CHAPTER: I

INTRODUCTION

By all accounts, the livestock sector is a vital constituent of agriculture and integral part of the farming system by supplying organic manure to crop production, providing nutrient-rich food products, offering livelihood opportunities to around two-thirds of the rural people, and an alternative source of income for rural households. Besides, contributing the food and inputs for crop production, livestock is important as saving and investment for the poor household and provide security or insurance through various ways in the different production system (Kitalyi et al. 2005). The sector plays a paramount role in the rural economy and could not be ever underrated as it provides a good quality source of food and contributes over one-fourth to the agricultural Gross Domestic Product. Besides, the size of the livestock market is now 1.25 times to the size of food grain in value terms (Birthal, 2015). According to NSSO 66th Round Survey (July 2009 – June 2010), total number of workers in farming of animals is 20.5 million. Marginal, small and semi-medium operational holdings (area less than 4 ha) farmers own about 87.7 per cent of the total livestock (Anon., 2014a). It contributed about 16 per cent of the income of small farm households as against an average of 14 per cent for all rural households. Interestingly, it is even more in states like Gujarat (24.4%), followed by Haryana (24.2%), Punjab (20.2%) and Bihar (18.7%) (Planning Commission, 2012). The small-scale producers who contribute around 70 per cent to total livestock production are constrained to establish market linkage because processing, storage and refrigerated transport are underdeveloped (Birthal, 2015). Moreover, livestock markets are under-developed, which is a significant blockade to the commercialization of livestock production (Planning Commission, 2012). Several initiatives were undertaken by the government in past as well in the present such as Operation Flood (1970), and de-licensing the dairy industry in 1991 and allowing multinational companies (MNCs) to set up milk processing and product. But, it was reintroduced back in Milk and Milk Products Order (MMPO) in 1992 and amended in
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2001 (Sharma and Gulati, 2003). In March 2003, a new leaf was turned in dairy sector as restrictions were abolished on setting up of milk processing and milk product manufacturing plants and the concept of milk shed was removed which facilitated the entry of large firms and increased competitiveness in the domestic market (Sharma and Gulati, 2003). On account of that, there has been a significant increase in private investment in the livestock industry.

At the same time, Indian livestock sector is subjugated by small-scale producers. Small animals like sheep, goats, pigs and poultry are largely kept by poor households for commercial purposes because of their low initial investment and operational costs (Birthal, 2002). In a rural area, livestock rearing has significant positive impact on equity in terms of income and employment and poverty reduction (Singh and Hazell 1993; Adams and Hezzell 1995; Birthal and Singh 1995; Thornton et al. 2002; Birthal and Ali 2005). Besides this, the sector also proves to be a life savior of the farming community especially in the case of drought condition and finally being a dependable “bank on hooves” in times of grave since time immemorial. In fact comparing the land, distribution of livestock wealth is rather more equal. Surprisingly enough, it happens to be the only sector which is highly gender sensitive and it is not exaggerating to say that animal husbandry is becoming feminized. Livestock sector employed 8.8 per cent of the agricultural workforce but it varied from 3 per cent in North-Eastern states to 40-48 per cent in Punjab and Haryana (Planning Commission, 2012). Women constitute about 69 per cent of the workforce engaged in the livestock sector and therefore the sustainable development of this sector become crucial as it leads to more inclusive development and empowerment of women (Anon., 2013a).

Food and fodder constitute 60-70 per cent of total cost of livestock production. Despite the availability of feed resources has increased, there is a gap between availability and requirement. Availability increased tremendously over 1985-86 to 2005-06 by around 52 per cent (240.7 to 365.8 Mt), 76.0 per cent (19.6 to 34.5 Mt) and 1.8 per cent (124.3 to 126.6 Mt) in crop residues, concentrates and green forages respectively. Yet by 2020, the deficit will likely to be 11 per cent, 35 per cent and 45 per cent from the present figure of 10, 33 and 35 per cent for fodder, concentrates, and green fodder, respectively (Planning Commission, 2012). This gap of feed and fodder is mainly due to declining area under fodder cultivation and reduced availability of crop residues as fodder although livestock population is
increasing (Anon., 2013a). Realizing this, availability of feed and fodder to livestock rearing is crucial and in this regards, optimum and efficient utilization of feed and fodder holds all aces for triumphant livestock production.

Of late, demand for high-value food products including livestock products is ever-increasing consequently as the food consumption pattern is altering very fast. The demand for livestock products is growing rapidly owing to high population growth, rapid urbanization, a higher standard of living and increasing income level both in rural and urban areas. The trends of increasing per capita income at an annual rate of 4.8 per cent and the urban population at a rate of 2.5 per cent during 1991-92 and 2008-09 are likely to continue. Between 1983 and 2004, the share of animal products in the total food expenditure increased from 21.8 per cent to 25.0 per cent in urban areas and from 16.1 per cent to 21.4 per cent in rural areas (Planning Commission, 2012). These connote direct attention for sustainable growth in livestock sector by accelerating the pace of existing production and productivity to unfold opportunities for fulfilling the future demand. Increasing global and domestic demand for livestock products have revealed that product-specific niche markets can be targeted to reap benefits of expanding global markets particularly for products whose domestic demand is relatively less and in which the country has a competitive advantage. For example, there is a considerable potential for export of buffalo meat that has been increasing at the rate of 8 per cent per annum during the last five years (Planning Commission, 2012) whose domestic demand is near to the ground. Trends in per capita consumption of different food commodities between 1983 and 1999-2000 show that per capita milk consumption nearly doubled from 43 kg to 74 kg per annum during this period, and meat consumption increased from 2.4 kg to 3.1 kg per annum in India (Birthal et al. 2006). The demand for livestock products is projected to increase more in developing countries than in developed countries (Heinrich Boll Foundation, 2014). Role of livestock sector is crucial to accomplishing the rising food demand which is expected to increase by 40 per cent by 2030 and shall almost be doubled by 2050 (Sharma, 2011). By the end of 12th Plan, demand for milk is expected to reach at 141 million tonnes and the combined demand for meat, egg and fish may increase to 15.8 million tonnes. The global market for animal products is expanding fast and it is an opportunity for India to improve its participation in the global market (Planning Commission, 2012). Therefore, realizing the mounting
demand for livestock products and the future prospects in the livestock sector, more concentration is being paid to enhance the investment in this sector.

Livestock is considered as one of the potential sectors for export earnings. Despite this, India has a negligible share in the world trade in livestock products by now. However, rapid globalization of agricultural trade under WTO regime reflected certain positive and negative implication for livestock producers. Meanwhile, there are multiple issues which spoiled the India’s growing livestock export. Some of the most prominent issues include: adulterated milk and milk products, detection of antibiotic residues, mixing of inferior with superior quality meat, adding non-meat ingredients in meat products such as blood proteins, edible offal and wide spread microbial contamination. Non-tariff barriers like stringent sanitary and phytosanitary standards (SPS), technical barriers to trade (TBT), anti-dumping duties, countervailing duties, etc. are emerging as major constraints in tapping the benefits of export potential of the livestock sector (Kumar et al., 2007b). The Food and Drug Administration (FDA), USA, has recently identified approximately 80 drugs which are likely residues in animal-derived human food. Another implication is tariff structure which is supposed to be reassessed as of many developed countries are heavily subsidizing their livestock production and exports though there has been a consistent decline in the import tariff rates on livestock products. Food safety and regulatory mechanism are other challenges for livestock export in India. Both central and state governments show their keen interest by the sound regulatory framework in order to ensure the removal of adulterants and pathogens in milk, meat and other livestock products, strengthen infrastructure, service delivery system for ensuring quality and safety issues together for domestic consumption as well as export intention. National Livestock Policy has been formulated in 2013 while National Livestock Mission (NLM) has commenced from 2014-15 with a total outlay of Rs 2,800 crore during the Twelfth Plan, in order to cope up with the quantitative and qualitative improvement, challenges such as increased incidence of emerging and re-emerging animal diseases, vulnerability to exotic diseases, shortage of feed and fodder, increasing production to meet demand for animal products (Anon., 2013a) and improving productivity of the livestock sector in a sustainable manner.
1.1 National scenario

The contribution of livestock sector to the national economy in terms of Gross Domestic Product is 4.1 per cent at current prices for the livestock sector and 0.8 per cent at current prices for fisheries sector during 2012-13 (Anon., 2014b). The contribution of livestock in terms of total agriculture is presented in Table 1.1. The share of Gross Value Added (GVA) of livestock sector in terms of Agriculture (Crops & Livestock) has increased from 24.7 per cent in 2011-12 to 26.1 per cent in 2013-14 at constant prices. At current prices, the share has increased from 24.7 per cent in 2011-12 to 24.8 per cent in 2013-14 with a marginal decline of 0.6 per cent as compared to 2012-13. In terms of share in total GVA, the share of livestock sector was found to be marginally declined from 4 per cent to 3.9 per cent both at current and constant prices during 2013-14 based on the revised base year 2011-12 (Anon., 2015a).

Table 1.1: Contribution of livestock in terms of total Agriculture

<table>
<thead>
<tr>
<th>Year</th>
<th>GVA at Constant (2011-12) Basic Prices</th>
<th>GVA at Current Basic Prices</th>
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<tbody>
<tr>
<td></td>
<td>GVA-Agriculture (Billion Rs.)</td>
<td>% to total GVA</td>
</tr>
<tr>
<td>2011-12</td>
<td>13106</td>
<td>16.0</td>
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<tr>
<td>2012-13</td>
<td>13259</td>
<td>15.4</td>
</tr>
<tr>
<td>2013-14</td>
<td>13772</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Note: Agriculture includes crops and livestock

1.1.1 Production and productivity of different livestock product in India

Milk: India ranks first in milk production, accounting for 18.5 per cent of world production, achieving an annual output of 146.3 million tonnes during 2014-15 as compared to 137.69 million tonnes during 2013-14 recording a growth of 6.26 per cent whereas, the Food and Agriculture Organization (FAO) has reported 3.1 per cent increase in world milk production from 765 million tonnes in 2013 to 789 million tonnes in 2014 (Anon., 2016a). The average yield of milk per day per animal in milk at National level from different species was 6.78, 2.50, 4.91 and 0.50 kg for cross bred cows, indigenous cows, buffalo and goat, respectively during 2013-14 (Anon., 2015b). The per capita availability of milk in India has increased from 176 grams per day in 1990-91 to 322 grams per day in 2014-15. It is more than the world average of 294 grams per day during 2013. This symbolized a sustained growth in
availability of milk and milk products and highlighted the vitality of dairy sector in providing the secondary source of income to the rural community (Anon., 2016a). Per capita availability of milk is more than national average of 307 grams per day in Punjab (980 grams), Haryana (800 grams), Rajasthan (572 grams), Gujarat (476 grams), Himachal Pradesh (461 grams), Uttarakhand (418 grams), Andhra Pradesh including Telangana (413 grams), Madhya Pradesh (349 grams) and Uttar Pradesh (318 grams) during 2013-14 (Anon., 2015a).

The first largest producer of milk is Uttar Pradesh, followed by Rajasthan, Andhra Pradesh including Telangana and Gujarat which produced 17.57, 10.58, 9.45 and 8.07 per cent of the total milk production in the country during 2013-14. The species-wise contribution in total milk production by Cattle, Buffalo and Goat is graphically presented in Figure 1.1. It shows that nearly 51 per cent of milk production is contributed by Buffaloes, followed by 25, 20 and 4 per cent by Cow- Exotic/Crossbred, Cow-Indigenous/Non-Descript and Goats, respectively during 2013-14 (Anon., 2015a).

**Egg:** Egg production has gone up from 21.10 billion egg in 1990-91 to around 78.48 billion egg in 2014-15, while poultry meat production has been estimated at 3.04 million tonnes. The significance of poultry and livestock products is increasing in the context of diversifying farm and non-farm activities in the agriculture sector to increase livelihood security (Anon., 2016a). The per capita availability of egg has increased from 25 eggs per annum in 1990-91 to 61 eggs per annum in 2013-14. The countrywide average yield of egg from different species during 2013-14 is 105.71, 276.61, 121.79 and 182.07 Nos. per year for desi fowls, improved fowls, desi ducks and improved ducks, respectively (Anon., 2015b).

Andhra Pradesh (including Telangana) ranked first which produced 30.48 per cent of the total egg produced in the country, followed by Tamil Nadu (18.89%), Maharashtra (6.46%), West Bengal (6.35%) and Haryana (5.83%), during 2013-14. The States such as Andhra Pradesh (264 eggs), A & N Islands (259 eggs), Tamil Nadu (205 eggs), Haryana (171 eggs), Lakshyadeep (170 eggs), Panjab (155 eggs), Kerala (69 eggs) and Karnataka (68 eggs) are having per-capita availability more than the national average i.e. 61 eggs/annum during the same period. Species-wise egg contribution is envisaged in Figure 1.2. It shows that 83 per cent of the production of egg is contributed by improved fowl, 14.40 per cent from desi fowls,
2.47 per cent from desi duck and 0.14 per cent is contributed by improved duck with respect to total egg production (Anon., 2015a).

**Meat:** The total meat production in the country was reported to have increased from 4.6 to 6.2 million tonnes in the period 2009-10 to 2013-14. Production of meat has shown an increasing trend during this period with an average annual growth rate of 7.73 per cent. The largest producer of meat was Uttar Pradesh which produced 19.59 per cent of the total meat production followed by Andhra Pradesh (including Telangana) that produced 14.99 per cent, West Bengal (10.41%) and Maharashtra (9.7%) during 2013-14. Figure 1.3 shows that nearly 36 per cent of the production of meat is contributed by poultry. Buffalo, goat, pig, sheep and cattle contributed 22 per cent, 19 per cent, 9 per cent, 8 per cent and 6 per cent in meat production respectively (Anon., 2015a).

**Wool:** Wool production has modestly improved over the period of time. The total wool production in the country was 41.2 million kg during 1990-91 and 47.9 million kg in 2013-14. Species-wise share in wool contribution is diagrammatically presented in Figure 1.4. It shows that 72 per cent of the production of wool is contributed by Ram/Weather but Ewe and Lamb contributed only 24 per cent and 4 per cent respectively. Rajasthan is the largest producer of wool in the country which produced 31.4 per cent of the total wool production followed by Jammu & Kashmir (18.2%) and Karnataka (16.2%), respectively during 2013-14 (Anonymous, 2015a). The average yield of wool per season for different categories of sheep during 2013-14 was 1.31, 0.78, 0.90 kg per season for ram, ewes and lamb, respectively (Anon., 2015b).

1.1.2 All India livestock population under different livestock census

Livestock Census was as early as 1919. Since the first livestock census carried out during 1919, the process has been continuing on a quinquennial basis. So far at present, 19 livestock censuses were completed and the latest one was conducted in 2012 while 20th livestock census is ongoing. It is perhaps a very crucial source for gathering the comprehensive information pertaining livestock sector. All the exercise is executed with the reconciliation of states and UT governments in a properly co-ordinated fashion. India ranks first with respect to buffalo, second in cattle and goats, third in sheep and fifth in poultry population at world level. The performance of various livestock censuses carried out for livestock and poultry population from 1966
to 2012 is presented in Table 1.2. The total livestock population was 512.06 million numbers in 2012 which has decreased by about 3.33 per cent over the previous census. The total bovine population (Cattle, Buffalo, Mithun and Yak) was 299.9 million numbers in 2012 which showed a decline of 1.57 per cent over the previous census. The total sheep population in the country was 65.06 million numbers in 2012, declined by about 9.07 per cent over census 2007. The goat population has declined by 3.82 per cent. With regards to total poultry population in the country, it has increased by 12.39 per cent over the previous census and the total poultry in the country was 729.2 million numbers in 2012. In 19th Livestock Census, there were 37.28 per cent cattle, 21.23 per cent buffaloes, 12.71 per cent sheep, 26.40 per cent goats and 2.01 per cent pigs. Mithun, yaks, horses, ponies, mules, donkeys and camels put together contributed only 0.37 per cent of the total livestock.

Table 1.2: All India livestock and poultry population during various livestock census from 1966-2012 (in Million numbers)

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>176.20</td>
<td>178.30</td>
<td>180.00</td>
<td>192.45</td>
<td>199.69</td>
<td>204.58</td>
<td>198.88</td>
<td>185.18</td>
<td>199.08</td>
<td>190.90</td>
<td>-4.10</td>
</tr>
<tr>
<td>Buffaloes</td>
<td>53.00</td>
<td>57.40</td>
<td>62.00</td>
<td>69.78</td>
<td>75.97</td>
<td>84.21</td>
<td>89.92</td>
<td>97.92</td>
<td>105.34</td>
<td>108.70</td>
<td>3.19</td>
</tr>
<tr>
<td>Sheep</td>
<td>42.40</td>
<td>40.00</td>
<td>41.00</td>
<td>48.76</td>
<td>45.70</td>
<td>50.78</td>
<td>57.49</td>
<td>61.47</td>
<td>71.56</td>
<td>65.07</td>
<td>-9.07</td>
</tr>
<tr>
<td>Goats</td>
<td>64.60</td>
<td>67.50</td>
<td>75.60</td>
<td>95.25</td>
<td>110.21</td>
<td>115.28</td>
<td>122.72</td>
<td>124.36</td>
<td>140.54</td>
<td>135.17</td>
<td>-3.82</td>
</tr>
<tr>
<td>Horses &amp; ponies</td>
<td>1.10</td>
<td>0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.80</td>
<td>0.82</td>
<td>0.83</td>
<td>0.75</td>
<td>0.61</td>
<td>0.63</td>
<td>2.12</td>
</tr>
<tr>
<td>Camels</td>
<td>1.00</td>
<td>1.10</td>
<td>1.10</td>
<td>1.08</td>
<td>1.00</td>
<td>1.03</td>
<td>0.91</td>
<td>0.63</td>
<td>0.52</td>
<td>0.40</td>
<td>-22.63</td>
</tr>
<tr>
<td>Pigs</td>
<td>5.00</td>
<td>6.90</td>
<td>7.60</td>
<td>10.07</td>
<td>10.63</td>
<td>12.79</td>
<td>13.29</td>
<td>13.52</td>
<td>11.13</td>
<td>10.29</td>
<td>-7.54</td>
</tr>
<tr>
<td>Mules</td>
<td>0.08</td>
<td>0.08</td>
<td>0.09</td>
<td>0.13</td>
<td>0.17</td>
<td>0.19</td>
<td>0.22</td>
<td>0.18</td>
<td>0.14</td>
<td>0.20</td>
<td>43.07</td>
</tr>
<tr>
<td>Donkeys</td>
<td>1.10</td>
<td>1.00</td>
<td>1.00</td>
<td>1.02</td>
<td>0.96</td>
<td>0.97</td>
<td>0.88</td>
<td>0.65</td>
<td>0.44</td>
<td>0.32</td>
<td>-27.17</td>
</tr>
<tr>
<td>Yaks</td>
<td>0.03</td>
<td>0.04</td>
<td>0.13</td>
<td>0.13</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.08</td>
<td>0.08</td>
<td>-7.64</td>
</tr>
<tr>
<td>Total Livestock</td>
<td>344.10</td>
<td>353.60</td>
<td>369.00</td>
<td>419.59</td>
<td>445.29</td>
<td>470.86</td>
<td>485.39</td>
<td>485.00</td>
<td>529.70</td>
<td>512.06</td>
<td>-3.33</td>
</tr>
<tr>
<td>Poultry</td>
<td>115.40</td>
<td>138.50</td>
<td>159.20</td>
<td>207.74</td>
<td>275.32</td>
<td>307.07</td>
<td>347.61</td>
<td>489.01</td>
<td>648.83</td>
<td>729.21</td>
<td>12.39</td>
</tr>
<tr>
<td>Dogs</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>18.54</td>
<td>17.95</td>
<td>21.77</td>
<td>25.48</td>
<td>29.03</td>
<td>19.09</td>
<td>11.67</td>
<td>-38.85</td>
</tr>
<tr>
<td>Rabbits</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>NC</td>
<td>0.48</td>
<td>0.42</td>
<td>0.59</td>
<td>39.55</td>
<td></td>
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</tr>
</tbody>
</table>

Anon., (2015a), NC: Not Collected
1.2 Gujarat scenario

The potency of Indian livestock sector in rural economy in terms of endowing with supplementary income, nutritive food, employment and so on is paramount, and Gujarat is not the exception in this line. Gujarat is shaping out as an outstanding state and notable place so far in the performance of livestock sector and its development is concerned. The sector plays a pivotal role by contributing 5.32 per cent of its share in total GDP of the state whereas its share in GDP of agriculture & allied sector is 24.1 per cent in 2013-14 based on a quick estimate (Anon., 2015c.). A large number of rural women are getting good opportunities to work in several operations of livestock production. Animal dung is an excellent source of manure and around 80 per cent of the dung is used for manure purpose. Besides, it is also useful for biogas production, which is utilized for cooking and lighting purposes.

The state government has taken several initiatives for conserving state natural resources to meet the necessities of the future generation. The government has set up 4 cattle breeding farms i.e. 1 for Gir and 3 for Kankrej to preserve Gir and Kankrej breeds established under the conservation and improvement of cattle and buffalo scheme. Junagadh Agricultural University has 1 farm for Gir Breed at Junagadh. Poultry is another subsidiary source for supplement income. Mostly in the tribal area such as Panchmahal, Dahod etc. it is quite usual practice where farmers maintain a small number of birds and have backyard poultry. However, commercial poultry farms are also established in different parts of the state. There are 23 Intensive Cattle Development Projects (ICDP) in the state. The key objective is to improve the breed of cattle and buffaloes for improving milk production. There are 965 centers active under this project. The main activities carried out under this project are Artificial Insemination (A.I.), castration, sexual health control Services, cattle camp for providing health services, fodder development and other activities. There are 12 Intensive Poultry Development Projects (IPDP), 5 District Poultry Extension Centres (DPEC) and 85 Poultry Service Centres functioning for the poultry development and extension activities. There are 17846 Co-operative societies in the state. Specifically, the co-operative dairy sector is well nurturing in the state as there are 18 co-operative dairy plants at the district level in the state with a handling capacity of 152.48 lakh liters of milk per day. Against this, the milk received in cooperative plants was 136.33 lakh liters per day in 2014-15 (Anon., 2016b). At the village level, 16654 milk co-operative societies are functioning. Nine District Co-operative Unions have
established cattle feed factories to produce and supply cattle feed to members at village level at no profit no loss basis (Anon., 2014).

The state has capitalized on growing several high yielding breeds of livestock species in the different regions of the state. The state has three major breeds of sheep such as Patanwadi, Marwadi and Duma. Saurashtra and North Gujarat is considered as the major hub of sheep population. These sheep show shearing at four or six-month interval. In the case of goat, main breeds include Kachchhi, Mehsani, Surati, Zhalawadi and Gohilwadi. Goat is considered as poor man’s cow. Economic efficiency of goat over sheep is well documented. It is found that goat is 160 per cent more economical than sheep and 130 per cent more economical than cattle on zero input basis (Anon., 2014). Besides, another well famous breed for the horse is Kathiawadi and Marwadi. Whereas, Kathiawadi horses are found in Saurashtra region which is also considered as homeland and Marwadi horses are mostly seen in north Gujarat. “Rewal” gati which is a special feature, allowing the rider to be comfortable while riding long distances. There is a particular caretaker group named “KAMA” which organizes exhibitions and competition of horses every year in collaboration with the State Govt. Kachhchhi is very a popular and primitive breed of a camel but lightly built compared to Bikaneri camel. The state government has set up camel breeding farm at Dhori for preservation and proliferation of Kachhchhi camel (Anon., 2014). Other than this breed, Gir and Kankrej breeds of cows and Mahesani, Jafarabadi, Banni and Surti breeds of buffaloes are also famous in the state.

1.2.1 Production and productivity of various livestock products of Gujarat

Milk: Milk is the pivotal product of livestock, contributes about 68 per cent of the value of output from livestock sector of the total livestock products. The production of milk has increased from 111.13 lakh tonnes in 2013-14 to 116.91 lakh tonnes in 2014-15 with a growth rate of 5.20 per cent. Gujarat state contributed about 8.00 per cent in total milk production and also enjoyed the third rank among all the states and union territories of the country in the year 2014-15. In the year 2014-15, the estimated milk yield per day in milk animal of various categories viz. crossbred cow, indigenous cow, buffalo and goat was 9.08 kg, 4.19 kg, 4.96 kg and 0.45 kg respectively, whereas the milk yield per day of India was at 7.15 kg, 2.54 kg, 5.15 kg and 0.46 kg, respectively which showed high productivity in Gujarat as compared to national average (except Buffalo and Goat). As per the recommendations of the
Indian Council of Medical Research, an individual needs 240 gram of milk per day for a healthy life. Per capita availability of milk increased from 476 grams per day per person in 2013-14 to 492 grams of milk per day per person during 2014-15 in Gujarat which is quite high (Anon., 2015c).

**Egg:** Total egg production of state has increased from 15,550 lakh in 2013-14 to 16,565 lakh in 2014-15. Among the total egg production during 2014-15, desi layer contributed 2078 lakh numbers and improved layer contributed 14487 lakh numbers. Desi layer gives only 102 to 168 eggs per year and improved layer gives at least 274 to 336 eggs per year. The per capita availability of egg reached 25 eggs per annum in 2014-15 (Anon., 2015c).

**Wool:** The total wool production led to 2577.41 metric tonnes in the year 2014-15 as compared to 2577.93 metric tonnes in the year 2013-14. The overall average annual yield of wool is estimated as 1191 gms. per sheep during this period. However, species wise, the average productivity of ram, ewe and lamb species of sheep was estimated as 1657 gms 1345 gms and 713 gms of wool per sheep during the year 2014-15 (Anon., 2015c).

**Meat:** Depending upon the source of origin, meat is classified into two type viz. livestock meat and poultry meat. Total meat production worked out at 34017.97 metric tonnes which included livestock meat (buffaloes, goats, sheep and pigs) of 3337.32 metric tonnes and poultry meat (desi, improved layer and broiler) of 30570.64 metric tonnes during the year 2014-15, excluding the production at unregistered slaughter houses, showing an increase of 2.51 per cent over previous year’s output of 33185.82 metric tonnes (Anon., 2015c).

**1.3 Statement of the research problem**

The livestock sector is contributing to Gujarat State Domestic Product (GSDP) to the tune of about 5.0 per cent. The sector has proved to be a life savior to the rural poor in many distress conditions, especially in the case of drought by contributing the supplementary income, employment, nutritive food etc. Indian economy is primarily characterized by the division of land holding, declining share of agriculture in GDP, disguised unemployment and rising number of operational holdings. The resource poor farmers own majority of the livestock resources. Therefore certain alternatives need to be evolved for relevant expansion in the growing sub-sectors of agriculture particularly livestock and poultry. The livestock
sector is also substantially zooming up in Gujarat since many years. Several dairy development programs such as Operational Flood led white revolution in the nation, AMUL Co-operative model and other poultry and livestock development programs have promoted livestock sector in the state notably. Thereby, an assessment of changes in growth pattern of livestock population, production and productivity are necessary. The instability and growth of production and productivity need to be analyzed as it might influence the performance of overall livestock sector. Hence, the improvement in production and productivity of indigenous and cross-bred species become crucial for sustainable production. Due to liberalization across the globe and WTO statutory obligation among the members, import tariff rate has been reduced considerably. The large subsidies are given by developed countries and their protectionist nature for domestic product influence the trade competitiveness. Therefore, the perceptive examination has become indispensable to dissolve the impediments for export sustainability of major livestock products from India in the international market. Export supply of livestock products influenced by several determinants. Those determinants influencing livestock performance are to be checked. For this purpose, Markov chain approach and gravity model are widely used to capture the direction of trade and the impact of various determinants on export performance of livestock sector.

1.4 Objectives of the study

Keeping the above viewpoint, the present study is commenced with following specific objectives:

1. To examine the pace and pattern of growth in livestock population in Gujarat state.
2. To study the growth and instability in production and productivity of major livestock products.
3. To measure the changes in the composition of livestock population.
4. To analyze the export dynamics of livestock products to different countries.
5. To study the export competitiveness and the determinants influencing the export of livestock products.
1.5 Hypotheses

The following hypotheses were framed with respect to the given objectives,
1. There exist a differential growth rates and instability in livestock population, production and productivity across the districts of state.
2. There are no changes in composition of livestock population and export during the study period.
3. The exports of livestock products are not competitive.

1.6 Scope of the study

The contribution of present investigation will aid the policy makers for planning, executing and implementing regional specific policies for sustainable livestock production system after understanding the changes in the growth pattern of livestock population, production and productivity. Agro-ecologic variability across the regions, growing demand, technological advancement etc. are certain drivers changing the composition of livestock in terms of population, production and productivity over the time. Improvement of livestock production and productivity can be achieved through technological improvement, maintaining indigenous breed and developing high yielding milk producing breeds. Hence, emphasize will be made for accomplishing long-term development in livestock sector across the state which will bring growth in rural areas as well as in the national economy. Export dynamics using Markov chain will facilitate in understanding whether the changes in direction of trade across the globe are actually desirable or certain changes are required to enhance the trade to a particular market. Export competitiveness of livestock products and quantifying export worthiness will help to ensure the level of protection provided on different livestock products. Hence it would lend a helping hand for suitable export policy formulation. Examination of various determinants will answer what kind of determinants can influence the export supply of livestock products and up to what extent. Therefore these analyses are rather much obligatory to reinforce the export earnings by formulating the appropriate policies which will look after the domestic production as well as enhance the export share of livestock sector in the international market.
1.7 Limitations of the study

1. Due to limited time and resource availability, the study was confined only to district level, and also to selective species of livestock population, their production, and productivity.

2. The data sources are secondary in nature, so they are compiled mainly from government reports, bulletins and other needful published documents. There may be a lack of control over data quality because such data represent general and vague information.

1.8 Plan of Thesis

The passage of research study split into five chapters including the present one of introduction covers background information on the research problem, the rationale behind the selection of present study, objectives, hypotheses, limitations and scope. In Chapter 2, reviews of several studies on various aspects of the research problem pertaining to objectives and their relevant findings are presented. Chapter 3 portrays the detailed modus operandi for selection of the study periods, collection of data and techniques used for data analysis. The in-depth outcome of the final results is discussed in Chapter 4. This chapter includes growth and instability of population, production, and productivity, changes in the livestock composition, trade direction of livestock product in the international market and determinints influencing the livestock export. Chapter 5 deals with summary and conclusions of the study as well as suggestion/policy implications are presented in nutshell. All the references are enlisted in the bibliography at the end.