496.2	36747.8	45228.5	62383.5

9.4.4. Enhanced costs of the proposed interventions

The above proposed interventions will add cost of producing, processing, and value addition of beef. The costs of the proposed interventions involve two types of costs i) value chain improvement costs and ii) sector support interventions costs.

9.4.4.1. Value chain improvement costs

The proposed sector transformation plan includes interventions both for on-farm and off-farm activities. Improvement entails spending more money for carrying out those activities on modern lines. Existing costs and the proposed incremental increases for different cost heads are shown in (**Error! Reference source not found.**59).

Table 59: Animal management incremental increases cost head in cluster-3

	Normal Conditions Cost (US$ per animal)	Incremental Increase
Cost of raising calves (US$)	198.7	38%

Based on the above unit costs, total increases in animal management costs for the cluster were calculated. It was assumed that costs will be incurred from the second year of implementation. Costs projections are shown in (**Error! Reference source not found.**60).

Table 60: Animal management improvement costs in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Total Operational cost of raising animals (000 US$)	1162.9	2426.9	3798.7	5285.3	5515.2

9.4.4.2.   Processing costs

In addition to the farm level costs, the value addition costs of processing different beef products have also been estimated. Details are provided in (**Error! Reference source not f ound.**61).

Table 61: Value addition costs (000 US$) in cluster-3

Processing Activity	Unit Cost (US$/tonne)	Year 2	Year 3	Year 4	Year 5	Year 6
Cost of additional production for sale in local market (US$/tonne)	74	997.0	1282.4	1756.0	1921.6	2276.5
Value addition cost in Slaughter houses (US$/tonne)	2,181	810.2	6021.6	17380.9	19108.2	27092.6
Additional cost of marketing in premium/export market (US$/tonne)	100	6.8	17.6	36.1	52.7	78.1
Additional cost of marketing in premium domestic high-end markets (US$/tonne)	50	5.4	13.9	28.4	41.5	61.5
Total Value Addition Costs (000 US$)		1819.4	7335.5	19201.5	21124.1	29508.6

9.4.4.3.   Total value chain costs

Total value chain costs were calculated by adding the costs of improved animal management costs and the value-added products processing costs (Table 62).

Table 62. Table 62: Total value chain costs in cluster-3

	Year 2	Year 3	Year 4	Year 5	Year 6
Animal management Costs	1162.9	2426.9	3798.7	5285.3	5515.2
Value addition costs	1819.4	7335.5	19201.5	21124.1	29508.6
Total value chain costs (US$)	2982.3	9762.4	23000.3	26409.4	35023.8

9.4.5. Cluster development interventions costs

Beef cluster-3 has huge growth potential which can be tapped by implementing focused interventions in the areas of production, processing and marketing. Animal production will be improved by provision of improved extension and veterinary services to the farmers. For improving the production efficiency, extension modules on whole farming system will be delivered on regular basis. This will form the basis to reduce calf mortality rate. Better feed, husbandry and improved genetic management practices will be implemented to improve fattening rate. Feedlot farms will be established to produce high quality beef animals by adopting the standard practices for disease control, traceability and meat quality control. Advisory council/platform will be established to stimulate regular meetings between stakeholders; including traders, processors, input-suppliers, academic institutions, livestock department and policy makers.

At the processing level, cattle feed mills will be established at village level to ensure the supply of quality feed required to implement the production level interventions. Value added beef will be produced by establishing slaughterhouses at village levels. These will be small slaughterhouses where slaughtering and beef processing will be carried out through modern means ensuring hygiene and safety of the meat. Capacity building of human resources will be carried out to process meat in boneless and other value-added cuts; which can be exported.

Interventions will be implemented on marketing front as well. New cattle markets will be established having upgraded facilities for weighing, shelter, loading/unloading, availability of fodder, etc. Market links will be established with new customer markets in GCC and East Asia regions. Support will be provided to participate in trade missions and promote Halal market segment of beef.

In line with the above-mentioned interventions, projections of production, processing and marketing costs are provided in (**Error! Reference source not found.**63, 64 and 65).

Table 63: Production investments (000 US$) projections in cluster-3

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Investments on research strengthening	-	-	-	-	-	-
Capacity building of stakeholders	740.7	740.7	740.7	740.7	740.7	3703.7
Calf fattening unit	320.3	341.0	372.0	403.0	62.0	1498.3
Total production investments	1061	1081.7	1112.7	1143.7	802.7	5202

Table 64: Processing investments (000 US$) projections in cluster-3

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Village level feed mills	59.3	63.0	66.7	74.1	11.1	274.0
Village level improved slaughter houses	118.5	671.0	1342.1	223.7	1006.5	3361.8
Interest free loans	57.3	123.6	204.8	80.6	124.2	590.4
Total processing Investments	235 1	857 6	1,613 6	378 4	1,141 8	4,226 2

Table 65: Marketing investments projections in cluster-3

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Establishment of modern cattle markets (US$)	1555.6	1555.6	1555.6	1555.6	1555.6	7777.8
Export promotion (US$)	20.0	15.0	7.5	5.0	2.5	50.0
Total marketing investments (US$)	1575.6	1570.6	1563.1	1560.6	1558.1	7827.8

Total investment projections are shown in (**Error! Reference source not found.**66).

Table 66: Total investments (000 US$) projections in cluster-3

Investment Head	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Production interventions	1061	1081.7	1112.7	1143.7	802.7	5202
Processing interventions	235 1	857 6	1,613 6	378 4	1,141 8	4,226 2
Marketing interventions	1575.6	1570.6	1563.1	1560.6	1558.1	7827.8
Total investments	2636.6	2652.3	2675.8	2704.3	2360.8	13029.8

9.4.6. Economic viability of cluster development plan

Based on the benefits and the costs of the proposed interventions package in the above paragraphs, the economic viability of the proposition has been calculated in terms of project's NPV and IRR. Discounted cash flow analysis has been carried out using an annual discount rate of 8.5%. Calculations and results are shown in (**Error! Reference source not found.**67).

Table 67: Economic viability of proposed interventions package in cluster-3

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Total Benefits of the Interventions (US$)	0.0	5115.2	16496.2	36747.8	45228.5	62383.5
Total operational costs of the Interventions (US$)	0.0	2982.3	9762.4	23000.3	26409.4	35023.8
Total investment costs of the interventions (US$)	2871.6	3509.9	4289.2	3082.6	3502.6	0.0
Net Cash Flows (US$)	-2871.6	-1376.9	2444.5	1066.4	131.6	27359.7
NPV (US$)		32749.1				
IRR		103%				

A positive NPV of US$ 32.7 million indicates that the interventions package proposed for uplift and transformation of Beef Cluster 3 is an economically viable proposition.

9.5.   Conclusion

In conclusion, the overall economic, social and environmental impact of the cluster development program will be highly positive, sustainable and long lasting over the period of six years. These estimated IRRs signify the fact that cluster development interventions are likely to positively impact not only the existing output of beef clusters, but also likely to add additional value increasing the overall potential of the beef value chain in all the beef producing clusters. Accounting for all the fixed costs and variable costs including the production, processing and marketing cost over the period of five years, the estimated Internal Rate of Return (IRR) is 143%, 112% and 103% for the clusters 1, 2 and 3 respectively.

10. PROGRAMS AND PLANS

This report presented an overview of the potential of beef sector in Pakistan. Identified the beef clusters as part of the V2025 of GoP. Discussed the gaps and constraints of identified beef clusters in Punjab and Sindh. Suggested recommendations for cluster development in all the regions; and estimated the economic and social impact of the cluster development interventions that shall set new frame conditions at production, processing, and marketing level of beef value chain in all the three clusters. In support of the strategies and interventions proposed in chapter 8 of this report, the following programs/plans are recommended to further strengthen the interventions and to creating greater opportunities for participation and learning.

10.1. Program for research reforms

The following program indicative areas for further research to strengthen the beef clusters along with the estimated costs.

Table 68: Program for research reforms

S#.	Identification of Areas for Further Research	Research Purpose/ Priority	Indicative Research Institutions	Estimated Cost (PKR) million
1. Cluster 2 & 3				
1.1	Development of drought resistant fodders, grasses, shrubs, trees	Improvement in feed resources (Short to medium term (1 to 2 years)	PARC, UAF, ICARDA	20
1.2	Development of mobile based ration formulation software	Improve fodder and feed management practices at farm (Short term (1year)	UET	5
1.3	Establish the technology to process and strore various industrial waste products into animal feeding	Alternative feeding resources for animals (Short to medium term (1 to 2 years)	PARC, UAF, SAU, UVAS, UET	20
2. Cluster 1				
2.1	Development farm equipment locally like fodder cutter, sialge and hay machine on solar energy	Energy effient farm equipment Short to medium term (1 to 2 years)	Private sector, UET	20
2.2	Design of animal feedmill for pallet production	Ration formulation equipment Medium to long Term (2 to 5 years)	Private sector, UET	20
2.3	Development of marketing strategies to increse the awarness of consumers regarding the qulaity of beef and value addition products	Improve marketing strategies Medium to long Term (2 to 5 years)	LUMS, IBA	40

The costs of these activities in respective clusters have been incorporated in the investment table of each cluster in Section 9.

11. ANNEXURES

Annexure 1: Macro data sources

MNFS&R (Ministry of National Food Security and Research). 2016. Agriculture Statistics of Pakistan (2015-16), Economic Wing, Ministry of National Food Security and Research, Islamabad. Pakistan: http://www.mnfsr.gov.pk/frmDetails.aspx

FAOSTAT, Production, Live Animals: http://www.fao.org/faostat/en/#data/QA

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Annexure 2: List of stakeholders consulted

Sr. No.	Name	Place/Organizations	Contact No.
Producers			
1.	Raheem Bux Soomro	Thatta	0300-9723136
2.	Sunway Lagoon Farm (Dr. Ahmad Shah)	Karachi (Large commercial farm)	0332-7858926
3.	Bukhari Dairy (Khizer Khan)	Karachi (Large commercial farm)	0304-2182085 0342-9754831
4.	Jam Shahzad Ali	Rahim Yar Khan	0302-2124732
5.	Muhammad Younis	Kasur	0346-4131614
6.	Muhammad Rashid	Kasur	0302-9436168
7.	Muhammad Aslam Farooq	Okara	0301-7383289
8.	Imtiaz Ahmad	Pakpattan	0304-8580395
9.	Shahid Javeed Jugir	Lodhran	0345-8105361
10.	Dr. Suresh Kumar	RDF	0334-3284480
11.	Dr. Muhammad Afzal	Islamabad	0346-8544161
12.	Prof. Dr. Talat Naseer Pasha	Lahore	0300-8434215
Feedlot Farmers			
13.	Dr. Muhammad Aleem	Lahore	0300-8453578
14.	Muhammad Ibrahim	Lahore	0301-4269162
15.	Dr. Zafar Hayat	Lodhran	0300-8482478
16.	Ilyas Ali	Rahim Yar Khan	0347-7047029
Processors			
17.	Dr. Khuram Rarique	Tazij Meats and Foods	0334-1644446
18.	Dr. Zahid Bhatti	Anees Associates	0300-4408741
19.	Dr. Iftikhar Hussain	UVAS	0331-7313086
20.	Brig Muhammad Raees	Fauji Meat Ltd.	0336-3246324
Exporter			
21.	Kashif Ahsan Hashmi	Hashmi's group Karachi	0300-9208148

Annexure 3: Literature Review

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Annexure 4: Animal production systems and their characteristics

Production system	Number of animals	Characteristics
Smallholder subsistence	1-3	They produce beef principally for the family at minimal cost. Grazing provides more than half of the feed requirement. Some green fodder and straw are provided, and a small quantity of concentrate is given to beefing animals. This traditional system makes heavy demands on family labour. Markets processed gods such as desi ghee
Smallholder market-oriented	3-5	These farmers have satisfactory access to beef markets and produce beef in excess of family requirements for sale. These farmers usually keep better quality animals. Beefing animals are generally stall-fed with seasonal green fodder, straw and concentrate and dry cows and herd followers are grazed. There is usually no adult bull in the herd. Calves are retained during lactation, and then the males are disposed of and females are kept as replacements. This system is the main source of beef in Pakistan
Rural commercial farms	More than 40	These are relatively large farms. These are either mixed crop-livestock farms or specialized farms for breeding and beef production. Fodder crops are grown and straw may be home grown or purchased. Concentrates are fed and dry females and heifers, if possible, are grazed. There is usually a bull for natural mating and the government artificial insemination service is also used. These farms are well-organized and keep good records, but their contribution to the total beef supply is small. This is an emerging farming system which is gaining popularity
Peri-urban commercial dairy farms	100–200: 90% buffaloes, 10% cattle	These are located around all big cities, the largest being at the Landhi Cattle Colony, Karachi, where more than 300,000 beefing animals are kept. This system has been growing at a fast pace and is now seen around all major cities of Pakistan. High demand for fresh raw beef and easy access to the market with high beef price are some of the factors promoting urban/peri-urban dairying. Turnover is very high. Animals close to calving or in calf are purchased, the calf can suckle for a few days and is then sold, generally for slaughter. Dry females are either sold for slaughter or returned to the rural areas for breeding. Most cows are not mated at least in the early lactation. Green fodder is purchased, but feed consists mainly of concentrate and straw. Since this is a high-cost system, only high potential animals are kept. In the cities (mainly small cities and towns), families sometimes keep one or two animals and sell the surplus beef, usually to neighbors

| Corporate dairy farms | 500-1000 Imported cows only | Many big investors have established these dairy farms in the country. Government has also announced incentives for setting up corporate livestock farms. Un-availability of animals of high production potential from a known source in the country has resulted in import of animals from abroad for establishing these farms. These imported animals suffer from adaptability problems and are particularly prone to tick borne diseases and foot and mouth disease. The success of these corporate livestock farms will depend upon the professional competence of the farm management. Success of these large dairy farms directly correlated to the degree of mechanization at the farm particularly in machine beefing, fodder cutting and silage making. The cost of production of beef at these corporate farms is expected to be higher than the one seen at smallholders' farms. However, availability of better-quality beef in sizeable quantity from a single source will result in payment of higher prices for beef from these corporate dairy farms by the dairy industry. Many of these corporate entities have started directly into processing and marketing themselves |

Afzal, 2008

Annexure 5: List of the extension material developed by ASLP dairy project for smallholder dairy farmers

Modules	Fact sheets
Animal husbandry	Basic husbandry principles
	Basics of animal requirements
Basics of animal nutrition	Nutritional requirement according to age, weight and production
	Ration formulation
Calf rearing	Calf management
	Calf diseases
	Calf fattening
Animal reproduction	Principles of animal reproduction
	Reproductive disorders
	Importance of feed for reproduction
Dairy breeds and their selection	Different breeds of dairy animals
	Recommendations for the purchase of beefing animal
	Selection of better productive animals
	Balanced feed for animals
Ration formulation	Total mixed ration (TMR)
	Urea molasses block (UMB) and mycotoxicosis
Improved fodder agronomy	Strategies to overcome fodder shortage
	Seed selection and preparation
	Summer and winter fodders
	Mixed cropping
Beef marketing and value chain	Cost of beef production
	Beef marketing options
	Beef value addition
Animal health	Deworming of animals
	Infectious diseases of animals and their prevention
	Mastitis prevention
Extension and mobilization	Communication skills
	Relationship building
	Community mobilization

Annexure 6: District wise population of cattle and buffalo in Punjab and Sindh

A. Punjab

Districts	Cattle	Buffalo	Total
Muzaffargarh	1,272,637	665,822	1,938,459
Faisalabad	505,054	968,983	1,474,037
Rahim Yar Khan	760,084	691,022	1,451,106
Bahawalnagar	647,401	616,831	1,264,232
Okara	482,898	726,243	1,209,141
Vehari	649,327	530,409	1,179,736
Bahawalpur	795,739	370,569	1,166,308
Jhang	591,701	555,398	1,147,099
Sargodha	534,814	584,877	1,119,691
Kasur	401,666	591,823	993,489
Sahiwal	390,767	577,142	967,909
Multan	568,725	341,931	910,656
Khanewal	477,444	410,319	887,763
Sheikhupura	353,087	492,339	845,426
Pakpattan	332,361	474,996	807,357
Gujranwala	196,259	575,503	771,762
DG Khan	525,378	240,325	765,703
TT Sing	359,947	398,652	758,599
Chiniot	293,199	434,450	727,649
Rajanpur	420,922	241,864	662,786
MD Din	168,097	465,481	633,578
Layyah	446,409	183,785	630,194
Sialkot	173,343	447,143	620,486
Bhakkar	419,178	172,065	591,243
Lahore	194,932	370,307	565,239
Lodhran	379,551	154,759	534,310
Hafizabad	158,077	337,772	495,849
Gujrat	160,405	310,476	470,881
Nankana Sahib	154,289	300,971	455,260
Narowal	158,616	280,063	438,679
Mianwali	318,693	112,295	430,988
Cholistan	413,193	10,588	423,781
Rawalpindi	250,895	130,810	381,705
Attock	301,648	75,837	377,485
Chakwal	289,400	83,837	373,237
Khushab	253,086	101,548	354,634
Jhelum	146,675	94,995	241,670
Total	**14,945,897**	**14,122,230**	**29,068,127**

Livestock census, Punjab 2018

B. Sindh

Districts	Cattle	Buffalo	Total
Hyderabad	861,526	1,476,592	2,338,118
Jacobabad	1,178,200	1,079,388	2,257,588
Dadu	1,010,538	835,606	1,846,144
Khairpur	862,454	943,949	1,806,403
Larkana	577,358	958,549	1,535,907
N.S.Feroze	611,268	755,786	1,367,054
Shaheed Benazirabad	647,388	679,949	1,327,337
Badin	572,005	703,532	1,275,537
Thatta	670,373	601,149	1,271,522
Sanghar	698,445	484,458	1,182,903
Shikarpur	438,555	531,179	969,734
Tharparkar	817,011	71,821	888,832
Qamber Shihadadkot	325,789	493,214	819,003
Mirpurkhas	348,443	418,275	766,718
Sukkur	412,478	326,190	738,668
Ghotki	341,122	369,832	710,954
Matiari	378,696	308,555	687,251
Karachi	240,127	345048	585,175
Kashomore Kandhkot	270,816	257,307	528,123
Umarkot	371,859	155,257	527,116
Jamshoro	232,309	156,116	388,425
T M Khan	81,464	207,648	289,112
Tando Allahyar	82,504	183,048	265,552
Total	**12,030,728**	**12,342,448**	**24,373,176**

Livestock census, Sindh 2018

Annexure 7. Estimated* population of beef animals available for slaughtering/year in each cluster

Cluster-1 districts	
Bahawalpur	324,233
Muzaffargarh	538891
Bahawalnagar	351456
Pakpattan	224,445
Rahim Yar Khan	403,407
Sahiwal	269,078
Vehari	327,966
Ghotki	197,645
Khairpur	502,180
Larkana	426,982
Shikarpur	269,586
Sukkur	205,349
Total:	**3,150,871**
Cluster-2 districts	
Sanghar	328,847
Tharparkar	247,095
Umarkot	146,538
Total:	**722,480**
Cluster-3 districts	
Attock	104,940
Bhakkar	164,365
Chakwal	103,759
D.G Khan	212,865
Layyah	175,193
Mianwali	119,814
Rajanpur	184,254
Total:	**1,065,190**

*Data of total number of cows and buffaloes in each district were obtained from provincial Livestock census, 2018. We assumed 44.5% herd in lactation. Considered 20% mortality in calves. Finally, beef animals available for slaughtering included 10% culling and male calve population.

Annexure 8. Characteristics and comparison of the beef clusters

Salient features	South Easter Punjab and North Western Sindh (cluster-1)	Southern Western Sindh (cluster-2)	Western Punjab (cluster-3)
Products	Various cuts of meat, value added meat products (ready to cook) and offal's (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)		
Districts	Punjab (Bahawalpur,	Tharparkar, Umarkot and	Chakwal, Attock, Mianwali, Bhakkar,

	Muzaffargarh, Sahiwal, Pakpattan, Vehari, Bahawalnagar, Rahim Yar Khan) Sindh (Ghotki, Sukkur, Khairpur, Larkana, Shikarpur) (mainly irrigated areas and along rivers)	Sanghar	Layyah, Rajanpur and D.G Khan
Focal districts	Rahim Yar Khan	Umarkot	Bhakkar
Type of animal	51% buffalo and 49% cattle	27% buffalo and 73% cattle	30% buffalo and 70% cattle
Total animal number* *(Number calculated with the latest census, 2018) considering 44.4% herd in beefing	Composed of 19% and 24% of total calves produced in Punjab and Sindh provinces respectively	10% of total calves produced in Sindh	13% of total calves produced in Punjab
Available number of beef animal/year	3,150,871	722,480	1,065,190
Location of focal districts	Rahim Yar Khan 28.42° N, 70.29° E	Umarkot 25.35° N, 69.73° E	Bhakkar 31.86° N, 71.38° E
Effect of season	Buffalo and cow have calving season in July-September and February-March, respectively		
Management practices	Low-cost system (heavily depends upon self-cultivated fodders) This traditional system makes heavy demands on family labor	Lowest-cost system farmers (heavily depends upon grazing). The cost of production is minimum in this cluster. Mostly depend upon family labor for the grazing of animals	Low-cost system (grazing provides more than half of the feed requirement) however, remaining requirement is fulfilled with self-cultivated fodders)
Beef producer	Majority of the producers in the cluster are smallholder farmers having average (3-5) adult animals	The cluster has the combination of small, medium and large farmers. The average herd size is (5-8) adult animals	The cluster has the combination of smallholder subsistence, medium and rural commercial dairy farmers. The average herd size is (3-5) adult animals
	Farmers have adopted the traditional husbandry and feeding	Animals have free access to water only 1-2 times in a day during the grazing. However, tied-up again once reached back at the farm in most of the cases. In Tharparkar animals are totally on grazing during the	

	management practices (animals are tied-up and offered 2-3 times drinking water per day)	day. The grazing only on the natural grasses/pasture after harvesting and heavily depends upon the rain. Animals have to travel long distance for drinking water	
	Most of the farmers offered green fodder 40 kg/animal/day by mixing of wheat straw depending upon the nature of green fodder available and concentrate feed only to the beef animals near Eid or before sale	Animals are mainly on grazing and stall feeding on limited available roughages, dried fodder or green fodder. Feed crushed seeds of various fodders and agriculture crops seeds like guar, millet, sorghum etc.	Animals are partially more than (50%) depends upon the grazing. Farmers cultivated the seasonal fodders and usually stall feeding of green fodder, roughages and very limited use of cotton seed cake and concentrate feed only near Eid or before sale
	Calves are retained during the lactation, and then the males are disposed of and females are kept as replacements. Farmers used the calves for beef let-down and did not use oxytocin hormone The average weight gain of calf in this cluster is 100-150 gm/calf/day	Calves rearing is one of the major strengths of this cluster. They did not offer the required amount of beef and concentrate feed to these calves. They sold these calves on urgent need of cash anytime of the year. The average weight gain of calf in this cluster is 60-80 gm/calf/day	Calves are retained during the lactation. Most of the farmers offered the colostrum to calves after the expulsion of placenta. The average weight gain of calf in this cluster is 80-100 gm/calf/day
Product feature	Sold the calves at the average weight of 100-150 Kg	Sold the calves at the average weight of 60-80 Kg	Mostly sold the calves at the average weight of 100-120 Kg
Major fodder production	Berseem, lucerne oats in winter and sorghum, maize during the summer season. Recently, increased trend of growing Rhode grass in southern Punjab	In this cluster, due to shortage of water guar, millet and sorghum are the main fodders. Farmers have to heavily depends upon the grazing on natural grasses	Berseem, barley, mustard, oats in winter and guar, millet, sorghum, cowpea, during the summer season are the major fodders of this cluster
Trader/Middle-men	Small farmer sells beef animals to fulfil his immediate cash needs. Local traders understand the urgent cash needs of the farmers and deals accordingly		

	Typically, the farmer allows the trader to take the animal and trader pays back the settled amount after selling animal in the open market. A beef trader avoids investing his own money except when he has supply order of specific type of animals	
	Beef value chain originate from small farmers and pass through 2 or 3 traders (Middle-men), livestock market (s) (Mandi) and get to the end market actor	
	All livestock populated areas have weekly and monthly livestock markets which are regulated by local government through contractors. Market days are fixed diligently to avoid any overlap between the markets of comparable size and/or locations	
	Butcher retails approximately 96% of total beef production, which originates from culled dairy buffalo or cows which are not (or no longer) productive for dairy purposes. Cull animal is sold at 1/3rd value of beefing animal	
	Trader to trader deals is common when a trader has an order of supplying specific type of animals to exporter or processor. These deals are either carried out through a bargaining process or at a certain fixed profit/animal if trust exists	
	Traders supply animals to abattoirs. It is common for exporters to have developed a network of traders in which one trader coordinate between 10-20 local traders for an efficient supply of specific type of beef animals from different areas of the clusters. Later, the coordinating trader receives the price of animals after slaughtering and weighing of their carcasses (3 to 7 days process)	
	The exporter prefers to deal with one trader, who is also responsible to take back the rejected animals after ante-mortem examination	
	There are seasonal trends in the prices of beef animals. On the supply side, factors like floods, fodder scarcity, sowing season and inadequate winter housing for animals increase the turnout of beef animals in the markets with corresponding contraction in prices. On the demand side, permits to export live animals and large-scale export demand of certain type results in price increases of animal	
	Exportable meat can only be slaughtered and processed in approved abattoirs. Criteria of age, breed (% of exotic blood) and sex of animals are set by importer. More than 98% cow calf/bull is supplied by the small farmers and a few come from feedlots	
New Technologies/ Infrastructure	Few feedlot farms have been established with the traceability mechanism Recently, traditional	There is no product traceability mechanism exist at the moment in both clusters The animal transportation facility is not proper. Animals are being transported on the same trucks used for goods

	butcher shop has been replaced by state-of-the-art meat retailer shops like Zenith, meat one and Khaas meat where all the meat cuts (fresh and frozen) are available	
Export	Exporting beef to many countries like UAE, Saudi Arabia, Kuwait, Bahrain, Oman, Qatar and Iran Increase in Pakistan's world market share from 0.11% in 2008 to 0.26% in 2012	
Research	Characterizations of various native breeds in relation with age, weight to the size of various meat cuts have been characterized which is essential parameter for beef export Livestock departments are locally producing vaccines against many infectious diseases of large animals like FMD, HS and BQ. Departments are playing a remarkable role to prevent the animals against these diseases through carpet vaccinations campaigns during the whole year. Farmers have high level of awareness regarding these diseases Livestock departments are also playing a significant role in the genetic improvement of the local breeds. Progeny testing programs run very well and had huge impact on the genetic improvement of native breeds especially Nili-Ravi buffaloes and Sahiwal and Cholistani breed of cattle	
Certification	Halal certification is essential for the high-end markets of East Asia and North Africa, which currently is not available. Traceability certification, which is an essential requirement for accessing the European market, is not currently practiced Disease free country especially for FMD is one of the biggest challenges. This certification has to be achieved yet	
Socioeconomic networking/ Gender involvement	Women are playing a significant role in smallholder beef production system in all these clusters. They are actively participating in various activities relating to the calves feeding, watering and cleaning. Australian government has funded series of the projects to increase the productivity and profitability of smallholder livestock farmers through improved extension services. They developed 'whole family approach of extension' in which gender is involved to adopt the improved farm practices. Project is extensively being implemented in Punjab and Sindh	
Livestock	Livestock departments in both the provinces are providing the	

Departments	veterinary services to these beef producer farmers mostly focusing on treatment and vaccination against various diseases. Very little extension is available on animal husbandry and disease control.
Subsidies/Incentives Facilities/Taxation	Zero-rated custom duties are being charged on import of livestock related equipment, such as cooling tank, which are exempted from Sales Tax. 100% foreign equity is allowed for corporate livestock farm, local or foreign, private or public limited companies to invest in livestock corporate farming. No government sanction is required to undertake CAF except registration with Board of Investment, Availability of liberal credit. Agriculture Income Tax regime presently applicable on incomes from agriculture would be applicable to CAF, thereby maintaining the preferential treatment available to agriculture. Exemption of dividends from tax. State land can be purchased or leased for 50 years, and extendable for another 49 years. Existing definitions of farming activity, as distinct from processing/industrial activity, continue to be maintained.

Annexure 9. SWOT Analysis by Cluster

A. Cluster-1 (South Easter Punjab and North Western Sindh)

Parameters	Strengths	Weakness	Opportunities	Threats
Season	Majority of the calving take place during summer/rainy season and cattle during the spring (February-April)	There are two fodder shortage periods (May-June) and (Nov-Dec) every year which significantly affect the growth rates of calves	In peak season when fodder is surplus farmers can make silage and hay could be effectively utilized during the fodder shortage periods	Increase flooding with more intense and frequent rainfalls
		High calve mortality rates in extreme weather conditions especially (Dec-Jan) in buffalo's calves and high morbidity rate during rainy season when immunity lower down		Drought during winter and shortage of canal water
Input supplies	There are many commercial companies	Increased level of aflatoxins can affect the health of animals and	Quality laboratories are available for feed analysis in	Use of poor-quality feed leads to more chances of diseases associated with aflatoxins

	producing wide range of concentrate feeds, silage, and hay in the market	teratogenic effect, depression, infertility, carcinogenic and immunosuppression type diseases in humans	Punjab and Sindh which can play a major role to gauge the quality of feed and toxic levels of aflatoxins	
	Quality fodder seed (Rhode grass, alfalfa, oats, sorghum multi-cut) are now available in the market	For the smallholder farmers the prices of these quality seed are much higher	Farmers can produce their own fodder seed production which could be added source of their income and availability of quality fodder seeds for future cultivation	Fodder seed production decreases every year
	Medicines, vaccines, dewormers are available	The quality of locally produced vaccines is not good. However, imported vaccines could not meet the demand of country	There is great opportunity of local production of quality vaccines	Poor quality vaccine sometime become the cause of disease outbreak
Cluster interaction	Large number of producers located in close cluster	Livestock department is providing the veterinary services to the farmers. However, there is no mechanism to properly link such a huge number of the farmers with on-going research/extension activities	Possibility of learning from progressive farmers in the cluster	
		It is very challenging to share the benefits of improved beef value chain to the smallholder producer level with such a huge number of producers and their product variations due to different feeding management practices	If the farmers will work in the cluster, they will be connected with improved beef value chain and get better price of their well fattened calves	Consumer awareness will take time to be established properly
		No contract farming with defined quantities	Farmers are not getting extra benefit of rearing	Selling poor quality beef to the consumers

		and quality parameter	quality beef animals on good farm practices	
		Little credit availability from formal institutes for any actor of cluster	Farmers can use electronic /social media/newspaper and various available mobile linked extension program to improve the efficiency and profitability of their farms	Internet availability
Production management practices	Large feedlot farmers adopted improved practices	Farmers did not offer colostrum before the expulsion of placenta, offered green fodder before one month of their age and did not use the concentrate feed for rearing their calves	Availability of extension training modules developed by ASLP dairy project, University of Veterinary and Animal Sciences, Lahore. The material consists of 10 modules and 33 fact sheets (Animal husbandry, nutrition, reproduction, health, social mobilization, ration formulation, breed selection, beef marketing, fodder production and fodder seed production) are simple, adoptable and have positive impact of the productivity	Government have to change the focus from the veterinary services to the improved extension services (curative to preventive)
		Lack of resources to adopt improved husbandry and feeding practices for their animals		
		Poor growth rates, high mortality rates		
		Small and medium size farmers are not adopting improved practices		
Transportation	Good road infrastructure connecting with all big cities	There is no proper arrangement/truck design according to the type of animals to transport from one place to another place	There is need to develop specialized truck for transportation of animals according to the animal type	It will be expensive for small scale farmers

		Calves loss the weight during travel, due to transportation stress the quality of meat affected badly. No legislation	Animal welfare rules should be applicable for the transportation of the animals	
Marketing	Great opportunity for the farmers where beef prices are low, and they can raise the calves and get better profit	Farmers are not getting good price of their calves raised on improved practices	Small and medium size farmers can sell their calves to feedlot operations	
	High demand of quality beef and properly processed offal's frozen (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)	Cattle markets are not operated on weight basis. Whole business is on visual observations and bargaining system		
		Cattle markets are the source of high risk of diseases		
		Small farmers can't bring their animals to cattle markets directly due to the high transportation charges	Farmers can sell their calves to the processors directly	Processors/supermarkets may exclude small farmers from the quality market
Trade/Export	There will be tremendous opportunities to export quality beef to many countries	Limited access to global market. Halal certification and traceability	Due to the cold chain development beef quality will be improved	The price of beef will be increased due to processing and cold chain
	High demand of processed offal's frozen (stomach, hooves, intestine, head, tongue, liver,	Little trade links with high end market. High cost of processing, packages and transportation	The native cattle breeds with hump have high demand in international market	Limited opportunity of export in European/many countries due to FMD and other diseases (need certification)

		kidney, brain etc.)			

Parameter	Strengths	Weakness	Opportunities	Threats
		Traditional butcher shop has been replaced by state-of-the-art meat retailer shops like Zenith, meat one and Khaas meat where all the meat cuts (fresh and frozen) are available	Lack of direct flight services, shortage of air cargo space during high season and inadequate cargo handling limit the export	Producers will be able to get better price and consumer will be able to get healthier products	
Processing	There is a great opportunity of meat value addition products ready to cook and skin for leather industry	Unavailability of modern processing plants, technologies, and equipment for processing	Huge demand for meat processed products within the country and abroad	The prices of the beef will be increased
		Lack of human resource development	Government incentives for the import of agriculture machinery especially cold storage machinery	Big processing firms from china through CPEC with big incentives from the Govt. of Pakistan may grab the whole beef processing market
		Government institutions/research organizations are far behind the needs of the industry		

B. SWOT cluster-2 (Southern Western Sindh)

Parameters	Strengths	Weakness	Opportunities	Threats
Season	In this cluster 90% of the producers have the cows which calved during the months of February-March	The cultivation of the fodders and crops totally depends upon rain which play a critical role to the survival of animals and their productivity	In rainy season the whole areas become lush green and huge grazing pastures are available. During that peak season when fodder is surplus farmers can make hay could	Drought condition is the serious threat in this cluster

			be effectively utilize during the fodder shortage periods	
		The land is sandy/baron and underground water is very deep	Farmers can cultivate many drought resistant fodder varieties, shrubs and trees etc.	
Input supplies	There are many commercial companies producing wide range of concentrate feeds, silage, and hay in the market	Farmers have lack of resources to purchase expensive input supplies (silage, hay and concentrate feeds) for their animals	There is tremendous potential for research organizations to work on the drought resistant fodder varieties in future	It will take time to adoption improved practices in this area
	The cluster is near the Karachi which could be a very big source of industrial waste products like (sugar cane, fruit pulp, bakeries left over, pieces of breads etc.)	The genetic potential of the calves is very poor. The average weight gain is 60-80 gm/day	It could be a good business opportunity for the commercial fodder seed companies as well to introduce the seed of drought resistant fodder varieties in this huge area	Expensive for the smallholder farmers
	Medicines, vaccines, dewormers are available	The quality of locally produced vaccines is not good. However, imported vaccines could not meet the demand of country	There is great opportunity of local production of quality vaccines	Poor quality vaccine sometime become the cause of disease outbreak
Cluster interaction	Large number of farmers distributed throughout the cluster	There is no proper roads network and transportation which badly impact on the beef marketing		
		It is very challenging to link with such a huge number of producers and their product variations due to different feeding	Farmers can use electronic /social media/newspaper and various available mobile linked extension program to improve the	Poor literacy rate in the cluster

		management practices	efficiency of their farms	
		No contract farming with defined quantities and quality parameter	Farmers are not getting extra benefit of rearing calves with improved farm practices	Selling poor quality beef animal to the consumers
		Little credit availability from formal institutes for any actor of cluster	Many NGOs like NRSP is working in these areas and providing them the facility of small-scale loans	Interest rate is more
Production management practices	Lowest-cost of production	Farmers did not offer colostrum before the expulsion of placenta, offered green fodder before one month of their age and did not use the concentrate feed for rearing their calves	Recently, largest coal mining reserves have been identified in this area. The China government is exploiting massive coal reserve in the area. Government should take serious steps to improve the livelihood of people and genetic potential of these animals with quality semen in this cluster	The impacts of genetic improvement are visible after few years
		Lack of resources to adopt improved husbandry and feeding practices for their animals		
		Poor growth rates, high mortality rates		
		Farmers are not adopting improved practices		
Transportation	Good road infrastructure in few parts of the cluster	There is no proper arrangement/truck design according to the type of animals to transport from one place to another place	There is need to develop specialized truck for transportation of animals according to the animal type	It will be expensive for small scale farmers
		Calves loss the weight during travel, due to transportation stress the quality of meat affected badly. No	Animal welfare rules should be applicable for the transportation of the animals	

		legislation		
Marketing	Great opportunity for the farmers where beef prices are low, and they can raise the calves and get better profit	Farmers are not getting good price of their calves raised on improved practices	Small and medium size farmers can sell their calves to feedlot operations	
	High demand of quality beef and properly processed offal's frozen (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)	Cattle markets are not operated on weight basis. Whole business is on visual observations and bargaining system		
		Cattle markets are the source of high risk of diseases		
		Small farmers can't bring their animals to cattle markets directly due to the high transportation charges	Farmers can sell their calves to the processors directly	Processors/supermarkets may exclude small farmers from the quality market
Trade/Export	There will be tremendous opportunities to export quality beef to many countries	Limited access to global market. Halal certification and traceability	Due to the cold chain development beef quality will be improved	The price of beef will be increased due to processing and cold chain
	High demand of processed offal's frozen (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)	Little trade links with high end market. High cost of processing, packages and transportation	The native cattle breeds with hump have high demand in international market	Limited opportunity of export in European/many countries due to FMD and other diseases (need certification)
	Traditional butcher shop has been replaced by state-of-the-art meat	Lack of direct flight services, shortage of air cargo space during high season and inadequate cargo handling limit the export	Producers will be able to get better price and consumer will be able to get healthier products	

		Unavailability of modern processing plants, technologies, and equipment for processing	Huge demand for meat processed products within the country and abroad	The prices of the beef will be increased
	retailer shops like Zenith, meat one and Khaas meat where all the meat cuts (fresh and frozen) are available			
Processing	There is a great opportunity of meat value addition products ready to cook and skin for leather industry	Unavailability of modern processing plants, technologies, and equipment for processing	Huge demand for meat processed products within the country and abroad	The prices of the beef will be increased
		Lack of human resource development	Government incentives for the import of agriculture machinery especially cold storage machinery	Big processing firms from china through CPEC with big incentives from the Govt. of Pakistan may grab the whole beef processing market
		Government institutions/researc h organizations are far behind the needs of the industry		

C. SWOT cluster-3 (Western Punjab)

Parameters	Strengths	Weakness	Opportunities	Threats
Season	Majority of the cows calved during the spring season (February to April)	This is Arid zone in Punjab and producers have to heavily depends upon rain in order to cultivate the fodder and crops	Producers used tube-wells and few places irrigated water is also available. In rainy season when producers have surplus fodder, they can make hay could be effectively utilize during the fodder shortage periods	Drought condition is the serious threat in this cluster
			Farmers can cultivate many drought resistant fodder varieties, shrubs and trees etc.	
Input supplies	There are many commercial companies producing wide range of concentrate feeds, silage, and hay in the market	Farmers have lack of resources to purchase expensive input supplies (silage, hay and concentrate feeds) for their animals	There is tremendous potential for research organizations to work on the drought resistant fodder varieties in future	It will take time to adoption improved practices in this area
	In this cluster there are number of the opportunities for the effective use of industrial waste products like sugar beet pulp, orange pulp, by product of chickpeas, sugar cane etc.	The genetic potential of the animal is very poor particularly in the districts like Attock and Chakwal. The average weight gain is 80-100 gm/day	It could be a good business opportunity for the commercial fodder seed companies as well to introduce the seed of drought resistant fodder varieties in this huge area	Expensive for the smallholder farmers
	Medicines, vaccines, dewormers are	The quality of locally produced vaccines is not good. However,	There is great opportunity of local production of quality	Poor quality vaccine sometime become the cause of disease outbreak

	available	imported vaccines could not meet the demand of country	vaccines	
Cluster interaction	Large number of farmers distributed throughout the cluster	The cluster have quite diverse socio-economic classifications. Sometime uniform strategy did not work in these circumstances		
		It is very challenging to link with such a huge number of producers and their product variations due to different feeding management practices	Farmers can use electronic /social media/newspaper and various available mobile linked extension program to improve the efficiency of their farms	Poor literacy rate in the cluster
		No contract farming with defined quantities and quality parameter	Farmers are not getting extra benefit of rearing calves with improved farm practices	Selling poor quality beef animal to the consumers
		Little credit availability from formal institutes for any actor of cluster	Many NGOs like NRSP is working in these areas and providing them the facility of small-scale loans	Interest rate is more
Production management practices	Low-cost of production system	Farmers did not offer colostrum before the expulsion of placenta, offered green fodder before one month of their age and did not use the concentrate feed for rearing their calves	There is a tremendous potential of beef production in this area. Producers can use the quality semen to improve the genetic potential of the native breeds. These cattle breeds have been very well adopted with the harsh environment. Cross-breeding with the quality semen will increase the weight gain to many folds will result into	The impacts of genetic improvement are visible after few years
		Lack of resources to adopt improved husbandry and feeding practices for their animals		
		Poor growth rates, high mortality rates		
		Farmers are not		

		adopting improved practices	improve the livelihood of farming communities located in this cluster	
Transportation	Good road infrastructure connecting with all big cities	There is no proper arrangement/truck design according to the type of animals to transport from one place to another place	There is need to develop specialized truck for transportation of animals according to the animal type	It will be expensive for small scale farmers
		Calves loss the weight during travel, due to transportation stress the quality of meat affected badly. No legislation	Animal welfare rules should be applicable for the transportation of the animals	
Marketing	Great opportunity for the farmers where beef prices are low, and they can raise the calves and get better profit	Farmers are not getting good price of their calves raised on improved practices	Small and medium size farmers can sell their calves to feedlot operations	
	High demand of quality beef and properly processed offal's frozen (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)	Cattle markets are not operated on weight basis. Whole business is on visual observations and bargaining system		
		Cattle markets are the source of high risk of diseases		
		Small farmers can't bring their animals to cattle markets directly due to the high transportation charges	Farmers can sell their calves to the processors directly	Processors/supermarkets may exclude small farmers from the quality market
Trade/Export	There will be tremendous opportunities to export quality beef to many countries	Limited access to global market. Halal certification and traceability	Due to the cold chain development beef quality will be improved	The price of beef will be increased due to processing and cold chain

	High demand of processed offal's frozen (stomach, hooves, intestine, head, tongue, liver, kidney, brain etc.)	Little trade links with high end market. High cost of processing, packages and transportation	The native cattle breeds with hump have high demand in international market	Limited opportunity of export in European/many countries due to FMD and other diseases (need certification)
	Traditional butcher shop has been replaced by state-of-the-art meat retailer shops like Zenith, meat one and Khaas meat where all the meat cuts (fresh and frozen) are available	Lack of direct flight services, shortage of air cargo space during high season and inadequate cargo handling limit the export	Producers will be able to get better price and consumer will be able to get healthier products	
Processing	There is a great opportunity of meat value addition products ready to cook and skin for leather industry	Unavailability of modern processing plants, technologies, and equipment for processing	Huge demand for meat processed products within the country and abroad	The prices of the beef will be increased
		Lack of human resource development	Government incentives for the import of agriculture machinery especially cold storage machinery	Big processing firms from china through CPEC with big incentives from the Govt. of Pakistan may grab the whole beef processing market
		Government institutions/research organizations are far behind the needs of the industry		

Annexure 10. Guidelines for Good Agricultural Practices

A. Guideline for maintaining animal health

Best farming practice	Examples of suggested measures to achieve good beef farming practice	Objectives of these measu
Establish the herd with resistance to disease	o Choose breeds and animals well suited to the local environment and farming system o Determine herd size and stocking rate based on management skills, local conditions and the availability of land, infrastructure, feed, and other inputs o Vaccinate all animals as recommended or required by local animal health authorities	Enhance herd disease resistance / reduce stress
Prevent the entry of disease in to the farm	o Only buy animals of known health status (both herd and individual animals) and control their introduction to the farm using quarantine if indicated o Ensure animal transport on and off the farm does not introduce disease o Monitor risks from adjoining land and neighbors and have secure boundaries o Where possible, limit access of people and wildlife to the farm o Only use clean equipment from a known source	Maintain farm biosecurity. Keep animals healthy. Comply with international/national/regional animal movement and disease controls
Have an effective herd health management programme in place	o Use an identification system that allows all animals to be identified individually from birth to death o Develop an effective herd health management programme focused on prevention that meets farm needs as well as regional and national requirements o Regularly check animals for signs of disease o Sick animals should be attended to quickly and in an appropriate way o Keep sick animals isolated o Don't slaughter the sick animals and animals under treatment o Keep written records of all treatments and identify treated animals appropriately o Manage animal diseases that can affect public health (zoonoses)	Detect animal diseases early. Prevent spread of disease among animals. Ensure food safety. Ensure traceability
Use all chemicals and veterinary medicines as Directed	o Only use chemicals approved for supply and use under relevant legislation o Use chemicals according to directions, calculate dosages carefully and observe appropriate withholding periods o Only use veterinary medicines as prescribed by veterinarians o Store chemicals and veterinary medicines securely and dispose of them responsibly	Prevent occurrence of chemical residues in beef

B. Guideline for nutrition (feed and water)

Best farming practice	Examples of suggested measures to achieve good beef farming practice	Objectives of these measu
Secure feed and water supply from sustainable sources	o Plan to ensure that the herd's feed and water requirements are met o Implement sustainable nutrient, irrigation and pest management practices when growing feed o Source farm inputs from suppliers implementing sustainable systems	Provide the herd with adequate feed and water. Limit the potential impact of beef feed production on the environment
Ensure animal feed and water are of suitable quantity and quality	o Ensure the nutritional needs of animals are met o Ensure the feed fed to dairy animals is fit for purpose and will not negatively impact the quality or safety of their meat o Ensure suitable quality water is provided and the supply is regularly checked and maintained o Use different equipment for handling chemicals and feed stuffs o Ensure chemicals are used appropriately on pastures and forage crops and observe withholding periods o Only use approved chemicals for treatment of animal feeds or components of animal feeds and observe withholding periods	Keeping animals healthy with good quality feed. Preserve water supplies and animal feed materials from chemical contamination. Avoid chemical contamination due to farming practices.
Control storage conditions of feed	o Separate feeds intended for different species o Ensure appropriate storage conditions to avoid feed spoilage or contamination o Reject moldy or sub-standard feed	Prevent microbiological or toxin contamination or unintended use of prohibited feed ingredients or feeds contaminated with chemical preparations. Keeping animals healthy with good quality feed
Ensure the traceability of feedstuffs brought on to the farm	o Where possible, source animal feed from suppliers having an approved quality assurance programme in place o Keep records of all feed or feed ingredients received on the farm	Quality of the feeds fed to beef animals are assured by the supplier or farmer. Prevent the use of feeds that are unsuitable for beef animals

C. Guideline for animal welfare

Best farming practice	Examples of suggested measures to achieve good beef farming practice	Objectives of the measures
Ensure animals are free from thirst, hunger and Malnutrition	o Provide enough feed and water for all animals every day o Adjust stocking rates and/or supplementary feeding to ensure adequate water, feed and fodder supply o Protect animals from toxic plants and other harmful substances o Provide water supplies of good quality that are regularly checked and maintained	Healthy, productive animals
Ensure animals are free from discomfort	o Design and construct buildings and handling facilities to be free of obstructions and hazards o Provide adequate space allowances and clean bedding o Protect animals from adverse weather conditions and the consequences thereof o Provide housed animals with adequate ventilation o Provide suitable flooring and footing in housing and animal traffic areas o Protect animals from injury and distress during loading and unloading and provide appropriate conditions for transport	Protection of animals against extreme climate conditions Provide a safe environment
Ensure animals are free from pain, injury and disease	o Have an effective herd health management programme in place and inspect animals regularly o Do not use procedures and practices that cause unnecessary pain o Follow appropriate birthing and weaning practices o Have appropriate procedures for marketing young beef animals o Protect against lameness o When animals have to be euthanized on-farm, avoid unnecessary stress or pain	Justified and humane actions. Good sanitary conditions. Prevention of pain, injury and disease. Prompt treatment of pain, injury and disease. Humane destruction of badly injured or incurably diseased animals
Ensure animals are free from fear	o Consider animal behaviour when developing farm infrastructure and herd management routines o Provide competent stock handling and husbandry skills and appropriate training o Use facilities and equipment that are suitable for stock handling	Animals are less fearful of people, their handling facilities and their environment. Safety of animals and people.
Ensure animals can engage in relatively normal patterns of animal behaviour	o Have herd management and husbandry procedures that do not unnecessarily compromise the animals' resting and social behaviour	Freedom of movement. Preserve gregarious behaviour and other behaviour, such as preferred sleeping position

D. Guideline for environment

Best farming practice	Examples of suggested measures to achieve good beef farming practice	Objectives of these measu
Implement an environmentally sustainable farming system	o Use farm inputs such as water and nutrients efficiently and sustainably o Minimize the production of environmental pollutants from beef farming o Manage livestock to minimize adverse environmental impacts o Select and use energy resources appropriately o Maintain and/or encourage biodiversity on the farm	Beef farming practices meet statutory and community expectations
Have an appropriate waste management system	o Implement practices to reduce, reuse or recycle farm waste as appropriate o Manage the storage and disposal of wastes to minimize environmental impacts	Limit the potential impact of beef farming practices on the environment. Beef farming practices comply with relevant regulations
Ensure beef farming practices do not have an adverse impact on the local environment	o Use agricultural and veterinary chemicals and fertilizers appropriately to avoid contamination of the local environment o Ensure the overall appearance of the dairying operation is appropriate for a facility in which high quality food is harvested	Minimize the impact of beef production on the local environment. Present a positive image of beef farming

Annexure 11. Estimated monthly cost of Extension and Veterinary Services

A. Extension team/unit

Description	Rate	Cost (Rs.)
Salaries of two veterinary extension workers (male & female)	50,000	100,000
Rent a car including POL for 20 field days in month	6,000	120,000
Expenditures trainings/capacity building of two extension workers	10,000	20,000
Extension material printing expenditures*	300	37,500
Stationary, printing, internet charges etc	10,000	10,000
Total		**287,500**

* Team will visit 3 villages/day and each village has the group of 25 farmers. In one month, 20 fields days team will cover 1500 families every month. Rs. 192/month/family extension cost

B. Veterinary Team

Description	Rate	Cost (Rs.)
Salaries of two veterinary assistants (one A.I technician)	35,000	70,000
POL and maintenance for two motorbikes	1,000	30,000
Expenditures trainings/capacity building of two extension workers	5,000	10,000
Total		**110,000**

* Team will provide the services to 1500 families every month. Rs. 73/month/family veterinary services cost

Annexure 12: Feasibility of Beef Fattening

Machinery and equipment and its cost

Description	Quantity (Nos.)	Unit Price (Rs.)	Total (Rs.)
Weighing scale	1	100,000	100,000
Fodder chopper and other Equipment	1	50,000	50,000
Veterinary kit	1	20,000	20,000
Water pump	1	50,000	50,000
Miscellaneous machinery (Farm utensils)	-	40,000	40,000
		Total:	**260,000**

Building and shed and its cost

Space requirement (Sq. ft)	Cost Rs. /Unit	Quantity Nos.	Area (Sq. ft.)	Total Cost (Rs.)
Shed for the animals	500	1	750	375,000
Open paddock for calves	100	1	1500	150,000
Store (Feed and machine)	500	1	500	250,000
Labor house	500		500	250,000
			Total:	**1,025,000**

Furniture and fixture and its cost

Description	Quantity (Nos)	Unite Price
Furniture and fixture	As total	20,000
	Total:	**20,000**

Animal cost

Description	Quantity (Nos)	Unit Price	Rs.
Cost of purchase of animals (125 kg body weight)	50	30,000	1,500,000
Mortality rate (4%)	2	30,000	60,000
		Total:	**1,440,000**

Operational and maintenance cost

Description	Quantity (Nos.)	Unit Price (Rs.)	Total (Rs.)
Cost of feeding animals @ Rs. 116/day (including fodder/silage and concentrate)	50	116	5,800
Cost of medicines	-	-	4,00
Vaccination cost per calves	100	950	95,000
Electricity	-	-	15,000
Diesel Charges	-	-	15,000
		Total:	**134,800**

Human resource requirement and its cost

Description	No. of Employees	Salary/person/month	Total per year
Labor	2	18,000	432,000
Farm supervisor	1	30,000	360,000
		Total:	**792,000**

Pre-operation cost

Description	Total (Rs.)
Cost of the total assets	1,439,800
Debt (30%)	431.940
Mark up @16% of total debt amount	69,110.40

Estimation of Feasibility

Feasibility for Calf fattening

Revenues		Year 1	Year 2	Year 3	Year 4	Year 5
Revenue (PKR)						
Anuall seassion			150	150	150	150	150
Numbers of animals that can be fatten (anually)			50	50	50	50	50
Mortality rate of the calves (4%)			48	48	48	48	48
Price of the meat (PKR kg)	400	400	400	400	400	400
Price of the animal before fattening	35000	1750000	1750000	1750000	1750000	1750000
Price of the animal after fattening	70000	3360000	3360000	3360000	3360000	3360000
Revenue generated after fattening		1610000	1610000	1610000	1610000	1610000
Direct varaible costs						
Weight before fattening (kg)			85	85	85	85
Weight after fattening			170	170	170	170
Weight difference			85	85	85	85
Price of the additional quantity after fattening			34,000	34,000	34,000	34,000
Labor cost			264,000	264,000	264,000	264,000
Electricity and water			30000	30000	30000	30000
Depreciation sost			81706	81706	81706	81706
Maintinance (5% of the machinery, equipment and furniture cost)			68706	68706	68706	68706
Land & building		300	1025000			
Total variable cost			1,469,411	444,411	444,411	444,411
Gross profit			140589	1165589	1165589	1165589
Indirect fixed cost						
Machinery		- 1,374,110				
Total		-1374110	0	0	0	0
Grand total cost		-1374110	1469411	444411	444411	444411
Net profit (Net cash flow)		-1374110	140589	1165589	1165589	1165589
NPV	8.5%		1,381,740			
IRR			42%			
			1469411	444411	444411	444411
			Total cost	Depreciation	Percentage for depricaia	
Machinery cost			260,000	26000	10%	
Misc. Fixed assets			20,000	1000	5%	
Pre-operation cost			69,110	3456	5%	
Land & building			1,025,000	51250	5%	
Total depreciation			1,374,110	81706		

Annexure 13: Feasibility Study of Small Beef Slaughterhouse

Project concept

Slaughterhouse (abattoir) is a meat processing facility where animals are slaughtered eviscerated or dressed. A well-established slaughterhouse working under regulated operations ensures that animals to be slaughtered are healthy and disease free. The slaughtering process is carried out under complete hygienic conditions to provide consumers with hazard-free meat. Well planned and controlled cleaning and sanitation of machines/equipment, rooms, and adequate personal hygiene are enforced to achieve the required food safety standards. Pollution control during slaughtering by prompt disposal of liquid and solid waste, and preparation and processing of carcass in a safe healthy environment is effectively managed.

In Pakistan, meat is mostly produced at butcher shops or unorganized slaughterhouses, whereas mechanized slaughterhouses producing meat under the required hygienic conditions are limited in number. Most of the meat is produced without observing the hygiene standards and ignoring the overall cleaning process. To follow the standard slaughtering practices, small abattoirs are needed to be established to produce quality meet acceptable to export and domestic market. Although significance of the fully mechanized slaughterhouses cannot be ignored, small and semi mechanized facilities, if well executed and functioned by regulated operations, can produce globally acceptable beef. This feasibility study proposes to establish semi-mechanized abattoir having capacity to process 15-20 cattle per day. Instead of transporting the live animals to the beef markets, the proposed village level slaughter houses have to be established in the beef animal cluster areas.

Potential market

Due to growing population, the demand for quality meat in the domestic and export markets is increasing. Not only the export market but due to increasing food safety awareness, demand for good quality meat processed under hygienic conditions is significantly increasing in the domestic market as well. The increasing average disposal income of middle- and upper-income segments of the local population is making it affordable for an increasing number of people. The past decade has seen opening of large formal meat shops in all the major cities of the country which is an indicator of the growing demand for high quality meat in the domestic market.

Another growing market is that of Halal processed food in which meat is one of the major products. Halal meat is a new attraction for the consumers of Muslim countries due to their religious considerations. Halal meat is gaining popularity even in non-Muslim communities due to its better hygiene and food safety standards. Halal certification can substantially enhance the value of a carcass. The product is able to claim a higher price in the market by being categorized as a special segment of the market.

Slaughterhouse process

Process flow

The received cattle should have a rest period after arrival at the slaughterhouse; keeping them cool with adequate ventilation. Animals should be allowed access to water but held off feed for 12 to 24 hours before the slaughtering time. To screen out sick, suspected diseased or injured animals, they are inspected before slaughtering. Generally, to render them unconscious, stunning is done by mechanical, electrical or carbon dioxide (CO_2) gas. Stunning is optional, some of the slaughterhouses producing Halal meat also follow this practice; a small facility may not go for stunning.

Slaughtering is done by a deep incision with a very sharp knife on the throat, cutting the wind pipe, jugular veins and carotid arteries of both sides but leaving the spinal cord intact. After the animal is bled completely, the forelegs, tail and head are removed from the slaughtered animal. The hide is pulled off by a hide puller or can be done manually at small village level abattoirs. The carcass brisket is cut by an electric saw and offal is taken out. By using the electric saw, the carcass is longitudinally split along the vertebral column into two halves. The carcass and offal are inspected to ascertain their suitability for human consumption. Only offal and the meat parts fit for human consumption pass the inspection. The carcass and offal which are fit for human consumption are officially stamped. The beef carcass halves are then rinsed with water in the rinsing area and the offal is cleaned in the offal washing room. Each side of the carcass is cut into two quarters between the 5th and 6th ribs. The quarters are chilled by storing in the chilling store before dispatching for further cutting and packing.

Figure 7 – Beef slaughterhouse process flow
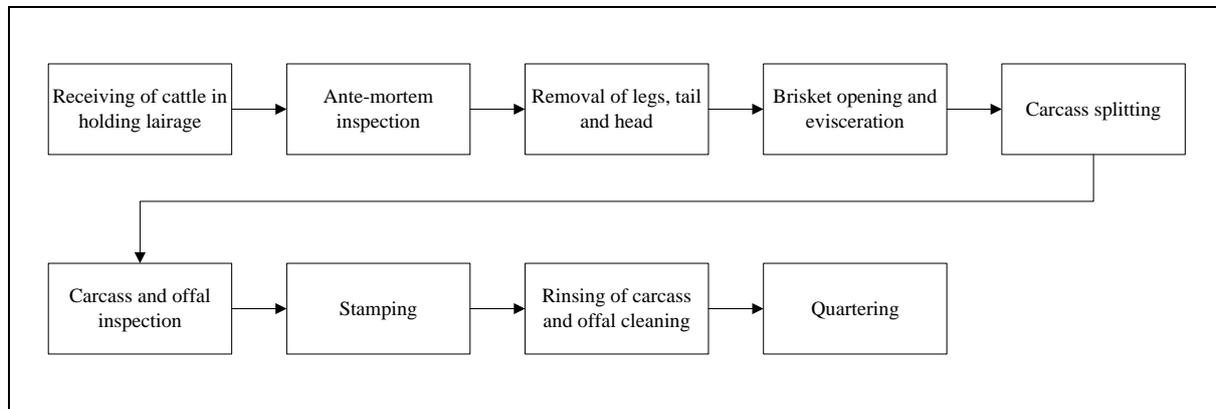
Project cost

Total project cost of the proposed small beef slaughterhouse is PKR 15.1 million. Major items of project cost are listed in Table 1.

Table 1 – Project cost details

Cost item	Cost (PKR)
Land	-
Building & civil works	-
Processing machinery	7,800,000
Utility/allied machinery	200,000

Laboratory equipment	-
Office equipment & furniture	187,000
Vehicles	2,000,000
Pre-operating expenses	690,000
Capital investment	10,877,000
Working capital	4,221,068
Total project cost	15,098,068

The project is assumed to be fully financed with shareholder's equity; without any debt financing.

Land and building

The proposed project will be established in a rented building with a covered area of around 3000 sq. ft. It is assumed that electricity and water connections will be available in the space rented for the project. Thus, the costs of electricity and water connections have not been included in the project cost. In case, these facilities are not available at the selected location, the costs of obtaining the connections of these two utilities will be added.

Machinery and equipment

The feasibility study has been based on locally manufactured machinery. This has been done to keep the capital cost of the project lower to keep it within the reach of smaller investors in the rural areas.

The required machinery and equipment comprise of processing machinery and utility machinery with a total cost of PKR 8.0 million. Summary of the machinery cost is shown in Table .

Table 2 – Machinery and equipment cost summary

Machinery	Cost (PKR)
Processing machinery	7,800,000
Utility/allied machinery	200,000
Total	8,000,000

Details of the two types of machinery and equipment are shown in Table **69**3 and Table 4.

Table 69 – Processing machinery cost

Sr. No	Machinery	No.	Unit Cost (PKR)	Total Cost (PKR)
1.	Small animal Lairage facility for 25 animals	1	300,000	300,000
2.	Small slaughter hall with capacity of 10-15 animals	1	2,000,000	2,000,000
3.	15x30 (10 hp) chiller with 3000 kg meat chilling	1	3,500,000	3,500,000

	capacity			
4.	Steel railing for 10-15 animals/hour	1	400,000	400,000
5.	Steel hangers 100 PC	1	200,000	200,000
6.	Steel lifts and work platform	1	200,000	200,000
7.	Stainless steel landing cradle for trap	1	400,000	400,000
8.	Fixed platform leg cutting (local)	1	300,000	300,000
9.	Lifting electric hoist	1	200,000	200,000
10.	Water pump and tank for storage	1	100,000	100,000
11.	Weight balance for live animals and carcass	1	100,000	100,000
12.	Miscellaneous	1	100000	100000
	Total			**7,800,000**

Table 4 – Utility machinery cost

Sr. No	Machinery	No.	Unit Price (PKR)	Total Price (PKR)
1	Generator 100 KVA	1	200,000	200,000
	Total			**200,000**

Other project cost items

- Office equipment and furniture has been included at a total cost of PKR 187,000.
- Pre-operating expenses include those expenses which have to be incurred before the business becomes operational. The costs included under this head are business registration/licensing, machinery transport, machinery erection and commissioning, personnel, routine administration and project's promotion. Pre-operating costs have been worked out to be PKR 690,000.
- Working Capital calculation includes the cost of two-day supply of animals, three months cost of building lease, one-month cost each of electricity bill and processing and two months cost of the staff salaries. Machinery spares equal to 1% of machinery cost and petty cash of PKR 1000,000 have also been included in the working capital. With these assumptions, total working capital requirement has been calculated to be PKR 4.22 million.

Revenues and costs

Revenues

Revenues will be generated by selling beef carcasses obtained after slaughtering the animals. It has been assumed that the project will process 20 animals per day. Operating at 300 days per year, the project will be able to process 6000 animals per year.

At a selling price of PKR 380 per kg, project's revenues for the first year will be PKR 342 million. Selling price has been assumed to remain constant over five years. Revenue calculations for five years are shown in Table 5.

Table 5 – Revenue Calculations

	Year 1	Year 2	Year 3	Year 4	Year 5
Capacity Utilization (%)	100%	100%	100%	100%	100%
Production (kg)	900,000	900,000	900,000	900,000	900,000
Price (PKR/kg)	380.0	380.0	380.0	380.0	380.0
Revenues (PKR)	342,000,000	342,000,000	342,000,000	342,000,000	342,000,000

Costs

Animals Cost

Animals constitute the major cost of slaughterhouse. This cost has been assumed to be PKR 50,000 per animal. The cost has been assumed to remain constant for five years. With these assumptions, animal cost for five years is shown in Table .

Table 6 – Animals cost calculations

	Year 1	Year 2	Year 3	Year 4	Year 5
No. of animals slaughtered	6,000	6,000	6,000	6,000	6,000
Cost per animal (PKR)	50,000	50,000	50,000	50,000	50,000
Animals Cost (PKR)	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000

Other costs

- Miscellaneous processing cost (excluding the electricity cost) has been assumed to be PKR 100 per animal slaughtered. Processing cost for first year to slaughter 6000 animals comes out to be PKR 600,000 per annum. Processing cost has been assumed to remain constant for five years.

- Building Lease cost has been assumed to be PKR 40,000 per month.

- Electricity cost has been worked out based on an electricity connection of 40 KVA. Electricity cost for the first year has been calculated to be PKR 1,212,810.

- Plant maintenance cost has been assumed to be 1% of machinery cost; growing by 0% each year. Maintenance cost during the first year has been calculated to be PKR 80,000.

- Transportation cost has been assumed to be PKR 2000 per animal which comes out to be PKR 12 million for transporting 6000 animals during the year.

- Marketing cost includes the cost of direct marketing by meeting the potential customers, advertising and doing awareness building activities. It has been assumed to be PKR 1,000 per day or PKR 30,000 per month or PKR 360,000.

- Administration cost includes the cost of travelling, office stationery, telephone and refreshment. Administration cost during first year of operations is calculated as PKR 336,000.

- Depreciation cost has been calculated using straight line method. A life of ten years has been assumed for machinery and equipment and five years for office equipment. Pre-operating expenses have been amortized over a period of five years.

Human resource cost

The proposed beef slaughterhouse unit will need small workforce; including a manager, a veterinary doctor, a team of butchers, machine operator, electrician and support staff. Total manpower requirement for this project will be fifteen. Human resource requirements and the associated costs are shown in Table .

Table 7 – Human resource cost

Designation	No.	Salary (PKR/month)	Total (PKR/month)	No. of Months	Salary per Year (PKR)
Manager	1	60,000	60,000	12	720,000
Butchers	6	30,000	180,000	12	2,160,000
Machine operator	1	35,000	35,000	12	420,000
Electrician	1	30,000	30,000	12	360,000
Veterinary doctor	1	60,000	60,000	12	720,000
Driver	1	30,000	30,000	12	360,000
Sweeper	2	25,000	50,000	12	600,000
Security guard	2	25,000	50,000	12	600,000
Total staff	15		495,000		5,940,000

Projected financial statements

Table 8 – Projected profit & loss statement

	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Revenues	342,000,000	342,000,000	342,000,000	342,000,000	342,000,000
Direct Costs					
Animals	300,000,000	300,000,000	300,000,000	300,000,000	300,000,000
Processing Cost	600,000	600,000	600,000	600,000	600,000
Direct Labor	4,020,000	4,020,000	4,020,000	4,020,000	4,020,000
Direct Electricity	1,188,810	1,188,810	1,188,810	1,188,810	1,188,810
Maintenance	80,000	80,000	80,000	80,000	80,000
Transportation Cost	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000
Total Direct Cost (PKR)	317,888,810	317,888,810	317,888,810	317,888,810	317,888,810
Gross Profit	24,111,190	24,111,190	24,111,190	24,111,190	24,111,190
Operating Costs					
Building Lease	480,000	480,000	480,000	480,000	480,000
Indirect Labor	1,920,000	1,920,000	1,920,000	1,920,000	1,920,000
Fixed Electricity	24,000	24,000	24,000	24,000	24,000
Depreciation	1,237,400	1,237,400	1,237,400	1,237,400	1,237,400
Amortization	138,000	138,000	138,000	138,000	138,000
Marketing	360,000	360,000	360,000	360,000	360,000
Office Administration	336,000	394,560	419,069	445,697	474,629
Licensing/Regulatory Fee	15,000	15,750	16,538	17,364	18,233
Total Operating Costs (PKR)	4,510,400	4,569,710	4,595,006	4,622,461	4,652,262
Earnings before interest and taxes	19,600,790	19,541,480	19,516,184	19,488,729	19,458,928
Interest	-	-	-	-	-
Earnings before taxes	19,600,790	19,541,480	19,516,184	19,488,729	19,458,928
Tax	-	-	-	-	-
Net Operating Income	19,600,790	19,541,480	19,516,184	19,488,729	19,458,928
Other Income (interest on investments)					
Net Income	19,600,790	19,541,480	19,516,184	19,488,729	19,458,928

Projected balance sheet

Table 9 – Projected balance sheet

ASSETS

ASSETS	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Current Assets						
Cash	1,000,000	11,018,325	31,935,205	52,826,789	73,690,918	94,525,246
Raw material	2,000,000					
Advance Processing Charges	1,141,068					
Accounts Receivables		14,250,000	14,250,000	14,250,000	14,250,000	14,250,000
Spare Parts inventory	80,000	80,000	80,000	80,000	80,000	80,000
Total Current Assets	**4,221,068**	**25,348,325**	**46,265,205**	**67,156,789**	**88,020,918**	**108,855,246**
Fixed Assets						
Land	-	-	-	-	-	-
Building & Civil Works	-	-	-	-	-	-
Processing Machinery	7,800,000	7,020,000	6,240,000	5,460,000	4,680,000	3,900,000
Utility Machinery	200,000	180,000	160,000	140,000	120,000	100,000
Laboratory Equipment	-	-	-	-	-	-
Office Equipment & Furniture	187,000	149,600	112,200	74,800	37,400	-
Vehciles	2,000,000	1,600,000	1,200,000	800,000	400,000	-
Net Fixed Assets	**10,187,000**	**8,949,600**	**7,712,200**	**6,474,800**	**5,237,400**	**4,000,000**
Other Assets						
Pre-operating Expenses	690,000	552,000	414,000	276,000	138,000	-
Contingencies						
Total Other Assets	**690,000**	**552,000**	**414,000**	**276,000**	**138,000**	**-**
TOTAL ASSETS	**15,098,068**	**34,849,925**	**54,391,405**	**73,907,589**	**93,396,318**	**112,855,246**

LIABILITIES

LIABILITIES	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Current Liabilities						
Accounts Payables		151,068	151,068	151,068	151,068	151,068
Short term loan						
Other Current Liabilities						
Total Current Liabilities	**-**	**151,068**	**151,068**	**151,068**	**151,068**	**151,068**
Long Term Liabilities						
Lease payable						
Long term debt	-	-	-	-	-	-
Long term debt	**-**	**-**	**-**	**-**	**-**	**-**
Equity						
Paid up Capital	15,098,068	15,098,068	15,098,068	15,098,068	15,098,068	15,098,068
Retained Earnings		19,600,790	39,142,270	58,658,454	78,147,183	97,606,111
Total Equity	**15,098,068**	**34,698,858**	**54,240,338**	**73,756,521**	**93,245,250**	**112,704,178**
TOTAL LIABILITIES	**15,098,068**	**34,849,925**	**54,391,405**	**73,907,589**	**93,396,318**	**112,855,246**

Projected cash flow statement

Table 10 – Projected cash flow statement

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Activities						
Net Income		19,600,790	19,541,480	19,516,184	19,488,729	19,458,928
Depreciation		1,237,400	1,237,400	1,237,400	1,237,400	1,237,400
Amortization		138,000	138,000	138,000	138,000	138,000
Change in raw material inventories	(2,000,000)	2,000,000	-	-	-	-
Change in advance processing charges	(1,141,068)	1,141,068				
Change in spares inventory	(80,000)	-	-	-	-	-
Change in Accounts Receivables		(14,250,000)	-	-	-	-
Change in Accounts Payables		151,068	-	-	-	-
Cash from operations	(3,221,068)	10,018,325	20,916,880	20,891,584	20,864,129	20,834,328
Financing Activities						
Short term debt principle repayment						
Long term debt principle repayment		-	-	-	-	-
Addition to short term debt						
Additions to long term debt	-					
Issuance of shares	15,098,068					
Net cash from financing activities	15,098,068	-	-	-	-	-
Investing Activities						
Capital Expenditure	(10,877,000)					
Cash from investing activities	(10,877,000)	-	-	-	-	-
Net Cash	1,000,000	10,018,325	20,916,880	20,891,584	20,864,129	20,834,328
Cash balance brought forward	-	1,000,000	11,018,325	31,935,205	52,826,789	73,690,918
Cash investment in securities		-	-	-	-	-
Cash available for appropriation	1,000,000	11,018,325	31,935,205	52,826,789	73,690,918	94,525,246
Dividend	-	-	-	-	-	-
Cash carried forward	1,000,000	11,018,325	31,935,205	52,826,789	73,690,918	94,525,246

Financial feasibility

The proposed project of small beef slaughterhouse is found to be financially viable with a positive NPV of PKR 39.5 million. NPV, IRR and payback period are shown in Table .

Table 11 – Financial feasibility indicators

NPV (PKR)	39,524,972
IRR	98.2%
Payback (years)	1.57

Profitability ratios are shown in Table .

Table 12 – Profitability ratios

	Amount (PKR)	%
Sales	342,000,000	100.0%
Cost of sales	317,888,810	92.9%
Gross profit	24,111,190	7.1%
Operating costs	4,510,400	1.3%
Net profit	19,600,790	5.7%