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Sustainable Growth in livestock sector: A case study of Pakistan

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Abstract: The aim of this thesis is to investigate the preconditions for implementing a sustainable livestock sector in Pakistan during the period (1960-2002). This study examines the economic policies related with production structure, technology and infrastructure available for livestock producers. The production and consumption patterns of meat and milk are analyzed for investment opportunities. The role of institutions in implementing economic policies is discussed. From the investigation, I conclude that a Knowledge intensive system is needed to be implemented that supports infrastructure and institutions to attain sustainable growth. For this purpose, community level network should be formed which focus on improving communication related to resource management, productivity and support services between regions and centre. In short, bottom-up approach is required to be implemented for sustainable livestock production systems which bring a transformation change in entire value chain through institutions.

Key words: Livestock, Pakistan, Economic growth, Investment, Production, Consumption, Sustainability

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List of Acronyms

ACO	Agricultural Censers Organization
ADB	Asian Development Bank
AI	Artificial Insemination
DN	Digestible Protein
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GOP	Government of Pakistan
LDDB	Livestock and Dairy Development Board
LPS	Livestock Production System
MNC	Multinational Corporation
PARC	Pakistan Agricultural Research Council
PPSC	Potential Population Supporting Capacity
SDPI	Sustainable Development Policy Institute
TAMA	Technical Assistance Management Agency
TDN	Total Digestible Nutrients
UNDP	United Nations Development Program
WFP	World Food Programme
WTO	World Trade Organization

Introduction

This chapter gives a general overview of this paper and discusses issues related to research question. The first part describes about the background followed by aim and justification of research. Further, the contribution and scope and limitation are stated. The last part includes the keywords and how this research is structured.

1.1 Background

All across the world, livestock play vital role for lot of poor households because livestock is not only used as a source of income but also utilized as source of nutrition, draft power, fuel and store of wealth. In general, livestock is owned by rural households. According to a survey, the rapid growth in the livestock production is highest as compared with any other agricultural sub-sector and it is predicted that by 2020, this sector will produce more than half of the agricultural output (Ahuja & Redmond, 2001). The demand for livestock is predicted to arise in developing countries due to high population growth; people are moving towards cities (higher standard of living) and increasing household incomes. The options for sustainable livestock in developing countries will provide growth in rural income and accelerate the pace of production but opportunities require economic policies that will ease the production at farm and processing level. To unfold opportunities for sustainable growth in livestock sector, economic policies and institutions are not geared up to fulfill the demand for livestock. The policies for sustainable livestock are formulated and implemented by the policy makers according to geographical environment but some professional argue that constraints in livestock are due to poor management, infrastructure, technology, processing and institutions (ibid).

Under the increasing population growth, shortage of agriculture land and increasing demand for livestock has created a pressure for formulating better agricultural resource management policies. Sustainability growth in developing countries is hard to attain under current economic and environmental policies because they are not emphasizing on improving agricultural resources and food security (Weeks, 1999). Agricultural and livestock policies are carried out within macroeconomic framework in which correspondence between sector and macro policies are essential for long term success. A report of FAO mentioned that sustainability and institutional policies are attributes for long-term agricultural and livestock development. Moreover, it explained that policies should be implemented with respect to land and labor markets. The Macroeconomic policies set the “framework for stability in which agricultural producers operate, and are part of the determinant of the economy’s growth performance” (ibid, p-5). Without understanding sustainable growth and economic policies, it is difficult to increase productivity in livestock sector (ibid).

The livestock conditions in developing countries are different due to socioeconomic issues. First, majority of livestock is owned by small holder’s thus, substantial proportion of their production is not be marketed. This is due to poor infrastructure, high transportation costs and low competitiveness. Secondly, support services are not good as compared to developed countries because of old technologies, limited access to institutes and very less research and development. Further, poor storage and marketing facilities create issues for efficient agricultural resources usage. Thus, economic policies need to consider small holders and restructuring of institutes which support them from purchasing new inputs to commercially marketing their products (Weeks, 1999, p.14). Sustainable growth in a livestock production system was not given proper attention (e.g Marshall, 1992 and Kaasschieter et al., 1992) but the aim focus was on improving livestock production rather than productivity in form of quality and quantity (Wit et al., 1995). The objectives are evaluated in terms of defined success factors. But growth

is measured by a “*sustained rise of the value of good and service per capital in real terms*” (Kasper & Streit, 2000). The social and environmental issues related to sustainable livestock production provide assistance in developing a system with accomplish the human consumption and social needs (Thompsona et al., 1999). Sustainable development basically gives stress to ecological limits but it now includes socio-economic and cultural dimensions as defined by Food and Agriculture Organization (FAO, 1992):

"Sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development (in agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable."

Growth is forced by producers by using different factors of production; with respect to institutional economics the role of human capital is more important because institutions are called “rules of games” (Kasper & Streit, 2000). Two major types of capitals that are considered important for sustainability. First, physical capital which considers all sustainable assets that cooperate in increasing productivity for attaining satisfied results. In recent years physical capital involves saving and investment process in which saving are generated through capital formation and investments are generated through credit markets for borrowing money. Second type of capital is human capital which includes all the skills and knowledge of people to transform products. The values and rules of society are shared in human capital and discuss rules how to protect and share value within a system (ibid, p.21).

The agricultural sector is the second largest sector in Pakistan and plays a vital role in economic growth. It contributes to over 21% of GDP and absorbs 45% of the total labor force (Economic survey, 2010a). About 62 percent of total population living in rural areas is directly or indirectly linked with this sector for their livelihood. The livestock sector contributes about 11.4 percent of national GDP with 53.2 percent of agricultural value added products (ibid). This sector provides raw material to other industries in shape of capital or market. The national herd consists of 29.6 million cattle, 27.3 million buffaloes, 26.5 million sheep, 53.8 million goats and 0.9 million camel (ACO, 2011). During the last three decades, this sector has only experienced an average growth of 2.9 percent due to poor economic policies (Quddas et al., 1997). The population growth rate is increasing 2.05 percent (Economic survey, 2010b). Due to high population growth and urbanization the demand for livestock products are increasing. Thus current situation it is difficult to meet the demand for livestock and its byproducts. During 1999-2000, GOP has spent 1213.5 million PKR of foreign exchange on importing milk products and according to National Commission of Agriculture; GOP has imported 1.08 million metric tons of meat to fulfill the domestic demand (Garcia, 2003).

1.2 Aim and Justification

The aim of this thesis is to investigate the preconditions for implementing a sustainable livestock sector in Pakistan during the period (1960-2002). I will analyze the production structure and technologies applied to this sector and try to identify the institutional frameworks vital for its development. Since there is a gap between production and consumption of livestock products in Pakistan, this research topic could be of vital importance for the implementation of new economic policies for sustainable livestock production system. This investigation will help in implementing long term macroeconomic policies that improve the food availability and accessibility. During last few years, the economic performance of Pakistan showed poor results such as GDP growth rate in 2008-09 was 5.7% and it declined to 3.6% in 2009-10 (World Bank, 2011).

Under current economic conditions, Pakistan has to spend lot of foreign exchange for importing livestock products. It result fiscal deficit and inflation in domestic markets. Moreover, this sector is neglected due to poor development plans and political instability, by implementing sustainable economic policies for livestock and resource management, Pakistan can save valuable foreign exchange. Due to poor institutions and management, lot of livestock products are not marketed, thus institutional framework will help in identifying opportunities for investment. With higher livestock production, prices of food items and inflation can be controlled in domestic markets. In Pakistan, majority of livestock producers belongs to rural areas, so institutional framework serves a social security and producers can cash them at any time.

1.3 Contribution of this study

As livestock involves in lots of economic activates through its products and byproducts. The major contribution of this study is to support policy makers in implementing economic policies for sustainable livestock production system. Furthermore, the emphasis is to improve agricultural resource management and identifying factors for structural improvements. The structural improvements which help in generating human capital that refers to skills knowledge, good health, and physical capability. The main focus is to attain long term development in livestock sector through sustainability which will bring growth in rural areas as well as in national economy.

The macroeconomic policies will help in enforcing competition in domestic markets, economically allocation of resources, standardization and improving market condition for producers and buyers. Moreover, this study will help in generating physical and social capital through which the economy can easily attain economic growth for long run. Under improved institutional framework, training centers and infrastructure will provide access to the market and educate the producers about the required feed and diseases. Thus, filling the gap between production and consumption, market prices and trade can be controlled easily. This will promote private sector investments which bring equity in society by reducing poverty. At the end, the entire value chain will provide quality products and enhancing productivity by value added byproducts.

1.4 Scope and limitations

To implement sustainable economic policies for livestock production, this study is based on macro level indicators so all recommendation and finding are suggested at macro-level. These economic considerations give overview of macroeconomic policies which involves issues related to trade, foreign exchange and economic growth. The sustainability in livestock can be achieved through technology improvement that led towards structural changes. Moreover, small producers owned majority of livestock in Pakistan, thus role of non-government organization and private sector is important in analyzing livestock management and marketing options. This study takes a snapshot of the situation which seems like a limitation because all the economic policies are analyzed and compared with other macro indicators.

1.5 Definitions

Livestock: The livestock includes all the animals that are included in livestock production in Pakistan with all their byproducts.

Sustainable livestock production: basically, it's an ecological aspect which provides biological constraints and further includes extensive preplanning, understanding of marketing options and the ability to review and adapt plans as needed (Kerr, 2008, Thompson & Nardoneb, 1999)

1.6 Structure of the study

Theoretical framework explains the economic growth and sustainability issues regarding to livestock. These issues are viewed through different approaches and problems related to these approaches are explained. The socioeconomic considerations with respect to sustainable livestock are discussed. Moreover, it explains role of institutions in economics growth and an institutional framework is identified for examining the current role of institutions in this sector.

Research Methodology part of this study mentions the relevant methodological assumptions which involves a complete research process that helps in conducting the study. Data collection sources are discussed and nature of data is described. The criteria for evaluation and analysis of data and economic policies are discussed.

Livestock of Pakistan provides complete overview of this sector. This chapter includes the description of all the policies, reforms and importance of livestock sector in Pakistan. Moreover, the role of livestock is discussed under socioeconomic issues. A review of production and consumption patterns (milk and meat) is shown for the need to implement sustainable policies. The current economic condition and policies and the constraints in implementing those policies are explained. The role and effect of infrastructure and institutions are explained with reference to livestock sector.

Discussion section is divided into three parts: first, economic policies analyze all the sustainable factors that impact livestock production like resources, production, human and social capital and technologies. Secondly, institution role is examined according to the framework developed in theoretical chapter and lastly, role of infrastructure is analyzed for implementing sustainable economic policies.

Conclusion chapter will give recommendation for research question and highlight the main finding from this study. Moreover, it provides suggestions for future research and managerial implications.

Theoretical Framework

This chapter provides the relevant literature for the investigation of research question. It highlights the importance of economic growth, sustainability and institutions in formulating economic policies. The first part defines two major approaches for sustainable development. Moreover, it illustrates the issues related to sustainable livestock and explains different economic consideration for livestock production system. The second part explains role of institutions with respect to economic growth and provides an institutional framework for analyzing economic policies.

2.1 Economic Growth and Sustainability

The economic approach for sustainable development is explained by different literature at three different levels. Firstly, at global or country level which aims is to balance the ecological and economic considerations. Its focus is to accomplish development objectives for attaining fixed amount of environmental assets which should be used by future generation and prevent assets from irrevocable losses (Mitlin and Satterhwaite, 1990). Secondly, “a pattern of social and structural transformation which optimizes the economic and other social benefits available in the present with jeopardizing the likely potential for similar benefits in the future” (Gilbert and Braat, 1991, p.261). According to this approach, the problem is centralized with two components:

- Identifiable and understand ability future benefits
- Requirements for fully utilizing the resources and their identical benefits

These two components help in developing model for sustainable development with respect to economic growth. Thirdly, According to Gladwin et al. (1995) “a process of achieving human development.....in an inclusive connected, equitable prudent and secure manner”. This approach includes the social, economic and institutional aspects for sustainable development with protect the resources according to technical, political and scientific aspect.

2.2 Sustainable development

Brundtland Report (WCED, 1987, p.43) defined sustainable development as “A development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: one is the concept of need and other is the idea of limitations imposed by the state of technology and social organization”. The key issues discussed for sustainable development means that need for the product should be given more superiority as compared with other needs and environmental ability to attain that product should not damage other things or concentrate on that product only. As Sunstein (1997, p.385) mentioned in (Rao, 2000) that socioeconomic argument presented two aspects, first market function should be background condition of the society and secondly, analyzing the existing distribution and management controls. The function of capital with respect to definition is very important in development process. It is possible to carry different forms of resources as a component of capital, like natural capital with ecological resources, human capital with knowledge and technical skills and social capital with institutions, behavior, trust and culture. Most of the researchers in this field suggested that per capita consumption is a good index to measure sustainability.

As everyday passes, the human population is increased, so there is a need for sustainable agriculture and livestock to fulfill the requirement according to global development. Thus, Brown (1981) has highlighted the strain on global resources with comparison of human population growth and global

development. These problems should be solved according to economic growth approaches as discussed under sustainable development.

2.3 Approaches for sustainable development

The sustainable development of agriculture is explained with respect to research and policies in two broad models. Douglas, G. (1984) explained three ways to attain sustainable agriculture as resources sufficiency, ecological sustainability and social sustainability. The resource sufficiency highlights the resources that are needed for sustainable production/practice in hand. The ecological sustainability explains the biological constraints for agricultural practice and social sustainability explains the political and ethical issues related to sustainable agriculture production. But Thompson (1992, 1996) criticizes the social sustainability that political issues do not showed improvement in sustainability.

To make a concept of sustainability, it is difficult to differentiate empirical criteria with performance criteria because empirical criteria followed the human purpose to make sustainability development (Burkhardt, 1989). On the other hand, performance criteria arrange production system without regard of their sustainability. The performance criteria mergers with empirical criteria and operationalize the concept. The empirical approach of sustainable agriculture can be explained by Douglas way in which resource sufficiency is very important and ecological and social sustainability could be explained as a part of production function of agriculture which can be discussed under functional integrity (Thompson et al., 1999).

2.3.1 Resource sufficiency

Resource sufficiency provides a practice which is called sustainable if resources required perpetuating that practice is predictable and available. It needs the description of rates at which resources are being consumed and what is the time frame of their consumption. It provides consumption pattern of that practice and it tells that practice will cause a sustainable effect if resources don't drop to zero (See Faeth, 1993). The main points on which resources sufficiency focus on (Thompson et al., 1999):

- Highlights on calculating the rates at which input resources are produced and used.
- Develop strategies for sustainable growth in regenerating and substitution of insufficient resources.

Resource sufficiency helps in calculating consumption pattern by making time frame fixed and analyzing the rate of change in consumption. This way permits us to predict the maintenance and substitution for resources in short supply which can be extended on a longer time frame. The research and policy making for agricultural sustainability is explained at a broader approach under resource sufficiency. Different researchers such as Julian Simon (1980) and Robert Solow (1993) have assumed that resource substitution has a high elasticity but ecologists such as David Pimentel (1989) and Miguel Altieri (1991) have opposed that assumption. There is un-usual effect of these assumptions on the maintenance of resources that bring the practice under required parameters of sustainability. After considering these assumptions, it will change resource sufficiency to production function, where analysis for inventory rates, required food for animals and plants are conducted. These things can attain balance in production and consumption for a longer time but the imbalance can occur anytime which can change the whole production function sustainability.

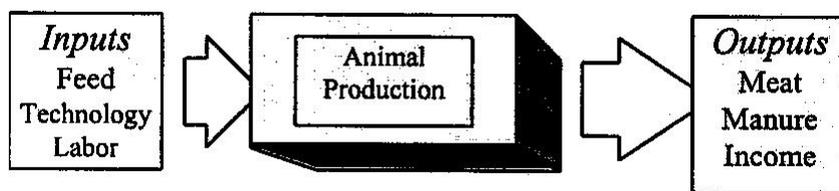
In functional integrity, social framework includes the need to raise capital and sufficient husbandry practices. These parameters change with production function. Thus in the circumstances of resource sufficiency, change in capital is equal to change in land and herd productivity and change in husbandry

is equal to human productivity. Thus, in an industrialized economy, profitability is provided by regeneration of capital and research institutions and education is provided by change in effective husbandry (Thompson et al., 1999).

On the other hand, resource sufficiency argues with these parameters of functional integrity. According to resources sufficiency human practices are risk for functional integrity so, it highlighted the ecological integrity (Hardin, 1968). The ecological integrity is damaged by framing practices because in that process productivity cannot recover itself such as over grazing. But human practices are the part of the system used for growth of capital and husbandry. When the system includes social parameters, human practices take actions because they are getting social and psychological benefits from that (Stuth et al., 1991).

Policies related to animal sciences are adopted in just a way that conceptual framework develops the animal production system by itself (Kunkel and Hagevoort, 1994). In this production system, the biological inputs like feed and water and social inputs like labor, capital and organizations are brought together with technology. When production system starts, it turn into product and waste output. The policies of animal science overlook production system and analyze biological flows of input to output process in shape of (meat, manure and fat). The applied animal science process focus on improving efficiency of biological process and analyze technological factors of production. In recent years, the demand for animal production and environmental issues are increasing in developing countries, thus an industrial model of livestock production is given in (Figure 1). This process is favorable for sustainable resource sufficiency for animal production. The consumption of livestock will increase slowly for a long time period because consumption pattern of livestock will increase as human population increase (Matassino et al., 1991; Alexandratos, 1995). Thus, resource sufficiency is only suitable for resources that can be produced like livestock and plant production.

Figure 1: Animal production process for resources sufficiency



Source: Thompson & Nardoneb (1999, p-4)

The quantity of resources needed to maintain the required level of efficiency should increase with the growth in human population, if it doesn't than resources should be damaged. On the other hand, increase in productivity of other resources can also affect the supply of other inputs or by products. The low efficiency of plants is affected by livestock production system because the grain consumed by animal should increase with a proposition of livestock (Maxwell and Milne, 1995). The increase in the grain production for animals will affect sustainability of agronomic system. Furthermore, the environmental role of resource sufficiency supports in controlling diseases and make reproductive biological cycles for plants and animals (Thompson et al., 1999).

2.3.2 Functional integrity

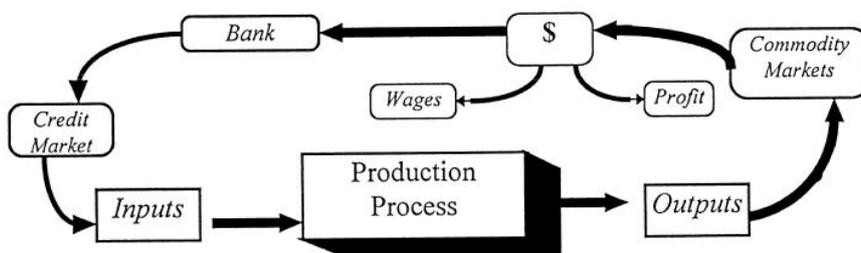
The functional integrity is a system in which elements are reproduced at a rate depending on the pervious system parameters. With respect to agricultural system, function integrity is about animal production which is analyzed under economics of livestock through which the system or process should regenerate its capital base and input that result profitability. This process uses both parameters

of resources sufficiency and functional integrity. The main points on which functional integrity emphasize are (ibid):

- Provide productive models for reproducing complex ecological and social processes.
- Develop sustainability as comparison with a system sensitive to anthropogenic stress.

The result of this economics system is that the monetary terms of output becomes higher than the monetary terms in input and technical factors becomes a part of financial system. According to regeneration of capital model, the person borrow money from credit market to purchase its fixed assets and incur its current expenses which are transformed into production process, than output is sold in the market to repay all debts. The remaining amount is the profit earned by that person. In this case, regeneration of livestock depends on the conditions in commodity and credit markets. In respect of agriculture production, it provides a feedback tool that prevents reproduction of input factors from rising without parameter or damaging the system limits. The production process for regeneration of capital is shown in following figure 2 (ibid).

Figure 2: Regeneration of capital in livestock production process through functional integrity



Source: Thompson & Nardoneb (1999, p-5)

The functional integrity is described by ecological factors of livestock output as directed by the exogenous factors like growth in human population and dietary shifts. The amount of waste from livestock can be helpful in explaining the output of environmental quality. If the rate at which the factors of production are going to be produced, the calculation can be made for input resources that should be needed for factors of production (Fitzhugh, 1993). Thus, functional integrity can overcome the problems of resource sufficiency and have significant capacity to solve sustainable livestock production system. There are two approaches based on (Kurkel and Hegevoort, 1994) theory of animal sciences that functional integrity follows: first is the efficiency of input/output for maintaining genetic potential by repeated production system (Courot and Volland Nail, 1991). Secondly, in functional integrity regeneration of capital is not easy for production system because it depends on the commodity and financial markets stability that develop this process at macro-level (see staatz, 1991).

The other measure which makes functional integrity more clear and important is the environmental production system and ethical issues. It highlights the nutrient cycle that is provided by manure output into soil. This process complete the feed input. According to Thompson et al., (1999) soil fertility depends on the nutrient cycles. When institutions are working on animal product it is difficult to do research on the functional integrity with help of traditional research on production process (Thompson et al., 1999). In industrialized developed economics, the problem of environmental population and ethical issues related to functional integrity are addressed by encouraging innovation and integrative research as ecological integrity. After summarizing the approaches for sustainable livestock, the resource sufficiency can be integrated in the functional integrity parameters. These approaches support

in developing the biological process, solving environmental issues and examining consumption/production patterns by using different innovative techniques (ibid).

2.4 Issues related to sustainable livestock

The issues related to livestock production system (LPS) in the light of economic growth and sustainability is explained in (table 1). In which important issues are discussed such as food shortage, water shortage, land shortage, resources deficiency (energy, nutrients and water). Moreover, environmental problems are also identified by various researchers (Durning and Brough, 1991). These problems are directly or indirect related to LPS which guide in finding the policies related to these issues.

Table 1: Criteria for measuring sustainability of livestock systems in an agricultural system (De Wit, 1993)

Criteria	Related sustainability problems	Factors influencing the effects of livestock
Supply & demand of consumable livestock products (PPSC) Potential Population supporting capacity	Food shortage Land scarcity	Land sustainable for arable farming as compared to livestock
Land used to agriculture	Soil degrading Global warning	crop-livestock interaction
Food distribution	Food shortage	Income elasticity of demand Feed processing
Variability	Risk of low returns Temporary food shortage	Correlation and Variation of yield in production prices of livestock production
Nutrient issues	Efficient energy Efficient resource use	Nutrient balances
Water availability	Efficient nutrient usage	Effects soil and other things

Source: WiP, d. J., Oldenbroek, J.K., Keulen, V.H., and Zwarff, D. (1995, p-222)

2.4.1 Food shortage

Food shortage is a major reason that affects LPS because population is going with more speed as compared to livestock production. The demand for livestock is increasing day by day due to consumption of products and byproducts. According to the reports of FAO, it is estimated that demand of milk and meat in year 2020 is more than the supply of these products. To measure demand and supply of livestock products, it is suggested to compared the need for livestock production with the resources used to attain that production and how much nutrients will loss if it is not attained. These comparisons provide benefits and disadvantages for attaining this production system. If unsuitable result came from increased livestock production then demand should be discouraged through factors such as population growth, maintaining high prices for livestock products and income elasticity of demand (Wit et al., 1995). On the contrary, if increased supply is needed than policy makers should have to consider these things: first, livestock “farm-gate” prices should be beneficial for producers so, they can earn higher profitability as compared to agriculture products. Secondly, what is the aim of livestock

producers other than production of livestock such as investment in livestock sector, fertilizers for land, security for livelihood and used livestock as draught power (Behnke, 1985; Crotty, 1980)?

Furthermore, what should be the dimensions for livestock production if no substitutes to attain the objectives are formed? Thirdly, accessible feed resources required to maintain sustainable livestock production because low quality feeds may provide maximum yield but it will affect livestock production system due to its low quality (Jones and Sandland, 1974). The result of LPS on the human food production or (PPSC) is measured other food crop production because livestock and crop uses same resources, but livestock also provide input in shape of waste for cultivable land (FAO, 1984). According to Spedding et al., (1992) LPS is not sufficient to fulfill the demand for human food production as compared to crop farming system because the yield is more than livestock production and it uses less resources as compared to livestock products. Moreover, if land is not suitable for crop production livestock can be one reason for livelihood (Kaasschieter et al., 1992b). While analyzing the food distribution process, livestock production has a negative effect on food grains because increase in livestock required more food grains as an input. But, in recent years LPS have developed their feed processing system that don't affect the food grains at higher context because wastage of food grains are used to form input/feed for animals and livestock feed also maintain a prices level in market.

2.4.2 Land shortage

The cultivated land available for next twenty years is declined from 0.28% to 0.17% ha. per capita which is a major problem to fulfill the demand of human consumption as per population growth (WRI,1990 & FAO, 1991). This situation is worse in Asian countries where it is estimated that cultivated land is decreasing by 0.09% ha. For sustainable livestock production the growth in crop production is necessary but low productivity of cultivated land is decreasing and some land is useless due to natural resources. It provides advantage to livestock because if land is not suitable for crop production it can be used to livestock production. After measuring this problem with respect to land shortage it provides loss to human consumption. The livestock feed mostly consists on crop by-products, so if livestock feed is imported the total land area also consider that land on which imported crop is cultivated. The imported feed should be analyzed on monetary terms because it tells the value of the byproduct as compared to main crop product (Wit et al., 1995).

2.4.3 Variability

In LPS, variability refers to measure in which risk of low returns are analyzed with respect to producer. While examining the agricultural system, livestock provides producers a back up of their damage/loss in crops. The effects of variability on the livestock may be temporary food shortage due to the migrations of livestock producers. The Livestock production takes long time period to show its effects in shape of product which can be consumable and thus it requires food and wealth for longer time but on the other hand it also becomes security for producers during inflation (Nordblom, 1988). The major benefit of livestock production is shock absorption quality because if the grain prices are high livestock product prices should be low and if grain prices are low than livestock prices are high which provide high profit to producers in both ways (Sandford, 1989).

2.4.4 Water and energy resources

Water and energy resources are indirectly related to livestock production but play a major role in livestock production system. Large scale irrigation areas in world use underground water for land and livestock. In early 1980's, underground water has declined by 1-4m per year in China and India (Brown et al., 1985). Water availability and utilization have an impact on the livestock production system. In

South Asia, people who raise livestock migrate to those areas where they can find water resources. The availability of water effect livestock on soil cover and utilization effect water required for cultivating the land. In developing countries, there are more problems related to these issues such as distribution of water and lack of technology for lifting water. Livestock is used as an energy resource in form of draught power and their waste is used as a fuel for soil and other purposes. Livestock production increases the fossil energy due to its input. But livestock also supports in decreasing the use of fuel and other pesticides for land cultivation. Moreover, energy resources are required to preserve livestock products. Sustainability in water and energy resource cannot affect direct the livestock production system but they are part of production system (Wit et al., 1995).

2.4.5 Environmental pollution

LPS also have an impact on the environmental issues which deals mostly with agricultural crop production but they are also affected by livestock production system. According to report (FAO, 1992) that environmental issues are very less in third world countries because of the usage of natural resources for cultivation and less use of machines and other equipments for increasing yield. The major problem in livestock production system is usage of different drugs and veterinary products for increasing livestock or using them as a substitute for other natural inputs. The usages of pesticides for crop production have increased rapidly which resulted damage for humans. It is estimated that more than 3.7 billion people per year are using products with higher pesticide level as compared to natural products (Jeyaratnan, 1990). In recent years, policy makers in developing countries are promoting subsidies for using pesticides which are harmful for human consumption (Repetto, 1985). LPS will decrease the usage of these pesticides by replacing them with natural waste that make land and crop more fertilize. The increase in livestock will help producer to save money by using waste of animals as fertilizer and provide opportunities to have a crop production free from harmful pesticides. Livestock contribute in reducing environmental issues such as; developing countries only contribute 1.5% in global warming due to usage of natural resources (FAO, 1991). It can also helpful in making the land able to utilize for cultivation if these measures are attained through a sustainable system.

2.5 Economic considerations

The economic considerations with respect to sustainable livestock are important to achieve the demand through a systematic way of using resources and trade. The economic considerations examine problem related to sustainable livestock in accordance with policy makers, farmers, producers and researchers. The livestock economics and sustainability, efficiency resources and trade and environmental issues are major economic challenges that should be address to attained sustainable growth in livestock sector. Moreover, role of technology cannot be denied because livestock productivity increased due to the technologies such as (AI), and modern feeding equipments. In developing countries, such technologies are supporting in maintaining the input/feed prices low by providing subsidies. The economic policies play an important role in achieving sustainable growth for longer time. Some of the most important economic and technological considerations are discussed below (Schillhorn et al., 1997):

2.5.1 Global livestock economics

One of main major macroeconomic issue is increase in human population more than increase in food supplied. It is estimated that by 2020 the human population will increase by 2.5 billion (ibid). The food production growth should be equal to population growth but problem is not simply attaining that level. In last few years, it is estimated that more than 1.3 billion people are living under the poverty line (which means they earn less than one dollar per day) and demand of human consumption in developing countries is estimated to increase by 80% for grains and 100% for livestock (meat & milk) (Iqbal et al.,

1999). This increase created challenges for policy makers and producers to fulfill human food requirement. To meet the needs international and domestic policies should be formed to achieve sustainable livestock and institutional framework are created with accordance to get favorable cost effective results (Quddus et al., 1997). In Southeast Asia, the producers increase supply for livestock to fill the gap such as meat production in developing countries increase by 95% during 1975-90 and in the same period the milk production increased by 95%. The increase in production is all due to increase in consumer demand such as in 1993, China per capita meat consumption is 33 kg and it is estimated that in 2020 it will be 63 (kg) which is similar to India, Both countries have the highest population growth rate. The annual growth in meat consumption is both countries during 1993-2020 is estimated nearly 3% (Schillhorn et al., 1997).

2.5.2 Economic consideration in sustainability

The livestock economics have showed the importance of sustainable livestock production with reference to policy makers and macro economic factors. In past years, less attention have been given to agricultural and livestock due to resources and increasing of technologies. The gap between consumption and production will be filled if resources are fully utilized and policy makers develop long term policies for attaining sustainable objectives. There are many economic policies that effect livestock but major macroeconomic policies are in shape of exchange rates and trade balances that impact on sustainability and livestock. Such as: high exchange rates encourage imports which result in restraining local production and investing in feed technologies due to low cost. High exchange rate favor the country but such policies should be developed which safeguard local producers and encourage people to buy domestic products (ibid).

The economic policies for sustainable livestock should be similar to grain cultivation process. Macroeconomic policies include subsidies on production, tax breaks for the producers and special incentives to increasing productivity, the government institutes should support in research and development and new technologies should be introduced at public level to provide benefits to producers (ibid).

2.5.3 Resources

The resources required for sustainable livestock are successfully attained through modern technologies introduced in feed availability. There are different types of input used all around the world for feeding animals. Mostly, crops by-products become feed for animals in developing countries. On the other hand traditional economists focus on land shortage problems because they analyze the issues under natural resources context (ibid). The resources needed for sustainable livestock are managed through production of agriculture products and other, by artificial feed developed from different waste byproducts. Many countries used water resources for other industries and import grain to full the consumption demand. The local production should be motivated by developing land use reforms and efficient plans for water management. Such as Australia is one of the major suppliers of livestock products in Middle East because policy makers develop effect plans for land resources which provide them cultivated land with high fodder production. The policy makers should also consider waste management control plans for agriculture (see Taiganides, 1992 for example).

2.5.4 Trade

Trade of agricultural commodities still provides a very surplus balance. According to a report, 7% of total dairy products are traded in international market from which 93% of exported from EU and Australia (Schillhorn et al., 1997). Due to rapid increase in population growth, demand for food

products are increasing which make agricultural and livestock products as one of major product in national and domestic market to supply. In light of sustainable livestock, trade helps in saving insufficiency resources by importing them from other countries and importing livestock from other countries will provide land and natural resources to be used to other factor of production. But if the country has a low exchange rate, it is better to invest and develop policies at attain sustainable livestock. Trade at national level is affected by the infrastructure required to transits the commodities from one place to another. There are socioeconomic issues related to trade policies at national and domestic level. Furthermore, various international organizations such as (WTO) are working to control the standards and provide best quality products to people (Schillhorn et al., 1997).

2.5.5 Sustainable production and marketing

To achieve sustainable results from the LPS it is necessary to examine the production process according to economic considerations. The production processes adopted by developed countries are mostly based on high technologies which help them to maintain standards and provide good livestock products to their people. But, in developing countries the production process used traditional methods for livestock production. Livestock provides lot of products and byproducts but meat and milk are two major products in livestock category. To produce economics of scale in livestock production, it is necessary subsidized input resources for livestock and technological change is required in feed production. The marketing of livestock products are as important as production because while analyzing the infrastructure of developing countries the products are not completely marketed as compared to developed countries. Mostly, livestock is operated by public organization but in recent years private organizations are investing in this sector due to which new machines and equipments are introduced. These reforms will change the production process and proper marketing channels will be formulated (Schillhorn et al., 1997).

2.5.6 Livestock and environment

Environment issues related to economic consideration for sustainable livestock includes various problems that are needed to be address such as effects of production, water pollution, global warming and public health (Wit et al., 1995). Policy makers should make laws to control the waste management and the infrastructure should be developed in such a manner that support in controlling global warming and water pollution problems. The public health issues are related to the macroeconomic health and safety reforms. The policies used to examine resources should guide in exploring efficient sources and attaining higher standards for environmental costs with a suitable product price.

2.6 Technology and sustainability

The other factor that play an important role after economic policies, are technological advancements that has become driving force for agriculture development. Technology is important because better quality depends on good and advanced technologies and such technologies lead to structural changes in the sector. Traditional ways of livestock production are not sufficient to fulfill the demand of people. In livestock, technologies effects in various ways, such as better vaccines for saving animals from various diseases, cultivating feed and finding new ways to get good and better breed of animals with more productivity. R&D with technological advancement will provide AI which help in improving productivity and decreasing drug diseases (Wit et al., 1995).

Higher changes of utility, of new technologies lead to the removal of basic diseases through R&D. In developing countries, government budget is limited which force policy makers to reduce the usage of new technologies in livestock and agricultural sector. Such policies limit producers to use domestic

resources for livestock production. In recent years, local research institutes are supporting producers in developing technologies for higher productivity and offer them cost beneficial solution. In developing countries, livestock producers offer action rational to the market forces due to short term economic consideration that provide them profit. In long run, these economic considerations might damage the livelihood of producer (ibid).

2.7 Value of sustainable livestock

One of the major criteria to measure importance of sustainable livestock is to analyze increasing public demand for livestock products. The other reason for sustainability depends on social goals. If sustainability is valued as resources sufficiency in which the social welfare reason is to achieve the demand for livestock products which gives a positive impact on society in shape of human food, by-products and nutrients. On the other hand, sustainability also provides negative impact for resources sufficiency in form of human health and environmental issues. If both arguments are compared with each other, the efficient usage of resources and benefits are achieved which explains the value of sustainability. Thus resources sufficient are explained as a calculation of costs and benefits in light of future (Kneese et al., 1983). The other approach through which sustainability is measured depends on maintaining social and natural process in such a way that it regenerates the process for collective advantages. This approach deals with functional integrity, which gives more importance to regeneration than using sufficient resources to produce livestock (Thompson et al., 1999).

2.8 Problem with sustainability

The sustainability is singular in form but it can be viewed in multi-dimension approaches. This study only focus in the ecological and environmental issues related to livestock production system. The reason to select ecological issues because it deals with the origin of sustainability (Adams, 1990) and social economic consideration guide in dealing with income situation (Lele, 1991). Some problem related to livestock sustainability effect indirectly the factors of sustainability growth. The other problem in measuring results of sustainability depends on time dimension because sometimes long term planning is needed to find solution but solution are required in short time period which become problematic with sustainable growth. If policy makers develop strategy to achieve some goal in future, there is always a risk related to that activity.

2.9 Institutions

Institutions are rules that are made by policy makers which includes chance and opportunity for human to interaction with each other for their benefits. Through institutions people share values and rules that are shared in society and rules are implemented by authorities like government or local agencies. Institutions have a positive impact on the economic plan at national and local level. In every society, people favor institutions because it provide them economic growth and freedom to select from different alternatives (Kasper & Streit, 2000 p.28). On other words, the main function of institution is reinforcing order in society which encourages people to make future assumptions about economic conditions and attain cost effective results. When environment changes, there is a great need of order-supporting institutional role for attaining economic outcome according to desire of people. In short: “institutes deals with two way relationship between economic life and institutions”.

There are two types of institution (internal and external): internal institutes are developed by a long evolutionary process in which the rules are generated with a steady path. It is a long process so, continuous feedback make adjustments with accordance to time. On the other hand, external institutes are enforced by policymakers through a political process. The external institutes helps in maintaining

law and order, protecting people and providing freedom to make economic and social decisions (Kasper et al., 2000). Institutions play important role in attaining sustainable results from economic growth rates (Olson, 1996). In developing countries, weakness in institutional development ignored the results of technical progress and huge consumer base which help in achieving economic growth. The past studies of economic growth deals with institutional innovation (James and Thomas, 1994, p.258). Institutions play vital role in long term economic development objectives which support in increasing correspondence, economic efficiency and high living standards (Powelson, 1994).

2.10 Role and functions of institutions

There are various functions of institutions some of important functions are discussed: first is creating convenient coordination and trust among people to solve complex processes. The coordination at local to national level guide in understand the issues and making plans to monitoring and enforcing rules of that system. With respect to economic growth, good coordination among people and system will help in increasing productivity such as labor. Sustainable development also required coordination among all the factors of production, if one factor of production falls to fulfill its responsibilities which result damage to entire system. Secondly, formulating rule for protecting individuals freedom which provide human values and environment for people to invest. It provides them security for the development of new techniques and system by enforcing property rights laws (Kasper et al., 2000). These laws safeguard the inventor/producers to market their products and prevent producers from any interference. It also brought economic competition in the market. Thirdly, institutions create power and choice in society. While analyzing economic development in long run, the central aim is to create a balance between different groups in society so that, the resources should be utilized with an efficient way (Powerlson, 1994). When power is distributed in an extensive system it caused sustainable growth in society.

In Institutional economics the “principal agent” framework help poor rural household to solve their problem but in many cases the agent got benefits and he provides misleading information to principal. The problem could be solved if interaction between principal and agent increased and people care about more social and moral norms (Ahuja & Redmond, 2001 p.259). As Ly (2000) transformation of information and services increase between livestock production the marketing opportunities will be more efficient and effective but the requirement for this transformation should be a dependent on the formation of suitable institutions, infrastructure and policies.

2.11 Economic growth and institutions

Different economist have stressed on the importance of economic growth under institutions role because entire economic process depends on the values that are shared in society and rules that are enforce to everyone which result in cost effective business (Kasper, 1998). To attain higher economic growth, there is a need to find alternative utilization of investments which help in finding new resources to fill consumption gap, adopting new technologies and providing education and training to learn new skills (Kasper et al., 2000, pp. 13–21). The importance of institutions is measured by the “quality of shared values and rules”, based on this assumption the difference between different societies can be analyzed. A good economic and institution system works as software and hardware, institutes develop infrastructure, opportunity for training, knowledge, resources and provide capital, while economic environment provides investment opportunities, cost benefits analysis and social system to work with coordination (Kasper, 1998).

Institutions encourage different types of human behavior that effect the economic growth situation at various layers in social development. These factors support in examining the role of institution based economic behavior. Following are the factors that affect economic growth with respect to institutional role (Wolf, 1955).

- 1 Comparison between cost and benefits: The most important factor that impacts the institution role is analyzing the cost and benefits related to any event. The cost/benefit analysis also helps in maintaining sustainable resources sufficiency through saving and investment process. The institution set policies for protecting domestic markets, cost-price relationship and impose tax and tariffs based on the situation of current market.
- 2 Coordination between production and distribution of products and resources. In developed countries, basic infrastructure provides such facilities for economic growth. But in developing countries, there is a need to develop such strong institutions that guide in increasing productivity through incentives on artificial feed, new equipments and training about new ways to develop sustainable livestock. The coordination between production (output) and distribution (income) identify the gap or surplus in the system that should be measured in monetary terms.
- 3 Examine the Order and predictability of economic environment. The institutions influence the environmental issues by enforcing order which limit the people. On the other hand, economic order can be examined by predicting result of different economic actions. These prediction give probability from which the best suitable alternative is selected based on profitability.
- 4 Awareness about economic opportunities also affected by institutions because it helps in diminishing imperfection in the market. The effects will increase opportunities in technologies, marketing and production. This process is suitable for under-developing countries because it only require the flow of knowledge.

Institutions used their function not only to get economic growth at sustainable rate but they provide a variety of benefits which effect economic output. The social benefits include distribution of input for attaining efficient productivity like (distribution of physical and human capital) (Acemoglu et al., 2004).

2.12 Framework of institutional Development

Developing new infrastructure and social environment requires framework through which the rules are implemented. To form new institutes for economic growth seem to be hard because the infrastructure and resources need reallocation or identifying new factors of productions. Institutional order and rules are followed and learnt more easily because society is involved with high human interaction. To change rules or add new rules require a complete structure with is supported by policy makers like (political force) because relearning rules sometimes become difficult for authorities to generalize. There are different layers in society that need suitable innovations for making improvement. A framework is given in (figure 3) which shows different layers and is effected by transport and communication, labor and knowledge (infrastructure) on institutional innovation based on the structure of society.

The growth in societies are based on different social developments like tribe interact with local economics and this process continues till forming a global economy for human interaction, thus adding new layer in social development need new rules or adjustment in rules to make system appropriate for economic growth. These changes develop shared values in society, better interaction opportunities and guide the producers to analyze the economic conditions. From historical cases, we observed that any society which don't adopt new set of rules faced economic issues. The first layer (tribes) interacts and

coordinates easily because it includes family members and personal leaders control the system. The values are shared with interest due to personal bond between people and growth of resources of individual affects the others. The market situation permits them to coordinate with other tribes by forming a local agricultural economics system like barter system. The leader controls the market place and has a reputed personality.

Figure 3: Framework for institutional development



Layers of Social development	Appropriate institutional Innovations	Typical organizations and Manifestations
Tribal	Personal leaders, sanction by force & reference to transcendental	Family, band, sharing by custom, balance of force, natural exploitation (hunting, gathering)
Local (Village) exchange	Internal, institutions, reputation, exclusion	Family network, clubs commons, wealth creation (agriculture, husbandry), barter
Regional exchange	Internal, informal institutions, with some external back-up	Loyalty networks, personal credit & exchange, specie money, middlemen, compradors, manufacturers, bazaar, trading cities, periodic fairs
Long distance (national) exchange	Centralized external institutions, protected property rights, impersonal contracts, direct controls	Impersonal markets, specialized distribution networks, fiduciary money, impersonal financial intermediaries, industries, serial mass production, law courts, planners & regulators

Source: W. Kasper (1997) given in (Kasper, 1998, p.11)

Rules are adjusted according to local environment and joint resources give more opportunity and improve productivity due to increase demand. When the society grows further it transforms itself in regional exchange system which includes more markets and a political system. This system generates new dimensions of institutes that support in increasing productivity (investment and distribution) and middlemen start to effect economic considers. Informal institute emerge for enforcing rules for trade and social development. Moreover, expansion in regional exchange develops national system which provides lots of benefits. In national exchange system, external institutes and centralized order are implemented in society which is developed by policy makers. It gives open competitions for producer to produce and market their products in different regions based on same set of rules (Kasper, 1998). As every new layer of social development added in this system, it needs more trust and coordination. With respect to livestock production system, the issues related to regional and national level can be solved if the rules and coordination increases between institutes.

Research Methodology

This chapter describes methodological issues attached to the research question. It starts with choice of subject that conceptualizes approach of research. The research strategy and design formulate a layout which is followed by data collection and evaluation.

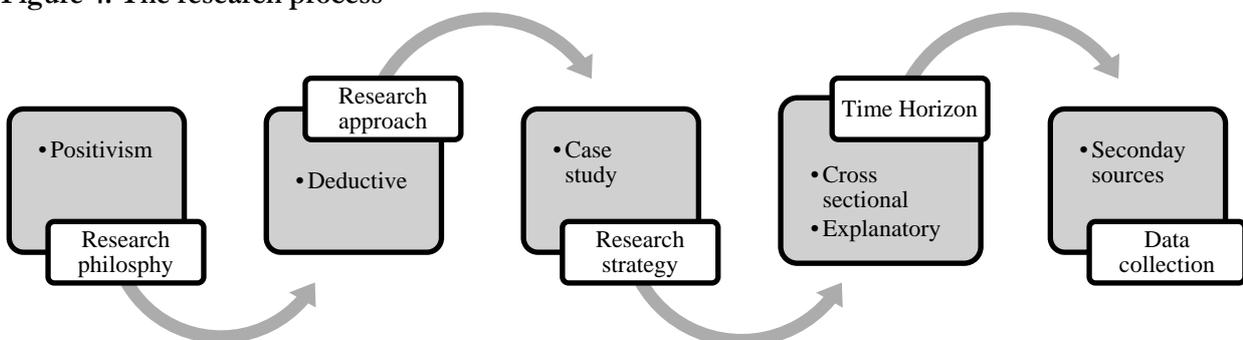
3.1 Choice of subject

The choice of subject is difficult because I have personal interest in the livestock production system. I read different reports and articles about the livestock situation in world and especially in Pakistan. The selection of topic is quite hard. So, I use brainstorming techniques to develop and refine my ideas about livestock growth reports of FAO and PARC (Saunders et al., 2007). For this purpose, I decided to investigate the economic policies for implementing sustainable livestock production system. Furthermore, I select Pakistan as a case study because, I observe that there is lots of issues and opportunities that are needed to be addressed such as (institutions, technology and structure). This research will guide in investigating economic policies for implementing a sustainable livestock system.

3.2 Perspective

It is important to have a clear perspective about the research process and approach before conducting any research. The perspective to this research is to investigate the economic policies for implementing sustainable livestock at macro-level which includes the policies and reports published at national level. Secondly, with respect of the case study, the identification of suitable institutional framework for investment and analysis of technological factors applied in this sector. The theoretical framework is developed to analyze the economic policies issues related to sustainable livestock and institutional framework is developed to encourage investment opportunity. The summary of research process is shown in (figure 4) which helps in understanding the outline for conducting this study.

Figure 4: The research process



Source: Saunders, Lewis & Thornhill (2000, p.85)

3.3 Research philosophy

There are three types of research philosophies which are positivism, interpretivism and realism, all of them are based on different process, development of knowledge and structure (Saunders et al., 2007). In simple words, research philosophy explains the way to understand the aim and clarify the structure of the study. For developing solid ground for this study, I adopted positivism as the research philosophy because it will help in supporting existing theories and link them with practical implementation. Furthermore, it guides in generalizing the results. This leads to research approach which explains the design of the research and it clearly expresses the finding and conclusion of research (Saunders et al., 2007). According to Gill and Johnson (1997), positivism provides significance to a structured methodology which guide in replication for statistical analysis.

On the other hand, interpretivism study behavior and culture of people which is analyzed through different ideas and thinking of people, thus it is preferred for conducting research in marketing and behavior studies (Saunders et al., 2007). Realism is about knowing the reality that we perceive or analyzing the reality of natural events and things. It is mostly used for natural science studies and primary aim is finding the truth with an independent mind (Bryman et al., 2007). Moreover, in positivism the researcher cannot influence the results or the subject of study and it is applied in a value free way (Saunders et al., 2007).

3.4 Research approach

Research approach guides in analyzing the use of theory which mention design and specify criteria for conclusion (Saunders et al., 2007). Research approach is divided into two categories: deductive and inductive. I followed deductive approach because it is based on developing theories with guide in examining current economic policies and deal with qualitative data for analyzing data (ibid). Key features for deductive approach are identification and measurement of variables and analyzing those variables for making conclusion about results (Ibid). On the other hand, inductive approach in which data is collected, analyzed and compared on the basis of theories formulated by the researchers (Bryman et al., 2007 p.14). Thus, I selected deductive approach to analyze research question because it guide in critical evaluation and provides justification to the theoretical framework (Bates & Jenkins, 2007 p.57). Furthermore, it provides help in generalizing the results on a larger extend.

3.5 Research strategy

There are five categories of research strategy: Experiment, Survey, Archival analysis, history and Case study (Yin, 1994, p.6). Experiment and survey are conducted with quantitative research. Thus, according to research question, case study is appropriate to analysis the problem because it is specific to one sector and it provide understand to the pervious literature related to the study. It also gives a detailed study of the events that create framework of the situation. Furthermore, qualitative research approach also used case study to investigate the events (ibid). According to Saunders et al., (2007) case study is “a strategy which involves empirical investigation of a particular contemporary phenomenon within its real context using multiple sources of evidence”. The reason to use this strategy is due to importance of context that will help in investigating the economic policies for implementing sustainable livestock production and used to explore new ways from existing theories (Saunders et al., 2009 p.146-7). There are limitations with case study strategy because it deals with one or multiple cases, it is hard to link the analyzing based on reliability and sometimes it’s difficult to generalize findings. But, a case study strategy is beneficial in application of finding based on the analysis of past experiences and explains criteria for specific situations at broad level.

3.6 Research design

Explanatory study is selected as a research design because it established a relationship between variables that explain the effects and used to study specific situation. The explanatory design is supported by problem solving theory in which problem is described with a different literatures and theoretical framework is developed for developing analysis (Yin, 1994). With respect to qualitative research, the economic policies are investigated by using this research design. Moreover, the investigation of economic policies is presented on the grounds of theoretical framework. Cross sectional study is selected as a time horizon for examining production and consumption patterns. Cross sectional study is in which a particular event is studied at a specific time and used to examine relationship between two or

more variables (Bryman et al., 2007, p.55). Thus, cross sectional study is used for livestock production and consumption analysis and explanatory design will guide in investigating economic policies and institutional framework for sustainable growth.

3.7 Data collection

The data collection method is dependent on secondary sources because investigation at macro level data mostly used secondary data sources. The data set that I use in this research is from (1960-2002). The reasons to select the dataset are; availability of consumption pattern of livestock and during these decades' livestock has changed due to rapid urbanization and high population growth rate.

I further divide this data set into two parts for making comparison between them due to change in economic and political policies in Pakistan. The data regarding to change in GDP growth rate and change in Population growth rate are taken from Economic Survey of Pakistan & World Bank. On the other hand, data regarding to production and consumption pattern of (meat and milk) and total livestock (heads) are taken from the ACO, LDDDB & FAO. The data is analyzed only for support our research problem and the data that is collected is verified and as per requirement of this study.

Documentary data is collected by the Lund library database (LibHub) with focus on the scientific journals and reports related to this research topic. These documents formulate guidelines for analyzing the different theories and finding economic policies applied to livestock during this period in other countries. Some keywords are used for finding scientific articles such as sustainable development, livestock production, institutional framework and economic policies.

3.8 Evaluation of data

As this study followed qualitative research, thus data is analyzed based on theories developed by other authors. The consumption and production pattern of livestock products are examined for supporting the research problem. The economic policies during last three decades are described with a view at macro-level. Moreover, the role of technology and institutional framework are examined through pervious literature and reports published by FAO and other international departments in which economic policies are discussed in light of sustainable development. The data collected on livestock production and consumption is analyzing gap and investment opportunities. The economic policies that were implemented during (1960-2002) are examined by production and consumption patterns. Moreover, the institutional role in developing livestock and structure of the industry are evaluated through the literature and reports available.

3.9 Ethical considerations

The ethical issues related to livestock are more dependent on the culture and environment rather than the productivity efficiency. Mostly in Pakistan, people don't consume castle milk or prefer more goat meat than beef meat due to different reasons.

Livestock structure in Pakistan

In this chapter, the historical background of livestock structure during (1960-2002) is presented. It describes the role and policies developed for livestock production growth followed by the available livestock products. The main focus of this chapter is to examine the gap between consumption and production of two major livestock products (meat and milk) and their related economic policies. Moreover, current infrastructure conditions and role of international organizations is presented.

4.1 Overview

The total population of Pakistan is 165.5 million with annual growth rate of 2.6% (1990-2000). The active population involved in agriculture business is 47%. The GDP annual growth rate is 3.7% (1990-2000) and livestock contributes 13.4% of total GDP during this period (FAO, 2003). In 2008-09, the economic growth decline to 5.7% and it is estimated that in 2009-10, the economic growth will decline to 2.2% (Pakistan, 2009). As, livestock sector is the subsector of agriculture, thus it has a macroeconomic preference for Pakistan economy and vital growth factor for rural areas (Burki et al., 2005). During last decade due to increasing demand of food, livestock has become the fastest growing sector based on income growth and structural change (FAO, 2009). During 1999-2000, it generated 37% of value addition in agriculture products and contributed nearly 9% in total GDP (Economic Survey of Pakistan, 1999-2000). Moreover, this sector employed about 30-35 million people, mostly these people belong to rural areas (Sarwar et al., 2002).

But, due to high population growth and urbanization the demand for livestock products are increasing day by day, under such circumstances it is hard to fulfill the demand in coming years (Government of Pakistan, 1988). In 1999-2000, Pakistan imported meat (1.08M metric tons) and milk (1.86M metric tons) to full the market demand. Thus, its importance has been neglected by policy makers during last three decades and the growth rate is only 2.9%/year as compared to crop growth rate with 4%/year (Quddus et al., 1997). The only reason is the structural transformation going in the economy which effect the agriculture and livestock sector and their share in economy are diminishing every year (Chaudhry et al., 1999). On the other hand, livestock is also a source of income for landless people and small farmers, these people keep livestock for rainy day and earn 10-25% of income from this sector. The main reasons for rising livestock is fulfilling the nutrient demand of people for livestock products and meet the work performance needs for agriculture sector (Iqbal et al., 1999).

4.2 Role of livestock in Pakistan

Livestock provide lots of socio-economic benefits like used as a draught power and rural transportation, generate raw material for many industries and provide employment. It's a major source of high nutrient for people in form of milk, meat and eggs (Akmal, 1994). In Pakistan, it is considered as a household activity and mostly small farmers and rural women are engaged in rearing livestock (Chaudhry et al., 1999). Small livestock produces with 1-6 animals are 84% of total livestock producers which identifies that it's a household activity and thus it don't get any special attention from institutes and policy makers (TAMA, 2010). In a growing economy, high per capita income and increasing population growth are factors that affect livestock resources (Byerlee & Iqbal, 1987). In Pakistan, livestock is valued according to increasing numbers of animals not with the change in productivity per animal. Under current situation, benefits for livestock framing are increasing due to the demand but with respect to traditional production system benefits are low (Iqbal et al., 1999).

Livestock use waste crop products, support in controlling insects and provide manure as fertilizer and transportation services in rural areas. A study shows that small producers can also be successful under institutional support and proper market because the opportunity cost is very low (Delgado et al., 2008). Thus, sustainable growth in livestock sector help in declining poverty and food availability but small producers, public health issues and environmental effect should be taken under consideration for sustainable results (FAO, 2009). Livestock is not important for meeting market consumption demand but also for socio-economic reasons because it provides profits, economic utilization of farmer household and it's a growing market worldwide (Sarwar et al., 2002).

4.3 Current economic policies and reforms in livestock sector

Pakistan spend large amount of foreign exchange on importing livestock products, to save foreign exchange policies should be implemented for increasing livestock productivity. According to a report by "Prime Minister's Task Force on Agriculture [Government of Pakistan (1993)]" recommend that livestock is not a vital sector to focus. The policies formulated for agriculture sector are also implemented in livestock which creates lots of problems. Different research paper during (1990-95) focused on the problems of livestock, such as [Akmal (1993, 1994)] on livestock production, [Ali (1990); Rosegrant and Evenson (1993) and Ahmad and Sampath(1994)] on livestock and crop growth and [Faruqee and Carey (1995)] focused on the role of policy makers and institutes in livestock production (Quddus et al., 1997). The main focus of policies is to increase productivity with quantity not with quality which caused socio-economic problem like marketing or grading and people prefer to buy quality food products. Pakistan is six largest producer of milk, but milk yield/animal is very low as compared to other countries like (Germany and New-Zealand) and poor management for animal stocks. This sector performs its function mostly on non-commercial basis but very little part is operated in an organized way through MNC's (i.e. through milk processing industries) (Burki et al., 2005).

Mostly, livestock producers in Pakistan use traditional ways to market their commodities without any training and research/development (Hasan, 2001). In long term, this effect the rearing for animals and in short run, the profitability for producers decrease so much that even it did not fulfill its operating cost. Changes are needed in market structure for positive impact on livestock business (Shafiq & Kakar, 2006). In recent years, private sector has set up commercial dairy farms which use new technologies and resources sufficiency techniques (Iqbal et al., 1985). These methods help in increasing productivity but it is only restricted to urban areas and large commercial producers are only 15% of total livestock (Dahlin, 1998). There are no policies for educating livestock producers or training centers for their assistance with any support services. Development plans are formulated for research and development, training and support services but there is no implementation due to limited access of producers to such centers and institutes (Burki et al., 2005).

Constraints related to small herd of animals are mostly as a result of poor institutional system due to following reasons: poor genetic potential is due to poor quality feed available to them, improper marketing and distribution networks and lack of technological access and poor extension services (Sarwar et al., 2002). To recover from these problems, government agencies are trying to coordinate with small producers by giving facilities such as small loans, incentives and support services but these policies are no sufficient to make improvements. The reason for uneconomical condition for livestock is due to poor management and tradition methods for livestock keeping which caused low growth rate in rearing livestock (WFP, 2009, p30). The advance technologies help in AI of livestock but due to poor infrastructure and knowledge it cannot be applied. Livestock extension services encourage people to adopt modern methods for rearing livestock but extension services are not completed integrated in

the system. The livestock feed markets are controlled by private people and they don't care about quality of feed, government should impose laws on illegal trade practices (Chaudhry et al., 1999).

Pricing of livestock products is also one of major factor that cause issues in rearing livestock because low producers profit don't allow rural people to use intensive production methods (Pizadeh & Islam, 1981). The livestock is traded according to quantity rather than quality thus; simple grading system should be introduced. Due to poor marketing infrastructure and transport, when livestock is traded the losses in their weight go up to 16% which effect its price (Shafiq & Kakar, 2006). In general, it's due to low rate of return of investment in this sector and production of livestock have a small support from government and marketing and distribution is dominated by private sector (ibid). The food deficit is increasing per year due to rapid increase in population, urbanization, climate change and poor agricultural development policy and removing subsidies from government (WFP, 2009, p, 31). Moreover, the policy makers are emphasizing more on private investments and allocation of resources rather than developing a sustainable resource management plans and macroeconomic policies for structural changes (Younis & Yaqoob, 2002, Weeks, 1999).

Iqbal (1994) mentioned some of major constraints by explaining them in three different groups: nutritional constraints, insufficient support services and Market and policy constraints. First, Nutrient issues explains feed resources. It is estimated the total feed production of livestock including (TDN & DP) is 65.72 million tons which is nearly 80% of the requirement. To fill this gap, different international and national institutes are developing technologies which are economical and biological practical. But, livestock extension system doesn't allow these technologies to implement due to farming system. Secondly, support services for livestock are provided by government agencies but only 10% of total livestock get vaccination every year. Moreover, financial assistance and budget allocation to these agencies is low as compared to other agricultural subsector. Thirdly, the marketing issues are related in general to infrastructure and distribution problem. Proper training and education is needed for making structural changes in this sector. The development policies on which government agencies are working is to develop such technologies which are economically useful in fields under current environmental condition. In Pakistan, research centers have AI facilities but only 3% of livestock producers can access it. Due to poor transportation, 70-80% of fresh liquid milk is converted into other byproducts. The policy makers are encouraging dairy farms in peri-urban areas and form cooperative societies for livestock producers (Iqbal et al., 1999).

4.4 Livestock products and availability in markets

In Pakistan, pricing system of livestock commodities depends on location (Urban, Rural), availability in market and type of middlemen involved (Ather & Raja, 2002). Prices are higher in cities as compared to villages those are away from urban markets (Farooq et al., 1999). But there are different factor that effect the pricing strategy of livestock for this reason, policy makers and institutes should play their role in maintaining standard prices (Schinzel, 1979). The major livestock products that impact on the socio-economic system of Pakistan are milk, meat, poultry and hides and skins. Milk is of the most important product of livestock that fulfill the need of people because in Pakistan majority of people consumer fresh liquid milk (Mohyuddin & Wahla, 1994). There is no structure of proper distribution and marketing of milk products from rural to urban areas. The milk produced near urban areas find its market but rural production cannot find appropriate market which results in low prices of milk in rural areas. The demand is higher in urban areas but supply is low and vice versa which resulted in shortage of fresh liquid milk (Upton, 2001). Most of milk did not reach to processing units due to poor infrastructure, so Pakistan imports powdered milk to fulfill the market demand (Burki et al., 2005).

GOP has spent 1213.5 million Rs. of foreign exchange on importing milk products (Agricultural Statistics, 1999-2000). During 1996-97, milk yield was 26.4 million tons and due to poor transportation and infrastructure the dairy processing industry got 15% of it (Hemani & Khan, 1997).

The other major livestock product is meat which provide high nutrient and it is considered as a necessary part of human food. There was no significant increase in production of meat due to traditional ways of production and no incentive for the producers who sell quality livestock due to institutions. It's all due to lack of facilities, old tradition slaughter house which and caused non-grading sale system and no price structure to meat distribution (Iqbal et al., 2000). Moreover, Hides and skins of animals are used for earning money. There are lots of opportunities for skins and hides in domestic and export market. Due to poor policies and marketing, Pakistan producers are facing damages related to skins prevention and grading (Qureshi, 2002). Poultry contributes 11.3% in livestock products and its growing with a very rapid pace due to high demand of white-meat and eggs (Wagenaar et al., 1997). In recent years, private sector investors brought new technologies and strategies by encourage local people to establish self control organization for poultry business (Shafiq & Kakar, 2006). There are lots of byproducts that support Pakistan in earning foreign exchange like leather products, wool products and fat and butter are used as substitute for cooking oil imports (Iqbal et al., 1999).

The suggested quantity of protein required for a healthy person is 36 grams/day per capita but in Pakistan people consume an only 18 gram which is not good for socio-economic status. According to a report, 3 million tons of meat and 41 million tons of milk are produced in a year which is not sufficient (WFP, 2009, p, 29). In 2006-07, \$62 million was spent on importing milk and its byproducts and \$883 million was spent on importing vegetable oil (Pakistan, 2009). During last two decade, the shortage of food availability is increasing in Pakistan. The reasons of food shortage are insufficient production and distribution systems, low income level with increased the unemployment and poor institutional structure which effect accessibility of food. According to an estimate 48.6% of total population doesn't have proper food availability (WFP, 2009).

4.5 Review of consumption and production patterns (meat and milk)

The production of livestock depends on the prices of input, its own price, technology applied in production and government policies. According to research, during 1994-2005 production growth rate of meat is 3.6% and consumption growth rate is 4.49%. Similarly, milk production growth rate is 2.59% and consumption growth rate is 4.14% (Akmal, 1994). The changes in livestock population vary during past years because feed resources available for livestock and category of animals due to low consumption of feed like goat as compared to sheep (FAO, 1987; MINFAL, 2003). In 1970, the average growth rate of livestock was nearly 3% and it continues to increase in 1980s by 4.5% and reach its highest level of 5.74%. But in early 1990s, the growth rate declined to 4.88% because livestock production decrease and negative growth rate in sheep production during 1994-95 (Pakistan, 1999). In general, the decrease in growth rate and production was due to recession in national economy (ibid).

For attaining sustainable results, the production of livestock and its products should increase with population growth. The examination of gap between consumption and production would help in analyzing the importance of sustainable growth. To get an overview of population growth, average for five years is taken to make the data easy for analysis. The growth rate of population during 1960-1980 is about 2.47% to 2.97% which is normal and the economy conditions are good. But during 1981-85, a rapid growth in population rate was observed which is 3.63% and it was the high peak of population rate. After 1985, Government and international agencies formulate plan for decreasing such as

population growth. During 1986-2000, the population growth rate decreases from 3.47% to 2.44% which was a good indicator and furthermore during 2001-2005, the growth rate was 1.82% as shown in (graph 1). But, still Pakistan is the 6th largest country in the world with respect to total population.

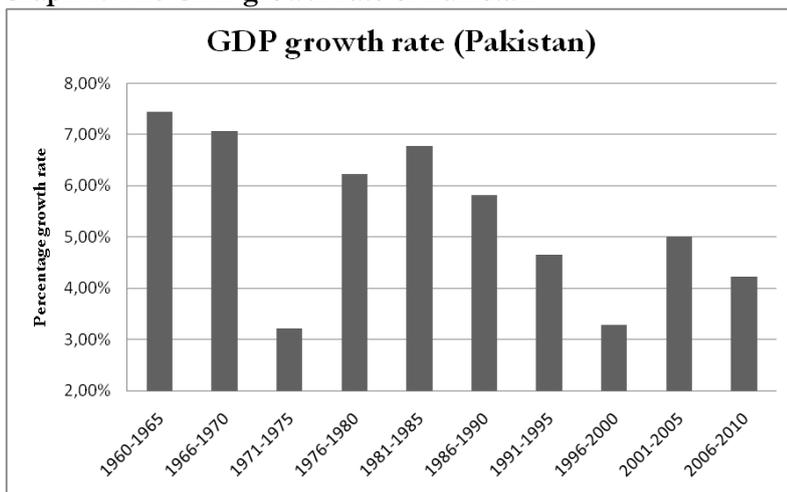
Graph 1: Growth rate of total population in Pakistan



Source: World Development Indicators Online. (World Bank)

With such a growth rate, the GDP growth rate should be sufficient to fulfill the demand of people for food and livelihood. The way to measure economic growth is to analyze the GDP growth rate as shown in (graph 2) which explains the GDP growth rate of Pakistan during 1960-2010. During 1960-70, the GDP growth rate was 7% but due to political instability and poor economic performance GDP growth rate decline to 3.22% in 1971-75. Government formulated plans and industrialization started with a rapid pace with effect the economic conditions and during 1976-1985, GDP growth rate rise to 6.78%. But after 1986-2000, GDP growth rate again decline and it's again due to political instability and poor governance. During 1981-2010, GDP growth rate of Pakistan decreases. Under current conditions and economic performance, GDP growth rate not seem to improve as population is increasing. The demand for food is increasing day by day and in such a situation, it very difficult to import food products which result inflation in country.

Graph 2: The GDP growth rate of Pakistan



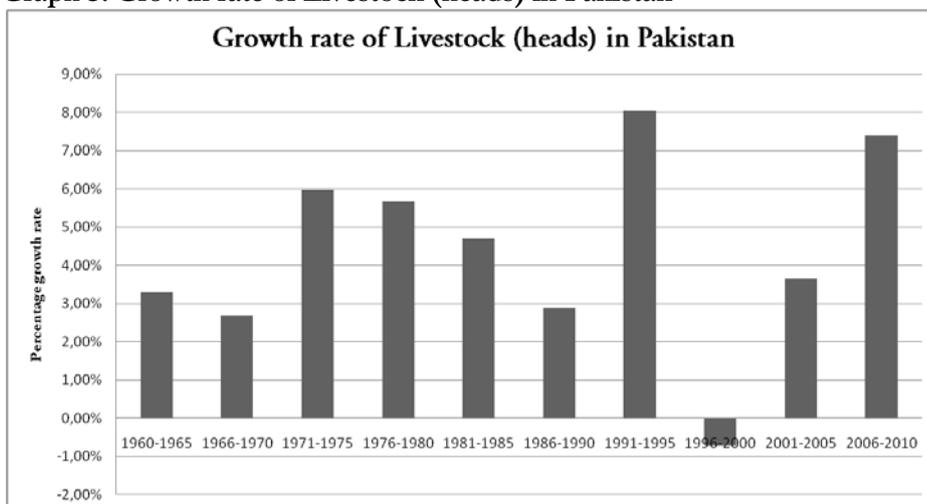
Source: World Development Indicators Online. (World Bank)

The growth rate of livestock (heads) in Pakistan identifies increase in livestock quantity. The following (graph 3) illustrates the growth rate in stock (heads) during 1960-2010. In 1960-1965, the growth rate was 3.29% and during 1965-1970, the growth rate decline to 2.68%. During 1960-70, the economy was

performing good results and more focus was given to crop farming because Pakistan is an agricultural state and most of the revenue is generated through agricultural products. In 1970-75, government developed plans for sustainable growth in livestock which helped in increasing livestock quantity. But the plans to attaining sustainable growth didn't complete due to poor governance and infrastructure. So, in 1981-85, growth fell to 4.70% and further decrease to 2.89% in 1986-90. The last two decade were very important for livestock because international organizations and world demand for livestock products has increased tremendously which effects the livestock business all around the world.

Thus, private sector and public sector invested in livestock especially in poultry business and new methods of technologies were introduced in market which result 8.05% growth during 1991-1995. But during 1996-2000, the national and international political infrastructure affected the growth rate and according to LDDDB reports, poultry business was affected by diseases which caused a decrease in poultry population. In last decade, government and international institutes developed different plans to attaining growth with reference to quantity as well as quality. FAO and UNDP formulates special development program for dairy industry and suggested various reforms for improving infrastructure. During 200-05, livestock attained growth of 3.65% and it further increased to 7.41% during 2006-2010.

Graph 3: Growth rate of Livestock (heads) in Pakistan

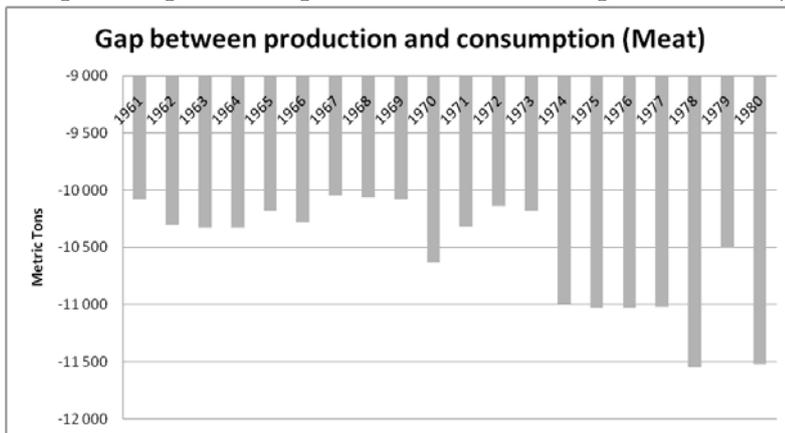


Source: Food and Agriculture Organization of the United Nations (FAO)

The gap between consumption and production of meat during (1960-2002) provide in-depth picture of the issues related to economic policies. Since 2000, the consumption of meat is growth by almost 6% per year while the production is growing only by 1.8% which leaves a gap of 4.2% and this gap is increasing due to high population growth (PBIT, 2010). Thus, Pakistan is spending its valuable foreign exchange on importing livestock products. If productivity increases according to population growth, the government doesn't need to import livestock products and with current resources, livestock will help in earning foreign exchange.

There is need for sustainable livestock policies implementation which supports livestock to fill this gap. To draw an in-depth analysis, the gap between consumption and production pattern is divided into two graphs based on GDP growth rate and economic performance. During 1960-1980, the gap between consumption and production was very little with reference to consumption patterns because the economy was performing well and livestock was growing on sustainable basis. The gap was nearly 10 000 metric tons to 11500 metric tons as shown in (graph 4). During this era, most of meat was imported from Iran and Afghanistan. The gap during this period was about 2-3% of total consumption.

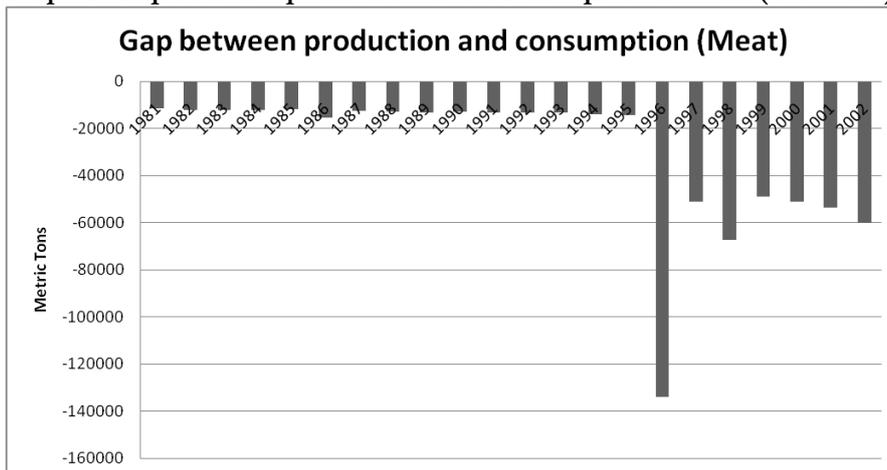
Graph 4: Gap between production and consumption of meat (1960-80)



Source: Food and Agriculture Organization of the United Nations (FAO)

The second period starts from 1980-2002 because population was growing with a rapid pace and economy indicators were not performing well due to political and regional instability. In this period, people are moving towards cities and industrialization was making structural changes in economy. Thus, livestock faced lots of issues related to sustainability and growth during this period. The following (Graph 5) illustrates a snapshot of the gap. During 1980-1990, the gap was less than 20000 metric tons. In 1995-96, a sudden increase of 134,119 metric tons gap between consumption and production affect the entire livestock production system. In this year, the production decreases about 332,870 metric tons. The reason for just a sudden deficit was decrease in camels, goats and sheep stocks (heads) due to disease and illegal exports to Middle-East. After 1995, the gap between consumption recovered but it don't recover as expected because the international demand of livestock also affected domestic markets. During 1997-98, the gap between consumption and production was 67928 metric tons. To fulfill this gap, government promoted poultry business but still the demand for red-meat is not fulfilled by domestic producers.

Graph 5: Gap between production and consumption of meat (1981-2002)

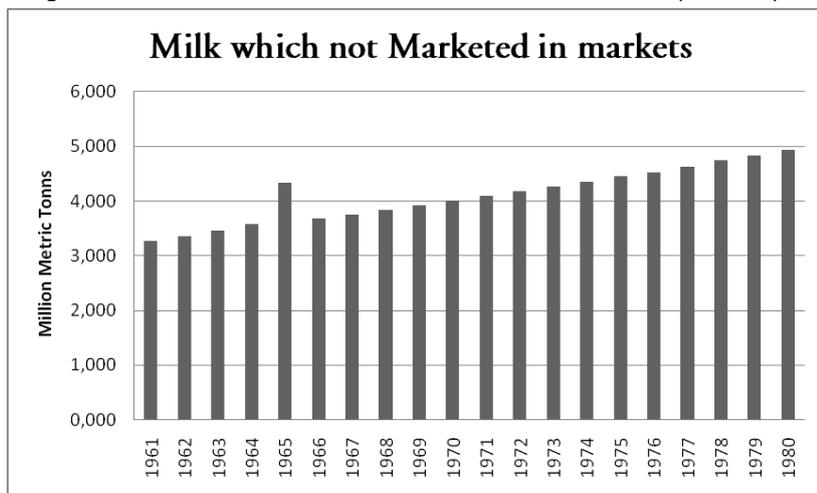


Source: Food and Agriculture Organization of the United Nations (FAO)

In case of fresh milk production and supply, the production is far more than supplied in the market. The (graph 6) illustrate the gap between production and supply in the market during (1960-80). During this period, the total fresh milk which was not supplied to markets was about 3 to 5 million metric tons or in other words it was about 53-55% of total production. During this period, Pakistan was facing lots of infrastructure and governance issues related to institutional development. The technologies used to

preserve milk were unavailable. The increase in milk gap was due to annual increase in livestock production.

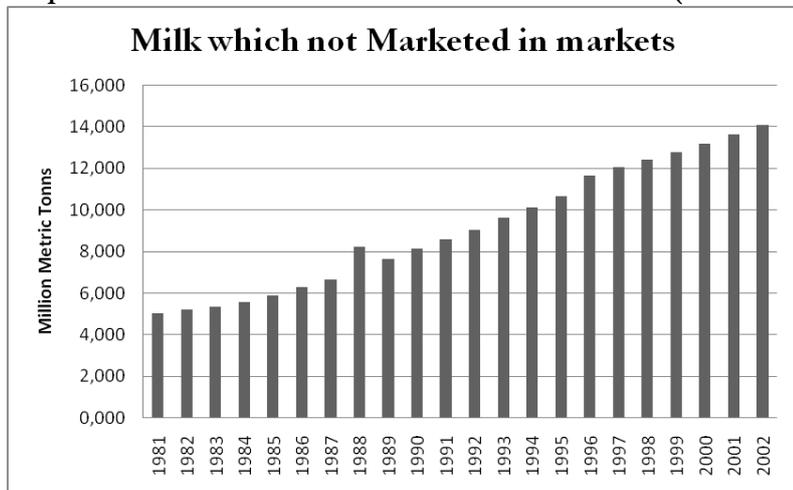
Graph 6: Fresh Milk which is not marketed in market (1960-80)



Source: Food and Agriculture Organization of the United Nations (FAO)

In 1980, government of Pakistan separated the Livestock department from agricultural ministry and formulated a new department as LDDDB. The one of main objectives of this department was to increase the access of fresh milk to markets. But as the (graph 7) showed that the gap during 1980-90 was 5 to 8 million metric tons which was about 55% of total production. Thus, no reform and policies are implemented to improving infrastructure. In 1990-95, government showed poor economic performance and neglect the livestock sector which showed its impact in meat and livestock production. In this period, about 56% of total production was not supplied to markets. In 1996-97, FAO and government institutes started dairy milk processing project through which small loans and training was given to improve the value chain. The infrastructure and transportation system from rural to urban was very poor which affect these projects. During 1998-2002, the amount of gap between production and supply increased due to livestock production but the percentage of total production which cannot reach to market decrease to 51%. It is expected that this gap will decrease more because dairy processing industries are started their operation in peri-urban areas.

Graph 7: Fresh Milk which is not marketed in market (1981-2002)



Source: Food and Agriculture Organization of the United Nations (FAO)

The fresh milk which is not supplied to markets is converted into other byproducts only to sake to preserve milk. Sustainable livestock growth with complete institution framework will support in solving such issues. The livestock producers are facing problem because the in formal channels control the markets which cause disintegration in market and effect production and distribution (PBIT, 2010).

4.6 Infrastructure and development issues

In Pakistan, market formation is constructed on local traditions, social culture and customs with people follow. As livestock is produced in rural areas, so transportation becomes a critical factor in decreasing producer's profit and distance become important factor for price determination in the market (Shafiq & Kakar, 2006). The current issues are due to inconsistent policies and insufficient tools for making decision (TAMA, 2010). GOP has formulated a five year program for improving farming communities and rural support program for restructuring infrastructure. In these programs, small loans are provided for support services and increasing production base (Khan, 2008). But, these plans are not implemented or not completed due to infrastructure and political issues.

At macro level, different types of strategic objectives are developed for livestock growth like specific on-farm activities, structural improvements, productivity and developing infrastructure. The specific on-farm activities focus on maximum usage of resources through efficient means which support in easy availability of feed, enhance shelters according to international standards by apply technological factors. It also reshaping management conditions for support services which safe animals from diseases and central aim of these activities are to increase productivity and decrease cost of inputs. The structural improvements focus on improving coordination between different stakeholders especially small mixed farmers. It brings public institutes and private sector to exchange knowledge by training and research, enhance quantity with better quality that provide value addition to livestock products. If these objectives are attained in next five years productivity will increase by 30-40% (TAMA, 2010).

The strategic objectives also focus on improved management practices that support in controlling nutrients, reproduction and extension services. Under these conditions, awareness about livestock production will increase, that could help in starting rearing for genetic improvements (TAMA, 2010). Government of Pakistan (GOP) is taking initiative my protecting special breeds and introducing new methods in public farms that help small and middle producers to adopting these modern methods (Ahmad, 2008). The water sources in Pakistan are sufficient in some regions, but in other regions water sources are not sufficient for irrigation which did not allow farmers to cultivate their land on commercial basis so they keep livestock for the livelihood (Giles & Baig, 1992; Farooq & Ali, 2002).

Infrastructure improvement is also vital to attain sustainability. The complete value chain needs to develop according to international standards, for this purpose different international organizations are working with L&DD. Improvement in value chain with increase quality of products and develop relationship between market and producers. (TAMA, 2010) For this purpose, GOP is emphasizing on growth-oriented institutional reforms through which local universities and research institutes are working on educating local people about livestock development (FAO, 2009).

4.7 Role of international banks and agencies

Different international organizations are working for sustainable growth in livestock sector like (FAO, ADB, WFP, SDC and SDPI). These organizations develop programs based on three major factors which are social, technological and biological because there objective is to understanding current livestock production and marketing system (Sugiyama et al., 2003). By understanding the local condition they can suggest and research on different nutrients and feed resources. Such collaborations

help local research and staff to learn and experience different types of strategies to attaining sustainability. The feed requirement has increased during last decades that promote the commercial production of livestock to meet market need. In these development programs, central focus is to develop commodity market; technologies oriented rearing and strengthening livestock research institutes (Kaasschieter et al., 1992). In Pakistan, most of livestock is raised by small framers which caused difficulties in applying their strategies (Sugiyama et al., 2003).

The productivity level of livestock (meat and milk) is less as compared to other countries like New Zealand which produce three times more than Pakistan with same livestock population (Garcia et al., 2003). Under small mixed traditional framing system rearing programs, artificial insemination and development strategies not seem to be successful (Sugiyama et al., 2003). Animal keeping generates 30-40% of income to small farmers; it will contribute to remove poverty if sound policies are implemented. In Pakistan ZTBL, micro finance banks and NGOs are contribution by providing incentives, subsidies and micro credit for rearing livestock and adopting technological methods (Burki et al., 2005).

The function of LDDDB involves training and educating people about livestock production, undertaking research for breeding and higher quality, producing vaccines to safe animals from diseases and providing support service. Due to insufficient institutional capacity and tradition way of keeping livestock don't allow LDDDB to solve these issues. This department needs to reposition its targets and work with private sector for implementing regulatory regime, encourage investment and promote institutes-industry coordination for better value chain (TAMA, 2010). In those areas where people can access the electricity, 15-20% of fresh milk is lost due to limited cold storage and only reason of this unavailability is operating expenses. GOP is now providing small loans, tax breaks and assistance in developing such projects. Another project starts "Milk packing project" it organize small and middle producers in groups and encourage them to work together by providing them incentives like technology, transportation support and access to market. The "UNDP Community Empowerment through Livestock Development and Credit project" was initiative to empower women in livestock sector by training and supporting them. This was public-private sector collaboration in which the complete value chain is examined and providing support services in which the most important was to link financial institutes with household livestock producers. By training women about livestock servicers will help in adopting new methods and formulating communities for economic growth (APHCA, 2008).

Discussion

This chapter presents a discussion on economic policies and reform related to livestock sector in Pakistan. I will discuss their role with regard to theoretical framework under current socioeconomic and institution conditions.

In Pakistan, the aim of economic policies related to livestock sector is to remove poverty and increase economic performance by providing effective policies and infrastructure (TAMA, 2010). According to a report of FAO, Pakistan needs to restructure its livestock production system by improving the resource management such as increasing availability of feed and improving its rearing practices for increasing productivity and to control livestock diseases (TAMA, 2010). The livestock sector has not been fully utilized, so there is room to improving productivity by implementing practical sustainable economic policies. Under current livestock population, functional integrity is the predominant factor to attain sustainable results which will increase 30-40% of productivity. The discussion focus on the context to policy setting and socio-economic conditions which examine the resource management and to what end the role of institutions are important for producing sustainable livestock production.

5.1 Economic policies

The economic policies developed for livestock sector are mostly fulfilling their objectives but the focus is on improving productivity rather than on improving farm activities under current ecological conditions. The production system is emphasized due to gap between production and consumption. During 2000-05, economic policies focus on regional development of resources management techniques and promoting modern technologies for rearing livestock (ibid). To control diseases and change nutrient issues for increasing productivity are also taken under consideration in recent years. The economic policies are linked directly to national economic performance because if national economy performs well, there should be more funds and opportunities for investor to setup new businesses. In general, economic policies for agriculture and livestock are relevant but due to increase food demand of livestock products, government develop different strategies such as improving genetic potential which will increase productivity and yield per animals. Due to political instability and poor economic performance during past five years, such policies are not truly implemented which caused more food deficit and problem in livestock keeping.

There is need to enforce these economic policies with special attention from government because increasing population will create more issues related to livestock. These policies will increase the resources management and provide new techniques for breeding livestock in a small life span which should be supportive in meeting demand and earning profits in a small life cycle. These policies will safe valuable foreign exchange and in coming years, livestock will earn foreign exchange by export products and by products. Thus, modern livestock sector will operate under international standards and increase GDP of Pakistan. These policies require a sound infrastructure and well structure institutes but unfortunately, livestock sector is facing serious problems with infrastructure and institutes.

5.1.1 Resources

To attain sustainable resource management structure for livestock efficient feed, land and water resources are required. As Pakistan is an agricultural country and most of livestock producer have their own land to feed their livestock but efficient resources are most considered while making development plans. There is a need for structural improvement for resource management at producer's level. Private sector should invest in processing plants for artificial feeds. For improving nutrients balance for livestock, small producers should be provided availability of seeds that support them in increasing

fodder per hectare. The policies for food security and nutrient issues are developed with reference to resources and land usage, so the consumption of food products and their availability is important than providing good nutrient balance. The gap between meat productivity and consumption isn't fulfilled with these reforms. A change in policy, regarding to marketing and pricing strategies is required for quality products.

Feeding management is necessary for sustainable growth in livestock because feed producing and availability has a major impact on production structure. Training and support is provided to producers for cheaper and effective feed resources by giving incentives and tax-break for vertical expansion but policies encourages horizontal expansion to higher productivity (Sarwar et al., 2002). A need for collaboration between universities and institutes for conducting research and identify current issues related to livestock. Universities will work as a ground for problem identification in milk and meat production and supply.

5.1.2 Production

Livestock production is main objective of policies during 1980-2000 but due to poor economic policies, required production cannot be attained. A survey conducted by Adams and He (1995), conclude that livestock income contributes 25% of the household income of 20% poorest people in Pakistan during late 1980's (Delgado et al., 1999). The increasing demand for livestock products emphasize on developing new strategies that should maintain sustainability and control issues related to resources and environment. Support services and development plan from promoting investors in poultry industry control production issues to limited extent but in long run, these policies will useless if proper management and institutional framework is not developed.

Lots of literature showed that high investment in R&D brought higher production that result in rising economic conditions (Cororaton 1999). Livestock policies promote productivity by considering traditional livestock production structure. This increase the production and herd size. But in long run such system will face problem in land, feed and water resources due to environmental and population growth of human and animals. A system with high yield and efficient resource management is required. Thus, policy makers are developing knowledge intensive system for small producers in which high productivity can be attained through a small herd and land, feed and water resource can be used to other purposes (Quddus et al., 1997).

The basic problem with livestock production structure is small producers and their main source of income is agriculture, thus these producers did not pay attention on increasing their productivity or efficiency. These producers are located in rural areas and they cannot access local markets or collection centers for milk. In a local rural community, 70-80% of milk is converted into byproducts for the sake of preventing them (Iqbal et al., 1999). Different international organizations conducted training and provide knowledge about milk preserving techniques. The animals have also low production yields, thus different research institutes provide knowledge about economical and biologically feasible feed techniques, but due to poor delivery system such techniques are not implemented (Iqbal et al., 1999).

5.1.3 Human capital

Human capital development and training is vital for improving structure but poor human resource development policies is one the main issues related to livestock production development. To improve the entire value chain skilled and trained people are required which provide information about modern ways of rearing livestock and communicate with local producers for value addition in their products. The research centers need to hire new staff for promoting technologies and develop plans for small

producers at individual's base to get higher yield with same livestock herd under economical usage of resources. The human resource should be capable for providing support services at community level with available technology and resources. Most of livestock producers have traditional ways of operating the animals; the hired local human resources should train and educate these producers about the opportunities and available support services.

To enhance economic of size, credit supply played an important role. During 1998-2002, small loans are provided to livestock producers for increasing their productivity and management practices (Mahmood et al., 2009). The policies develop for these loans focus on filling the production gap. Under current economic situation, policy makers should provide loans for efficient energy and resources management which support in removing unemployment and give training to rural labor. Moreover, specific credit should be provided to producers for improving the distribution system which reduce the migration process from rural to urban areas and open new dimensions for doing business (ibid).

Small producers don't take advantage of current economic policies because most economic refers to sector reforms and small producers are neglected and issues related to their development are not identified by decision makers. The small producers need to be gathered under local community and groups with respect to their location. There is need to sustainable enterprise development plans for livestock producers. There is a need for capital investment which helps in adopting modern technologies and improving infrastructure. The capital investment from government should focus on small and medium producers or provide them micro credit according to their socioeconomic conditions.

5.2 Technology

As technology is a vital factor for future development, thus livestock current technologies help in substituting natural resources with land and water saving techniques. At global level, "knowledge intensive systems" are implemented which support in maintain sustainability among the livestock resources (Delgado et al., 1999). In Pakistan, sound policies are developed to adopt this system but before that structural improvements are required such as commercialization and transformation of knowledge. This system integrates with macroeconomic policies and currently, implemented in poultry and dairy processing industries because private investments are transforming livestock from small producers to commercial and specialized businesses (ibid). This transformation change is only in limited region due to infrastructure. Apland and Andersson (1996) presented a limited sector model in Sweden based on sectoral dimensions for maximum utilization of location and profitability. This kind of model will help in long run for increasing profitability and provide sustainable environment for livestock.

The usage of old technologies is due to lack of resources and transformation of knowledge to local producers. The economic policies ensure that modern technologies are implemented and achieving successful results in controlling the use of land and water resources. These technologies are not emphasizing the role of regions because most of livestock occupied regions are not having the basic technologies like electricity and communication devices (Ahuja & Redmond, 2004).

5.3 Role of institutions in livestock

Sound livestock policies stress on institutional change for achieving sustainable production and growth in coming years under current national and livestock capabilities (TAMA, 2010). To restructure this system, policy makers develop strategies at regional and national level. The main focus is to improve the communication related to livestock support services and research between regions and government.

At national level government promotes new research areas in production and training of veterinary staff which the help of universities and research centers. The main problem with at national level is less faculty members and less research facilities due to infrastructure. This issue requires human resource development in livestock for achieving goals. At national level, there is need for develop knowledge intensive system for sustainable production and this system can be easily implemented at this level due to less involvement of untrained producers. The skill development techniques are supportive under collaboration with international organizations for delivery of efficient support services to regional centers. This will promote specialized distribution and marketing policies for various livestock products. Mostly, policies follow top down approach in Pakistan, so improving top infrastructure will create new ways to communicate with regions.

Providing credit for improving infrastructure in livestock showed a positive impact on production growth of large and medium producers (Iqbal et al., 2003). These credit facilities are available at national and large regional level due to national laws and regulations. Special policies are developed to small producers but they are unaware due to lack of communication. At regional level, training and education about various support services are provided but they are not conveyed to small producers due to gap between regional centers and rural areas. Thus, rural small producers are unaware of technologies and skill development opportunities. For this reason, local people from rural community should be trained by lectures and training at rural areas and this ongoing process will provide opportunity for increasing capability and help in problem identification for a sustainable growth. The funds are not sufficient to improving structure of regional level, so self-supporting techniques at regional level should be introduced such a charging nominal fee to support services and constancy or private sectors should sponsor regional centers for operating expenses.

At regional level, network building between producers and market should be considered by policy makers because it will provide them good price and increase their profits. Moreover, it help in building or restructuring current infrastructure to higher production yield and transform information from national to regional producers about upcoming situation related to diseases and resource management. The local research should be promoted for allocation of best regions related to livestock development, thus providing knowledge to private sector for developing new business related to livestock. At regional levels, the coordination among producers and sellers are not appropriate due to poor market condition and intermediates. By organizing meeting among producers and sellers the problem can be solved with local regions related to price determination and demand and supply of livestock products.

In Pakistan, community level livestock policies are not formulated. By formulating community policies, the government can combine small producer and get more benefits from their products. In other words, there is a need to develop bottom up approach for livestock production growth. The aim focus of policies is how to develop and increase high productivity in terms of livestock population rather than get higher yield with same livestock population by using modern techniques. By promoting community level policies, skill development and technologies can be exchanged among small producers which will safe their operating expenses and provide than resources management in terms of land and feed.

A way to attain sustainable results, the policy makers should focus on institutions and social foundations; which will increase the local capabilities for rearing livestock and provide economic growth in long run. The social foundation provides internal connectivity among producers and market which enable policy makers to understand the current situation and issues Ray Hudson (1996). The institutions can analyze the region deficiencies regard to production and infrastructure.

5.4 Marketing and Infrastructure

The infrastructure is the root cause of poor policies of livestock. The complete value chain required a restructuring which enhance the livestock quality, resources management and provide value addition in livestock products. The socioeconomic issues also emphasize on improving the production structure. The traditional way of rearing livestock has to be changed, but before that infrastructure should improve market conditions and support facilities. Thus, small producers can address his issues and get micro-credit for improving production structure. Pakistan is an agriculture country, so sustainable growth in livestock with help in controlling environmental aspects related to crops and land by enhancing soil fertility and additional production of manure will protect farmers to use artificial pesticides. The marketing policies will help in linking different channels like research center with local producers and domestic market. This system is implemented by private sector for their own like in processing plant and collection centers of milk. It's government duty to provide basic infrastructure and facilities at the door step for attaining sustainable growth.

In general there are no specific policies related to marketing of livestock products. In developed countries, sound marketing policies increased investment and infrastructure (TAMA, 2010). Marketing policies will increase the value of livestock products and increase the productivity will fill consumption gap. To implement such policies, international standards about producing livestock products is need to be applied, for this purpose knowledge and technologies should be upgraded including domestic market conditions. When these standards are implemented they will enforce producers to produce high quality products and to attain that, support facilities are provided through improved infrastructure. This will also minimize the role of intermediates in controlling market conditions and product prices.

5.5 Public and private sector

In Pakistan, livestock farms are developed for breeding and increasing quality through public investments but due to political instability and mismanagement they are not showing desired results. On the other hand, private sector developed large cooperate farms which earn profit and try to fulfill the market demand. These farms used modern techniques for rearing livestock. Current livestock policies provide advantage to such business and neglect small producers. Private sector is important but more focus should be given to small producers because they hold 80% of total livestock. Public-private sector collaboration will help in enhancing small producers (TAMA, 2010). Special policies should be formulated and improvement in infrastructure can be a way to get sustainable results.

The environmental issues are not currently addressed by policy makers in a serious manner because in livestock sector the effects of global warming, water pollution and public health are not taken under consideration. But, trade laws have forced policy makers to plan public health and product standardization policies. These policies create opportunities for resource management and preservation of products with quality. To do that, infrastructure should be supportive and effective but it doesn't promote such policies. The result is that, it increase fiscal deficit and low production yield. As Pakistan depend more on natural resources for sustainable production, thus there is no problem in developing policies for resources management (Repetto, 1987).

The demand for meat and milk products is affected by income growth and rapid urbanization which change the market situation for both producer and buyers. The policy makers during last few decades formulated plans for increasing supply to meet the demand, but input resource and environmental changes enhance more pressure to get sustainable results. This caused food availability/accessibility and inflation issues in domestic market. The economic reforms to recover this situation require institutional

innovation and modern techniques for rearing livestock, in Pakistan such reforms are plans but implementation did not become successful due to traditional ways to rearing livestock. There is need of public-private collaboration for resources management and delivery of support services (ILRI, 2009).

5.6 Role of FAO in support of livestock

FAO is playing a important role in promoting effective system for sustainable livestock production by boosting institutional role, economic policies and transferring applicable knowledge. These functions are not easy to apply under current marketing mechanism. For this reason, objective knowledge should be produced by scientific field research that will formulate ground for economic and institutional policy. The socio-economic issues that create problem in applying policies are top-down approach strategy adopted by livestock department. This approach faced issues due to communication gap between central and regional institutes while initializing new projects. Furthermore, lack of standard slaughter house for meat production and unfinished development projects are ignored by policy makers (ADB, 2004). The resource management practices for framing and livestock also affect this sector because small mixed farmers keep livestock for a source of income and daily food needs. This situation caused low productivity because resources and diet required to animal are not considered as a major issue. When policies are developed with respect to local communities, it will increase and provide knowledge about the required diet for higher productivity.

On the main problem at policy makers face while formulating plans for livestock is low producers price which affect their return on investment and production techniques (Pizadeh & Islam, 1981). Due to inflation price has increased during last few years but this increase was due to increase in price of resources/feed. The prices are controlled through informal channel and private organization that bargain on the market situation of demand and supply (Shafiq & Kakar, 2006). The policy makers try to control market and producers prices but the institutions structure faced lots of issues while implementing these policies. This problem can be solved through developing large markets in which government institutes define prices. Such large markets will discourage private organization to run their business by providing shelter, feed and water accessibility until the animals are sold. For this purpose, fee or commission should be charged from producers and buyer to meet the operating expenses of that market, thus it will be not become a burden on government and local institutes. Large livestock producers should support government for developing such strategies because they are mostly familiar with handing and controlling large herds.

The low growth rate in livestock production was due to recession and economic performance during 1990-1998 (Pakistan, 1999). Due to poor policy and investment, growth rate was negative in 1994-95 and 97-98. In these periods, low productivity and poor feed resources caused lots of diseases which showed its impact on total livestock (heads).

During 1980's, policy makers reduce their effects on artificial breeding, nutrients and environmental issues due to poor national economic performance and encouraged private investor to establish industries in this sector for improving productivity which resulted in problem in developing markets and institutional framework due to informal control of markets Government of Pakistan (1990). The situation of livestock products become critical when supply decrease more than expected, then policy makers develop plan during 1990-95 for improving animal stocks and production technologies. To cover the gap, government imports meat at 5% tariff rate in 2004 (Burki et al., 2005).

Under current policies institutional capability was somewhat in terms of local disease controlling but the planning for future precautions about livestock disease and sectoral improving plans for institutions

are not achieved as required (ADB, 2004). Moreover, technical capability showed very little impact on the support services and adoption of modern techniques. The policies should be implemented to increase the awareness about the technical capability. The traditional way for keeping livestock need to be change but it hard to transform their structure due to poor macroeconomic policies and political instability in Pakistan. Once institutional and technical capabilities are built by government, but hard to maintain their operation due to operating cost, for that reason private sector is now controlling these institutions for support service which is a good indication for sustainable growth.

Conclusion

This chapter draws the conclusion for attaining sustainable livestock sector in Pakistan. I will provide results based on the discussion of economic policies and role of institutions. I will suggest some areas for further research and managerial implications of this study.

6.1 Conclusion

Pakistan is an agriculture country with high population growth rate. During last two decade economic performance is not showing good results due to poor political instability. For sustainable production and growth: planning is very necessary, after analyzing the current policies government should involve private sector in developing plans and implementing an infrastructure for distribution of resources management and increasing production with modern techniques. The knowledge should be provided to livestock producers that feed resources are limited, thus extension services are required for efficient resources management. The livestock herds should be increased according to the capability of regions such as sheep or camels because they have genetic potential to control environmental issues and biologically feed resources should be managed. The socio-economic factor cannot be ignored for such growth because mostly producers are using traditional ways of rearing livestock, thus there is need of change of their lifestyle by providing basic infrastructure and facilities. Such change can occur, if education and training is provided to rural livestock producers and people.

To increase the quality of livestock stock, policy makers emphasize on the increasing better feed opportunities through efficient usage of resources and to fulfill the demand, the livestock should be increased with substantially for long run benefits. Under current population growth, this sector needs to be commercially promoted for new opportunities and by the use of new techniques it can attain high growth rate. The current facilities are costly and cover limited regions; the policy makers should amend support service policies for cheap and accessible AI. These facilities will help small producers to keep healthy and high productive herds. One way to attain this is by providing micro-credit facilities or encouraging them by providing incentive or better infrastructure such as market access and storage facilities. On the other hand, corporate farming system should be introduced to remove all these problems but this system might be hard to implement due to economic conditions.

The current situation of livestock is due to growing high livestock population rather than productivity per animal. By increasing productivity per animal problem related to diseases and feed can be solved and rural areas will attain economic growth. If constraints are removed, it will reduce the effect of intermediaries on determining market prices for livestock. Furthermore, with investment of private sector, infrastructure for livestock will improve and competition in market brought standards and quality for livestock products. The current policies are favorable for horizontal expansion rather than vertical which create further issues that needed to be addressed. By ignoring the sustainable perspective, it is difficult to attain regional sufficiency in resource management. The trading of the livestock need to shift towards short life span by using AI that result in quick return on investments and removing the meat production gap.

The economic principles that are identified by the different economist for strong institutional structure recommend some solution for sustainable development. In developing countries, main aim is to make reforms at rural level such as for low agricultural/livestock productivity, price liberalization rules should be implemented for price control. Furthermore, for production incentives the land should be privatized

so that people invest more to attain cost benefit analysis. The growth depends on technologies; capital and labor factor in livestock.

If sustainable livestock is attained, Pakistan can earn foreign exchange by exporting livestock product and by products to Middle East and other Asian countries. Quality improvement should be main focus for developing strategies which help in linking marketing policies with economic growth. Building sound institutional and human resources will fill the resource management gap through public-private investments and sustainable results can be achieved. More research is needed to set new measure for growth, thus policies should improve current infrastructure and institutions framework before setting new targets for livestock. Livestock is a major part of agricultural economy so, it will support in improving sustainability in crop production by using waste management and some of draught power for poor farmers. The recommendation are 1) information about different policies for development for higher livelihood. 2) Discussion on different policy issues for enhancing effectiveness in livestock production. 3) formulate policies for credible local institutes 4) create local database, information centers and research centers for growth (Ahuja & Redmond, 2001).

6.2 Managerial implication

This investigation should guide LDDDB personals to get a brief snapshot about the current economic policies and its related issues/constraints. Moreover, this investigation is also conducted by examining the macro-level indicators, so they can see the impact of sustainable livestock on economic growth and its investment opportunities at regional level. Furthermore, investment opportunities will guide the managers of MNC's to invest in their area of interest. This investigation identifies an institutional framework of community network that will help the small producers to access the market under current conditions.

6.3 Suggestion for further studies

In livestock sectors, more research is required and it will be helpful to making sound economic policies and development plans for short and long term. The current economic policies faced lots of constraints due to infrastructure and poor institutes. There is a need to develop more beneficent and long term economic policies to get economic growth and reduce poverty. Currently, the sector is promoting horizontal expansion. The future studies should investigate the impact to vertical expansion on economic growth and improving the productivity by adopting model from other developed countries.

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Appendix I: Population: Growth rate of total population

Units: Percent (%)

Year	Growth rate
1960-1965	2,47%
1966-1970	2,59%
1971-1975	2,74%
1976-1980	2,97%
1981-1985	3,63%
1986-1990	3,47%
1991-1995	2,46%
1996-2000	2,44%
2001-2005	1,82%
2006-2010	1,84%

Source

Development Data Group, The World Bank. 2008. *2008 World Development Indicators Online*. Washington, DC: The World Bank. Available at: <http://go.worldbank.org/U0FSM7AQ40>.

Appendix II: GDP growth rate

Units: Percent (%)

Years	GDP
1960-1965	7,44%
1966-1970	7,06%
1971-1975	3,22%
1976-1980	6,22%
1981-1985	6,78%
1986-1990	5,82%
1991-1995	4,66%
1996-2000	3,28%
2001-2005	5,02%
2006-2010	4,22%

Source

Development Data Group, The World Bank. 2008. *2008 World Development Indicators Online*. Washington, DC: The World Bank. Available at: <http://go.worldbank.org/U0FSM7AQ40>.

Appendix III: Total Livestock (head) In Pakistan

	Stock	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Buffaloes	Head	6700000	6900000	7110000	7330000	7550000	8586000	8770000	8958000	9150000	9345000
Camels	Head	600898	640000	680000	720000	763000	720000	720000	700000	700000	700000
Cattle	Head	14179000	14224000	14269000	14314000	14359000	14404000	14449000	14494000	14539000	14584000
Goats	Head	8800000	9200000	9600000	10000000	10400000	10800000	11300000	11800000	12200000	13200000
Sheep	Head	10230000	10680000	11200000	11650000	12290000	12850000	12900000	12950000	13000000	13095000
Total	Head	40509898	41644000	42859000	44014000	45362000	47360000	48139000	48902000	49589000	50924000
Stocks change into 1000 Head		40509,9	41644	42859	44014	45362	47360	48139	48902	49589	50924
Chickens	Stocks (1000 Head)	11500	12000	13000	13800	14000	15000	15800	16000	16800	16800
Grand total		52009,9	53644	55859	57814	59362	62360	63939	64902	66389	67724

	Stock	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Buffaloes	Head	9545000	9750000	9959000	10172000	10389000	10611000	10838000	11069000	11305000	11547000
Camels	Head	700000	732000	746000	760000	774000	789000	804000	819000	835000	841000
Cattle	Head	14629000	14674000	14719000	14764000	14810000	14855000	14901000	14946000	14992000	15038000
Goats	Head	14300000	15581000	16925008	18385008	19971008	21693008	23564000	25597008	27804000	24953008
Sheep	Head	13192000	13667000	14828000	16088000	17454000	18937008	20546000	22291008	24185008	21439008
Total	Head	52366000	54404000	57177008	60169008	63398008	66885016	70653000	74722016	79121008	73818016
Stocks in (1000 Head)		52366	54404	57177,01	60169,01	63398,01	66885,02	70653	74722,02	79121,01	73818,02
Chickens	1000 Head	17000	17000	20000	23000	27000	31000	34000	36000	38000	45200
Grand total		69366	71404	77177,01	83169,01	90398,01	97885,02	104653	110722	117121	119018

	Stock	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Buffaloes	Head	11917000	12197000	12483000	12777000	13077000	15705000	16106000	16518000	16940000	17373008
Camels	Head	855000	869000	883000	897000	912000	926000	941000	996000	1015000	1035000
Cattle	Head	15774000	15964000	16157000	16352000	16549000	17541008	17575008	17609008	17643008	17677008
Goats	Head	25842000	26763008	27716000	28704000	29726000	29945008	31235008	32580000	33983008	35446000
Sheep	Head	22115008	22812000	23531008	24272000	25037008	23287008	23868000	24463008	25072000	25698000
Total		76503008	78605008	80770008	83002000	85301008	87404024	89725016	92166016	94653016	97229016
Stocks (1000 Head)		76503	78605	80770	83002	85301	87404	89725	92166	94653	97229
Chickens	Stocks (1000 Head)	48000	51200	57000	61600	66800	67000	70700	78000	79300	79000
Grand total		124503	129805	137770	144602	152101	154404	160425	170166	173953	176229

	Stock	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Buffaloes	Head	17818000	18273008	18740000	19219000	19711000	20273000	20838000	21422000	22032000	22669000
Camels	Head	1056000	1076000	1097000	1119000	1141000	816000	803000	794000	784000	775000
Cattle	Head	17711008	17745008	17779008	17814000	17848000	20424000	20802000	21192000	21592000	22004000
Goats	Head	36972000	38564000	40225008	41957000	43764000	41169000	42650000	44183000	45775000	47426000
Sheep	Head	26338000	26995008	27668000	28358000	29065000	23544000	23668000	23800000	23938000	24084000
Total	Head	99895008	102653024	105509016	108467000	111529000	106226000	1,09E+08	111391000	114121000	116958000
Stocks in (1000 Head)		99895	102653	105509	108467	111529	106226	108761	111391	114121	116958
Chickens 1000 Head		75000	82000	96000	130000	159000	184000	200000	145000	148000	150000
Grand total		174895	184653,024	201509,016	238467	270529	290226	308761	256391	262121	266958

	Stock	2001	2002	2003	2004	2005	2006	2007	2008	2009
Buffaloes	Head	23335000	24030000	24800000	25500000	26300000	27334985	28165000	29000000	29900000
Camels	Head	767000	758000	751000	743000	736000	921000	933000	945000	1000000
Cattle	Head	22424000	22858000	23303000	23757000	24218000	29558812	30673000	31830000	33000000
Goats	Head	49140000	50917000	52763000	54679000	56665000	53789000	55244000	56742000	58300000
Sheep	Head	24236000	24398000	24566000	24744000	24923000	26488000	26794000	27111000	27400000
Total	Head	119902000	122961000	126183000	129423000	132842000	138091797	141809000	145628000	149600000
Stocks in (1000 Head)		119902	122961	126183	129423	132842	138092	141809	145628	149600
Chickens 1000 Head		155000	174000	182000	186000	189000	232000	251000	273000	296000
Grand total		274902	296961	308183	315423	321842	370091,797	392809	418628	445600

Source

Food and Agriculture Organization of the United Nations (FAO), 2007.

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Appendix IV: Meat Production and Consumption Pattern

Meat (1960-2002) Units: Metric tons

Year	Consumption	Production	Gap	Year	Consumption	Production	Gap
1961	365 971	355890	-10 081	1981	748238	736651	-11587
1962	377603	367303	-10 300	1982	780954	768949	-12005
1963	386005	375673	-10 332	1983	827736	815752	-11984
1964	396603	386276	-10 327	1984	882201	870214	-11987
1965	405524	395346	-10 178	1985	946697	934774	-11923
1966	416963	406679	-10 284	1986	1057829	1042625	-15204
1967	428889	418842	-10 047	1987	1117414	1104890	-12524
1968	439085	429018	-10 067	1988	1195280	1182315	-12965
1969	449973	439894	-10 079	1989	1273541	1260510	-13031
1970	462456	451820	-10 636	1990	1324447	1311705	-12742
1971	476520	466196	-10 324	1991	1382945	1369900	-13045
1972	492998	482859	-10 139	1992	1473478	1460160	-13318
1973	520767	510585	-10 182	1993	1645476	1632290	-13186
1974	543666	532676	-10 990	1994	1758264	1744420	-13844
1975	564810	553780	-11 030	1995	1856940	1842550	-14390
1976	590937	579910	-11 027	1996	1643799	1509680	-134119
1977	620 073	609053	-11 020	1997	1703696	1652680	-51016
1978	646 769	635222	-11 547	1998	1646978	1579680	-67298
1979	679 923	669417	-10 506	1999	1686508	1637680	-48828
1980	713 159	701638	-11 521	2000	1730857	1679680	-51177
				2001	1780241	1726680	-53561
				2002	1836879	1776680	-60199

Source: Food and Agriculture Organization of the United Nations (FAO), FAOSTAT on-line statistical service (FAO, Rome, 2004). Available online at: <http://apps.fao.org>.

Appendix V: Milk Production and Supply to market

Quantity (tons)

Milk Production and Supply to market (1961-80)

Year	Supplied	Production	Milk not supplied to market	%age Milk not supplied to market
1961	2 734 996	5 998 400	3 263 404,00	54,40%
1962	2 799 127	6 160 150	3 361 023,00	54,56%
1963	2 855 902	6 317 050	3 461 148,00	54,79%
1964	2 928 963	6 500 100	3 571 137,00	54,94%
1965	2 329 747	6 658 100	4 328 353,00	65,01%
1966	3 036 048	6 712 500	3 676 452,00	54,77%
1967	3 101 604	6 856 000	3 754 396,00	54,76%
1968	3 212 356	7 052 500	3 840 144,00	54,45%
1969	3 334 642	7 262 000	3 927 358,00	54,08%
1970	3 429 969	7 445 000	4 015 031,00	53,93%
1971	3 496 945	7 591 500	4 094 555,00	53,94%
1972	3 571 917	7 758 000	4 186 083,00	53,96%
1973	3 625 995	7 899 000	4 273 005,00	54,10%
1974	3 683 836	8 044 000	4 360 164,00	54,20%
1975	3 744 675	8 193 000	4 448 325,00	54,29%
1976	3 827 727	8 348 000	4 520 273,00	54,15%
1977	3 879 603	8 509 000	4 629 397,00	54,41%
1978	3 931 870	8 670 000	4 738 130,00	54,65%
1979	4 006 551	8 841 000	4 834 449,00	54,68%
1980	4 075 936	9 014 000	4 938 064,00	54,78%

Quantity (tons)

Milk Production and Supply to market (1981-2002)

Year	Supplied	Production	Milk not supplied to market	%age Milk not supplied to market
1981	4 151 920	9 195 000	5 043 080	54,85%
1982	4 263 638	9 465 000	5 201 362	54,95%
1983	4 332 991	9 662 000	5 329 009	55,15%
1984	4 662 969	10 242 000	5 579 031	54,47%
1985	4 970 743	10 856 000	5 885 257	54,21%
1986	5 522 432	11 818 000	6 295 568	53,27%
1987	5 813 245	12 482 000	6 668 755	53,43%
1988	5 076 145	13 319 000	8 242 855	61,89%
1989	6 352 232	14 003 000	7 650 768	54,64%
1990	6 577 307	14 723 000	8 145 693	55,33%
1991	6 909 136	15 481 000	8 571 864	55,37%
1992	7 251 428	16 280 000	9 028 572	55,46%
1993	7 511 780	17 120 000	9 608 220	56,12%
1994	7 892 476	18 006 000	10 113 524	56,17%
1995	8 324 827	19 006 000	10 681 173	56,20%
1996	11 301 504	22 970 000	11 668 496	50,80%
1997	11 516 290	23 580 000	12 063 710	51,16%
1998	11 817 851	24 215 000	12 397 149	51,20%
1999	12 104 642	24 876 000	12 771 358	51,34%
2000	12 369 784	25 566 000	13 196 216	51,62%
2001	12 628 038	26 284 000	13 655 962	51,96%
2002	12 942 908	27 032 000	14 089 092	52,12%

Source: Food and Agriculture Organization of the United Nations (FAO), FAOSTAT on-line statistical service (FAO, Rome, 2004). Available online at: <http://apps.fao.org>.