Introduction

Statement of the Problem

From the dawn of civilization, mankind has been utilizing different animal species for a variety of purposes viz. production of milk, meat, wool, egg and leather, draught power, companionship, entertainment, research experimentation, sports, security etc. Livestock wealth is deemed as the oldest wealth resource for mankind and was once a symbol of economic status in the society. Even now livestock sector plays a crucial role in rural economy and livelihood. This is one sector where poor contributes to the growth directly instead of getting benefit from elsewhere (Eleventh five year plan).

Animal husbandry is concerned with the care and breeding of domestic animals such as cattle, goats, sheep, hogs (a pig breed), and horses etc. Domestication of wild animal species was a crucial achievement in the prehistoric transition of human civilization from hunting and gathering to agriculture. The first domesticated livestock animal may have been the sheep, which was tamed around 9000 BC in N Iraq (The Columbia Encyclopedia 2007).

But where and when exactly this domestication started is not clearly documented. Historically, however it is thought that the cattle were probably first domesticated in Europe and Asia about 8500 years ago. Cattle are considered one of the first animals domesticated by man for agricultural purpose. The first Indian cattle landed on Brazilian shores in 1906 and it is ironical that the finest Indian Zebu specimens are rarely found in their native land India and are mostly confined to Govt. institutional farms while they can easily be seen in Brazil. Zebu cattle, originated in India, are thought to be the world’s oldest domesticated cattle. They were introduced in the United States as early as 1849 (Secretary Member, 2007).

The first importation of Zebu from India into the western world, especially the American continent, were bullocks for draft purposes, but they were later interbred with other cattle breeds and hybrids were produced which
were bigger, faster growing and thriftier. Today India has a very rich reservoir of genetic diversity and possesses some of the best breed of cattle and buffaloes in the world. The country’s population of 218.8 million cattle accounts for 17% of total world population of cattle. The best indigenous draught and dual purpose animal account for 22-25% of the Indian cattle population, while 7-10% of cattle population is crossbreed. The country shares largest number of cattle and buffalo of the world. She also ranked second in goat and third in sheep and seventh in poultry sector (Hegde, N. G., 2006).

Livestock is one of the important segments of Asian agriculture. It has been practiced as an auxiliary activity in the process of production of different foods since antiquity. The farm animals such as the cattle, buffalo, goat, sheep, pig, hen, and so on were always reared as domestic and subsistence animals. Many traditional techniques and practices had been applied in the process of their rearing like mixed farming, nomadic herding and commercial grazing. Commercial form of livestock husbandry has rarely existed during colonial period in Asian countries (Khan, N. et al, 2008). In some cases, cattle and buffalo were reared in a very few regions and were used mainly for the work in agriculture as drought animals. The animal dung was always valuable for their usages as domestic fuels and is still being used in many villages of South Asia. Despite the primitive and traditional nature of livestock husbandry that existed in pre-Second World War era in Asian countries, they had the largest number of cattle, buffaloes, pigs, chickens and goats in the world.

India witnessed a revolution in agricultural economy, especially in food grain production after its independence in 1947. The late 1960’s are considered as a period of the agricultural food products revolution, in which she achieved self-sufficiency in food production. However, this success was achieved at the cost of environmental degradation; ecological suitability, genetic diversity, and the various kinds of potentials of diversification of farming systems were neglected. Consequently, the growth of farmers and farming system remained imbalanced in India. During the last decade of the 20th century, Indian agriculture stood at a crossroad and a severe depression was witnessed among
the farmers as well as in the government. The food grain production became non-economical solely due to increasing gaps between the input cost and the output price per unit weight of its production (Khan, N. et al, 2006).

The agricultural input costs continuously increased because of removal of subsidies by the respective governments in successive years under the influence of world economic order. Inefficient agricultural marketing system led to low price per unit weight of output. Reduction in the size of operational holdings year after year due to division of land holdings among the heirs has also contributed to the reduction of productivity and consequently badly affected the economic viability of traditional crops like the food grains. This critical agricultural situation called for a drastic and constructive change in agricultural policies and object orientation of farmers toward diversification of crops and farming systems. The agricultural policies in the current decade urged the farmers to move from subsistence-traditional cropping system to value-added market-oriented agriculture and from monoculture to diversified one. In this regard, the farmers adopted various kinds of farming systems along with cultivation of some major food crops.

Livestock farming, however, has been appearing as one of the most important value added farming systems. After cultivation of crops, livestock is the second largest productive asset in rural India. Of the total household in the rural area, about 73 percent own some form of livestock. Among these farmers, small and marginal farmers account for three quarters of the households. Livestock and its allied activities like dairy and meat production emerged as an important sector of Indian rural economy. They are important and integral parts of country's socio economic fabric in rural areas. It plays a vital role in socio-economic development of a region/country. It is considered as a source of employment, involving the people in various operations for the rural population in the developing world (Inforesources, 2007).

The livestock sector recently emerged as an important form of diversification of agriculture in many developing countries like India. It is an important source of food security as it provides meat, milk and other dairy
products, which enrich the nutrition intake (Rollefson 2001). Thus food security and health improvement have been also solved to a great extent through the development of this sector as animal derived food intake is increasing over the decade.

The demand of livestock products rose up tremendously at global level because of increasing urbanization, burgeoning middle class population as well as improvement in level of income and socio-economic transformation and consumption of food of high calorie. (Delgado, et al. 1999, Rollefson, K.I. 2001, Chindola, P. and Otte, J. 2006, Brithal and Taneza, 2006, Padamkumar, V. 2007). Such a dramatic change in demand and production of livestock and their products is described as Animal Revolution by IFPRI (International Food Policy Research Institute) analysts (Conroy, C. 2004). This livestock revolution has offered opportunities to the producers to expand on this sector through the enhancing production, both in qualitative and quantitative terms. Scaling up of the production and agri-business has also been encouraging in developing countries especially in India, which is very much patterned on the models of developed countries. The revolution has been accelerated after liberalization of agri-business and increasing demand of livestock in global market due to price competitiveness of livestock products originated in tropical monsoon developing countries where production cost is rather low due to low wage rate (Padamkumar, V. 2007).

Thus in this way, the livestock products from tropical countries are in great demand, both in the Asian as well as in the European markets. These products, especially those produced in India, have a good competitive price in international markets due to a low production cost after reducing the subsidies on agricultural production and export by them (Allana 2005, Padamkumar, V. 2007).

The increasing intensity of livestock husbandry and scaling up of this industry opened an opportunity for the poor farmers to get employed and enhance their income. The sustainability of cropping system may be also improved through the adoption of livestock cropping integrated agricultural
practices especially in those countries where traditional small scale livestock husbandry is regulated by small and marginal farmers (Pratap S.et al.(2004)).

However, the livestock revolution also poses threat to resource poor livestock keepers in under-developed countries. Increasing competition with big firms, revenue constraints, disease threat, new trade standards and environmental issues are some of the important factors that put further pressure on this sector. The emergence of livestock industries as opposed to traditional-small farmers seems to be a threat to poor livestock keepers. Its effect has been demonstrated into four inter-related processes of structural integration, specialization, and close spatial link between production and consumption points (Laper, et al. 2003, Costales 2004). Hoffman (1999) argued that this industry has raised four important issues for Asian economies: one, the importance of livestock to national economy, two, the protection of environment in the face of increasing intensive farming methodology, three, the protection of human and animal health and four, the maintenance of social equity.

Livestock environmental pollution is an important issue which causes havoc every year. It is viewed that pollution is locally generated by concentration of small farms. The scaling up of the system need not cause pollution but the concentration of animals in commercial or industrial production facilitate the mutation of more highly pathogenic virus form that can spread to humans (Papangsakaron, 2003). The livestock industrialization has negative impact on social equity. The small producers suffer a setback as they have lost out in the competition or failing to recover from price fluctuation, disease outbreak that destroyed capital and stock (Rigg 2005, Tuong 2007).

It is a diversified form of agriculture system which accounts for about 4.70% of GDP during 2004-2005 at 1999-2000 prices (Eleventh five year plan). Today the country has first position in milk production as well as in livestock in the world. It is well known that during first three five year plans and the successive annual plans of India (1966-1969) the subject of animal
husbandry was not accorded the recognition, it was deserved in country’s planning and as such adequate provisions were not made towards harnessing this rural resource (Kataria, M. S. (1982). Thus, milk production in India remained stagnant during the period 1950 to 1970, when the production grew at the rate of about 1% per annum. Thereafter, India’s milk production showed rapid growth between 4 and 5 percent, reaching a level of 91 million tones in 2004-05. The per capita availability of the milk increased from 112 gm per day in 1970-71 to 229 gm per day in 2004-05. An estimated 70 million rural milch animal households are engaged in milk production (Eleventh five year plan).

Among different states, Uttar Pradesh has the largest livestock population in India. In spite of these facts this sector is subsistence in nature but with exponential growth of population and continuous fragmentation of land, there is need to enhance the economic viability of small and marginal farmers through animal husbandry and allied activities.

The number of marginal and small farmers is continuously increasing. It accounts for nearly 78% of the total operational holding in the country and operating over 32% of the total agricultural land. The livestock husbandry may also improve farmer’s investment capacity for the use of various inputs like fertilizers, seeds, pesticides etc. which would improve the productivity of land at remarkable level. The women economic power and participation in animal husbandry, the employments and income generation, soil fertility through the addition of animal excreta(dung) produced by them as waste are valuable encouraging aspects of livestock husbandry maintaining sustainability of farmers.

**Significance of the Study**

The present research work can play a significant role in policy making for employment generation through livestock husbandry. The district Aligarh has been chosen as a study area to show the role played by livestock on economic viability of marginal and small farmers. Agriculturally, Aligarh district is one of the developed districts of western Uttar Pradesh in India and
witnesses the area which comes under operation flood which is one of the biggest dairy development project undertaken in India (NDDB, National Dairy Development Board 1979).

Most of the people are engaged in agricultural activity ranking as crop activity to be the primary and livestock husbandry as a secondary occupation for their survival and maintenance. Therefore, livestock husbandry is the first optional occupation in the district, particularly for the farmers. This activity has a paramount effect on economic status of the people directly related to their livelihood and provides a handsome amount of employment for them. Proper utilisation and consumption of milk makes and saves the money. Marketing of milk also enhance the income of farmers.

Moreover the cultivation of few crops both subsistence and value added, may produce the bi-product in the form of either dry or green residues which would encourage the livestock husbandry through supply of food. Various kinds of food grains can also be grown for feeding the reared animals. Besides, during agriculture lean period or off agricultural seasons the farmers may involve themselves in development of livestock rearing by same house hold. Thus livestock husbandry would be very much effective and fruitful for increasing viability of marginal and small farmers and for improving the biological and chemical composition of soils through the use of biomass produced from combined crop livestock farming system.

Under the above circumstances animal husbandry system would be a positive and blessing option for increasing economic viability of farmers of low size of operational holdings like marginal and small farmers. The rearing of livestock will generate new forms of employment for rural youths in rural areas. Income of households and the capital formation will also improve.

Thus livestock husbandry and its role on economic viability of marginal and small farmers is an important aspect of agricultural geography. An understanding of these facts of study area will provide empirical evidence for
the planners and policy makers to formulate policies which shall be helpful in
development of livestock as well as its products.

Objective of the study

Keeping in view the significance of livestock husbandry in socio-economic transformation as well as maintaining the agricultural sustainability and the economic viability of poor farmers in developing countries like India in general and Aligarh district in particular, following objectives have been taken into consideration.

1. To Study the dynamics of livestock development in Aligarh district (Study Area).
2. To show the socio-economic conditions of livestock rearers.
3. To evaluate the quantum of employment and income generation through animal husbandry.
4. To show the effects of seasons and livestock dairy centers and markets on livestock products and on livestock number.
5. To examine the economic viability and sustainability of marginal and small farmers.

Hypotheses:

1. Livestock husbandry is economically more viable to small and marginal farmers than big farmers.
2. Mixed farming system is economically more viable than the exclusive livestock rearing system.
3. Livestock husbandry is directly proportional to the distance of milk collection center and livestock markets from rearing point.

Research Methodology and Data Collection

Present study is based on both primary and secondary sources of data. Primary data were collected through field survey of the sampled villages. For micro level study of the district, all the 12 blocks have been taken into
consideration which is confined in five tehsils (Subdivision of district) namely Koil, Khair, Atrauli, Gabhana and Iglas. Considering each block as a stratum/base, 5% of populated villages were selected. Therefore, total 59 villages were selected for the study keeping in view some special considerations viz. road connectivity, interior location and villages around livestock markets as shown in Table 1.1 and Figure 1.1. In sampled villages 20% household were selected as a stratified random sample for the survey purposes. Besides, five livestock markets and five dairy centers were also selected for detail survey of visitors.

Data were collected in 2007-2008 on the basis of detailed questionnaire. Households were thoroughly interviewed regarding various aspects of livestock husbandry and its role on economic viability. List of sampled households are classified as landless, marginal, small, medium and big on the basis of size of landholdings. 0 hectare, 0-1 hectare, 1-2 hectare, 2-4 hectare and more than 4 hectares are the criteria for the respective group of farmers.

Secondary data were collected from published record available in various offices of agricultural statistics located at State and District headquarters. The block-wise data regarding livestock numbers in different quinquenial years, area and population of the block have been collected from District Statistical Magazine of different years from Vikas Bhavan (District development building). Other data were collected from chief veterinary officer, Office of Dugdh Utpadan sahkari samiti (DUSS, Milk Production Co-operative System) and from the office of livestock market. The collected data were processed and analyzed with the help of simple statistical techniques. The figures of different indexes has been divided into three categories i.e. low, medium and high on the basis of 0.5 *(mean ± standard deviation) of the index. For map making paint brush and arc view 3.1 techniques have been used. Among Livestock, only four types of ruminants like cattle, Buffalo, Sheep and goat have taken into consideration for the study.
Study area

The study area is located in the western part of Uttar Pradesh. It lies between latitudes 27°34'N to 28°11'N and between 77°29'E to 78°38'E longitudes in the central part of Ganga–Yamuna Doab. The district has a total area of 3691.54 square kilo meters with a population of 2992286 persons in 2001.

Aligarh is one of the important agriculturally advanced regions of Uttar Pradesh. Livestock also remain a backbone after cultivation of crops in this region, particularly after white revolution this sector became complementary as well as supplementary for the agricultural farmers of the study area. Therefore, 986918 livestock consisting 143620 head cattle, 715774 buffalo, 145471 goat, 9587 sheep are available in the district. Four meat processing unit along with one municipality controlled slaughter house are also located in the study region.

From the administrative point of view, the district has been divided into 5 Tehsils (Subdivision of district) namely, Atrauli, Gabhana, Khair, Koil and Iglas. These Tehsils are further subdivided into 12 blocks namely, Atrauli, Gangiri, Bijauni, Jawan, Chandaus, Khair, Tappal, Dhanipur, Lodha, Akrabad, Iglas and Gonda which include 1180 villages in which 30 villages are non-populated (abandoned).

Table 1.1 Stratification of Sampled Households in Aligarh District

<table>
<thead>
<tr>
<th>Category of households</th>
<th>Number of households surveyed</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of households surveyed</td>
<td>2109</td>
<td>-----</td>
</tr>
<tr>
<td>Livestock rearing Households</td>
<td>1921</td>
<td>*91.08%</td>
</tr>
<tr>
<td>Landless livestock rearers</td>
<td>340</td>
<td>**17.69 %</td>
</tr>
<tr>
<td>Marginal farmer (less than 1 hectare)</td>
<td>471</td>
<td>**24.51%</td>
</tr>
<tr>
<td>Small farmer (1-2 hectares)</td>
<td>599</td>
<td>**31.18 %</td>
</tr>
<tr>
<td>Medium farmer (2-4 hectares)</td>
<td>338</td>
<td>**17.59 %</td>
</tr>
<tr>
<td>Big farmer (&gt; 4 hectares)</td>
<td>173</td>
<td>**9%</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2007-08
*Percentage share of livestock rearers to the total sampled households.
**Percentage share of livestock farmers to the total livestock rearing households.
Table 1.2- List of Block-Wise Sampled Villages of Aligarh District

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Block</th>
<th>No. of Populated villages (2005)</th>
<th>No. of selected villages</th>
<th>Name of the villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tappal</td>
<td>87(5)*</td>
<td>4</td>
<td>Bairam ganj, Rasool pur, Zikar pur, Keelpur</td>
</tr>
<tr>
<td>2</td>
<td>Khair</td>
<td>96(0)*</td>
<td>5</td>
<td>Manpur Kalan, Arni, Sujanpur, Rajpur, Aidalpur</td>
</tr>
<tr>
<td>3</td>
<td>Chandaus</td>
<td>92 (2)*</td>
<td>5</td>
<td>Jalakha, Jamanka, Elampura, Balrampur, Jahrana</td>
</tr>
<tr>
<td>4</td>
<td>Jawan</td>
<td>108(1)*</td>
<td>5</td>
<td>Madhau Gar, Mirzapur, Sarmastpurkota, Amlaui, Jangalgarh</td>
</tr>
<tr>
<td>5</td>
<td>Atrauli</td>
<td>110(3)*</td>
<td>6</td>
<td>Gomali, Swalehpur, Sindhaura, Kamalpur, Logarh, Bijaui</td>
</tr>
<tr>
<td>6</td>
<td>Bijauli</td>
<td>85(7)*</td>
<td>4</td>
<td>Dhurra todi, Pali mukeempur, Ran mochan, Bijauli</td>
</tr>
<tr>
<td>7</td>
<td>Gangiri</td>
<td>99(2)*</td>
<td>5</td>
<td>Husainpur, Bhai, Barla, Baikhurd, Rahmapur,</td>
</tr>
<tr>
<td>8</td>
<td>Lodha</td>
<td>13(7) *</td>
<td>7</td>
<td>Mandak, Sarsaul, Bithana, Khijarpur, Sikharan, Illiyaspur, Kalua</td>
</tr>
<tr>
<td>9</td>
<td>Dhanipur</td>
<td>98(0)*</td>
<td>5</td>
<td>Sikandarpur, Panaithi, Morthal, Kalai, Adaun,</td>
</tr>
<tr>
<td>10</td>
<td>Akrabad</td>
<td>86(3)*</td>
<td>4</td>
<td>Nanau, Badri, Bahadurpur, Shanker Garh</td>
</tr>
<tr>
<td>11</td>
<td>Gonda</td>
<td>83(0)*</td>
<td>4</td>
<td>Dhatu, Bhaya, Mumreja, Mati</td>
</tr>
<tr>
<td>12</td>
<td>Iglas</td>
<td>103(0)*</td>
<td>5</td>
<td>Toor, Jarath, Udambra, Tehra, Mohraini</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>1180(30)*</td>
<td>59</td>
<td></td>
</tr>
</tbody>
</table>


* Villages in bracket is non populated

Figure 1: Location Map of Sampled villages
Chapter Design

Present study reveals the various aspects of livestock husbandry and its economic aspects. Apart from the introduction in which statement of the problem, significance of the study, objectives, hypotheses, and methodology of research and data collection have been dealt, the study has been divided into six chapters.

First chapter deals with the reviews of the literatures. It reveals the studies on livestock composition, livestock production, livestock dairy centers and dairy production, breeding technology, fodder demands, livestock economy, mixed farming, women participation in livestock husbandry, trade and marketing of livestock and problems and prospects of livestock keeping.

Second chapter examines the geographical outlook of Aligarh district. It deals with geographical location, physical conditions, demographic profile, agricultural conditions, industrial economy, transportation, fairs, and livestock markets of the study area. The study area shows a distinct geographical personality in terms of physical and socio-economic conditions. These factors reshape and redesigned the geographical landscape.

Third chapter deals with the dynamics of livestock development in which growth of livestock population, species wise growth of livestock population during two points of time (1993 and 2003) in different blocks have been dealt with livestock area and livestock population indexes.

Fourth chapter deals with the socio-economic profile of sampled household. It analyses the gender-wise distribution of livestock husbandry in sampled households, Caste-wise distribution of population involved in livestock husbandry, educational status of livestock rearers, occupational structure of different classes of farmers, caste-wise employment and women participation involved in livestock husbandry in study area.

Fifth chapter analyses the locational and seasonal effects on livestock husbandry. It deals with the effect of seasons on milk and meat production. It also analyses the locational effect on livestock husbandry in which effect of dairy centers, effects of livestock markets on livestock husbandry, spatial
distribution of livestock and distribution of livestock products in study area have been dealt.

Sixth chapter deals with economic viability through livestock husbandry. It analyses with the stratification of livestock rearers, economics of livestock husbandry, employment through livestock husbandry, and livestock cropping integrated system and sustainability.

At last there is conclusion with problems and suggestion followed by references and indexes.
References


