Journal of Animal Research: v.7 n.2, p. 345-354. April 2017

DOI: 10.5958/2277-940X.2017.00050.X

# Dynamics of Livestock Population and Output in Rajasthan: A Temporal Analysis

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**Received: 08** Dec., 2016 **Revised:** 16 Feb., 2017 **Accepted:** 20 Feb., 2017

**ABSTRACT**

The total livestock population in the last five and half decades in Rajasthan was noticeably increased from 32426.98 thousand number in 1956 to 57732.20 thousand number in 2012. The increase in buffalo population during this period was more than four times. As far as population of small ruminants are concerned, sheep and goat dominated the livestock population and constituted over 50 per cent of livestock population in the state. The goat population has been growing at faster rate than sheep population. Annual milk, egg and meat production in state have grown about four times, seven times and ten times, respectively, since 1985-86 to 2014-15. The annual production of wool has declined. The per capita availability of milk, egg and meat in state has significantly increased during 1985-86 to 2012-13. The per capita availability of milk in state was higher than ICMR recommendation while that of egg and meat was lower than its recommendations. The gap between demand and supply for milk has changed from negative to positive since 1994-95 onwards while it was negative in case of meat and egg products.

**Keywords:** dynamics, livestock, output, milk, egg, meat, wool, demand, supply

According to 19$^{th}$ livestock census, Rajasthan state possesses 57732 thousand number of livestock animals which accounting for about 11 per cent of total livestock population of India. Rajasthan is second leading milk producing state after Uttar Pradesh in India. Land and livestock animals have been two basic resources of farmers for income and employment generation. Animal husbandry is being envisaged as an integral part of diversified agriculture in the state. Livestock sector occupies a very important place in socioeconomic development of state. The quality and quantity of various animal species maintained by rural households are considered as the outward indicator of social status of rural families in state. Besides, it has potential to fetch cash income on a regular basis to meet the social and family requirements of households.

Since crop farming is constrained by erratic rainfall and limited area under irrigation, livestock has received special emphasis in solving the problems of poverty and unemployment in the country in general and in state of Rajasthan in particular. Livestock is not only a major source of animal food and nutrition for human population but also substantial source of income and employment for them, especially for poor one. Livestock in state is closely interwoven with agriculture since ages and plays an important role in the rural economy. Livestock production is thus likely to undergoing significant change in terms of population adjustment, production efficiency, commercialisation, industrialisation and intensification to respond to the increasing demand for animal-based foods (Rae and Nayga, 2010). The livestock production is also moving towards more intense and mixed systems (Galloway *et al.,* 2010).

Many studies have been before now carried out to examine the temporal and spatial changes in the livestock population at all India level (Patel, 1993; Pandey, 1995; Pandey and Gangwar, 1995 and Sharma, 2004) and also in northern states like Jammu and Kashmir (Baba *et al.,* 2011), Uttarakhand (Bardhan *et al.,* 2010), Himachal Pradesh (Chand, 1995; Kumar *et al,* 2004 and Chauhan, 2008), Punjab (Kaur and Bhullar, 2012; Subhash and Kaur, 2013), Haryana (Goyal, 1995; Tomer and Singh, 1995 and Elumalai and Pandey, 2003) and Rajasthan (Yadav, 1995). However, no such recent detailed studies are available in

the context of Rajasthan. Thus, keeping the significant role of livestock sector in the state economy in view, the present study was undertaken to examine dynamics of livestock sector in Rajasthan in terms of growth in population, production and per capita availability of major livestock products.

## MATERIALS AND METHODS

The present study was mainly based on secondary data. The data on livestock population, production of major livestock products viz, meat, milk, egg and wool were collected and compiled from various published sources like Livestock census, Directorate of economics and statistics, various census reports, reports of Animal Husbandry, Statistical Abstract of Rajasthan, Basic Statistics of Rajasthan. The analytical tool employed for the study was tabular analysis. Simple averages and percentages were worked out to facilitate easy comparison. The compound growth rate was worked out for various livestock products and population based on the time series data available. It was computed by fitting the following formula.

$$Y_t = Y_0 (1+r)^t \quad \ldots(1)$$

Where,

$Y_t$ = Value at $t^{th}$ year

$Y_0$ = Value at base year

r = Compound growth rate

t = 1, 2, 3……..years.

The log transformation of equation no. (1) becomes:

$$\text{Log } Y_t = \text{Log } Y_0 + t \text{ Log } (1+r)$$

$$r = (\text{Antilog } (1+r) - 1) \times 100$$

## RESULTS AND DISCUSSION

### Temporal change in composition of livestock population

Temporal changes in the total livestock population and different species like cattle, buffalo, sheep, goat, camel, pig and other animals like horses and ponies, mules and donkeys have been presented Table 1.

### Cattle population

The cattle population have shown fluctuating trends but a general increase was observed from 12072.71 thousand number in 1956 to 13324.46 thousand number in 2012, with an increase of 10.37 per cent. The share of cattle in total livestock population continuously reduced from 39 per cent in 1961 to 21.39 per cent in 2007. It was reduced to 23.08 per cent in 2012 from 37.23 per cent in 1956. The maximum share of cattle (39.20%) among livestock was observed in 1961.

Compound growth rate of cattle was -0.56 per cent during the study period. The negative growth rate of cattle over the period might be due to the fact that cattle are losing their importance over time. Similar pattern of cattle growth was also reported by Subhash and Kaur, 2013 in Punjab.

### Buffalo population

The buffalo population have shown increasing trend in terms of number during the period from 1956 to 2012, and it has significantly increased from 3439.45 thousand in 1956 to 12976.10 thousand in 2012, with an increase of 277.27 per cent. As far as concerned with share of buffaloes to total livestock, it was seen that buffalo contributed 10.61 per cent to total livestock population in 1956 which increased to 22.48 per cent in 2012. Prabhu *et al*. (2012) also observed increasing trend in buffalo population at India level. The reasons for increase in share of buffalo in state might be due to the substitution of cow with buffalo for milk purpose.

### Sheep population

Regarding the sheep population, number of sheep was increased from 7372.81 thousand in 1956 to 9079.70 thousand in 2012. Its population showed an increase of 23.15 per cent from 1956 to 2012. Prabhu *et al*. (2012) also found the increasing trend in sheep population at India level and its declining trend in Tamil Nadu. The share of sheep in total livestock population has decreased from 22.74 per cent in 1956 to 15.73 per cent in 2012. Similar declining share of sheep in total population was also reported by Baba *et al.* (2011) in different regions of J & K.

**Table 1:** Temporal change in number and share of livestock population in Rajasthan (1956-2012)

**(In 000' numbers)**

| Species/ Year | 1956 | 1961 | 1966 | 1972 | 1977 | 1983 | 1988 | 1992 | 1997 | 2003 | 2007 | 2012 | %* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cattle** | 12072.71 (37.23) | 13136.42 (39.20) | 13123.46 (35.02) | 12469.51 (32.07) | 12896.30 (31.18) | 13504.35 (27.20) | 10950.49 (26.71) | 11666.11 (24.08) | 12158.52 (22.37) | 10853.51 (22.09) | 12119.51 (21.39) | 13324.46 (23.08) | 10.37 |
| **Buffalo** | 3439.45 (10.61) | 4018.61 (11.99) | 4222.04 (11.27) | 4601.54 (11.83) | 5071.98 (12.26) | 6043.37 (12.17) | 6376.68 (15.55) | 7775.44 (16.05) | 9756.39 (17.95) | 10413.83 (21.19) | 11091.97 (19.58) | 12976.10 (22.48) | 277.27 |
| **Sheep** | 7372.81 (22.74) | 7359.59 (21.96) | 8806.17 (23.50) | 8556.20 (22.00) | 9937.92 (24.03) | 13430.79 (27.05) | 9907.60 (24.17) | 12491.25 (25.78) | 14312.49 (26.33) | 10054.10 (20.46) | 11189.86 (19.75) | 9079.70 (15.73) | 23.15 |
| **Goats** | 8730.16 (26.92) | 8052.22 (24.03) | 10323.40 (27.55) | 12162.44 (31.28) | 12306.92 (29.76) | 15479.52 (31.18) | 12617.06 (30.78) | 15284.94 (31.55) | 16936.96 (31.16) | 16808.52 (34.21) | 21503.00 (37.95) | 21665.94 (37.53) | 148.17 |
| **Camels** | 436.24 (1.35) | 570.32 (1.70) | 653.45 (1.74) | 744.52 (1.91) | 752.01 (1.82) | 755.91 (1.52) | 718.46 (1.75) | 746.09 (1.54) | 668.24 (1.23) | 498.02 (1.01) | 421.84 (0.74) | 325.71 (0.56) | -25.34 |
| **Pigs** | 72.03 (0.22) | 71.46 (0.21) | 83.35 (0.22) | 116.69 (0.30) | 130.00 (0.31) | 179.50 (0.36) | 207.45 (0.51) | 252.90 (0.52) | 303.12 (0.56) | 337.76 (0.69) | 208.56 (0.37) | 237.67 (0.41) | 229.97 |
| **Other animals** | 303.58 (0.94) | 300.35 (0.90) | 263.64 (0.70) | 235.67 (0.61) | 264.14 (0.64) | 256.78 (0.52) | 217.86 (0.53) | 228.86 (0.47) | 213.19 (0.39) | 170.59 (0.35) | 128.45 (0.23) | 122.62 (0.21) | -59.61 |
| **Total livestock** | 32426.98 (100.00) | 33508.95 (100.00) | 37475.51 (100.00) | 38886.56 (100.00) | 41359.27 (100.00) | 49650.22 (100.00) | 40995.58 (100.00) | 48445.59 (100.00) | 54348.90 (100.00) | 49136.35 (100.00) | 56663.18 (100.00) | 57732.20 (100.00) | 78.04 |

Figures in parentheses indicate per cent of total livestock population. *Percentage change in 2012 over 1956

**Goat population**

The goat population have shown steady growth with 8730.16 thousand number in 1956 and 21665.94 thousand number in 2012. There has been an increase of 148.17 per cent in goat population over the period of time. The per cent share of goat population in total livestock population has increased from 26.92 per cent in 1956 to 37.53 per cent in 2012. Similar increasing share of sheep in total population overtime was also reported by Baba *et al.* (2011) in different regions of J & K. The reasons for increase in share of goat population might be linked with increase in demand for chevon by consumers, easy management practices for goat over other livestock species, high remunerative price for chevon over other products, etc.

**Camel population**

The camel population have decreased from 436.24 thousand number in 1956 to 325.71 thousand number in 2012. The per cent of share camel in total population of livestock in Rajasthan was decreased from 1.35 per cent in 1956 to 0.56 per cent in 2012. The overall decline was 25.34 per cent in camel population over the period. The camel, generally used for draught purpose, initially had shown increasing trend up to early eighties and thereafter, it had steadily declined. In order to save India's dwindling camel population, the government of Rajasthan declared the camel an official State Animal in 2014. On 2 October 2016, the Rajasthan state government announced Ushtra Vikas Yojana, an innovative new Camel Development Scheme. Government of Rajasthan will support camel breeders with a subsidy of ₹ 10,000 (payable over a period of eighteen months) for each camel calf born.

**Pig population**

The pig population has increased from 72.03 thousand number in 1956 to 237.67 thousand number in 2012. Prabhu *et al*. (2012) noticed declining trend in population in Tamil Nadu as well as in India. The per cent increase in the population of pig in 2012 over 1956 was recorded as 229.97. The per cent share of pigs in total livestock population was remained constant about less than one per cent throughout the whole period with small variations.

**Other population**

The other animals considered were horses & ponies, mules and donkeys. Their population have been steadily declining in number during the study period and were recorded as 303.58 thousand in 1956 and 122.62 thousand in 2012. The highest population was recorded in 1956. The per cent change in 2012 over 1956 was recorded as -59.61.

**Total population**

The temporal composition of different species of livestock animals had changed noticeably during the period from 1956 to 2012, as shown in Table 1. The total livestock population was increased from 32426.98 thousand number in 1956 to 57732.20 thousand number in 2012 with an increase of 78.04 per cent. The highest population of livestock was recorded in 2012. An increasing trend in number of total livestock population was observed from 1956 to 2012, except in the years 1988, 1992 and 2003. Thus, the total livestock population in the last five and half decade has almost doubled in the state of Rajasthan. Moreover a general decline in all livestock species were seen during 1988 over 1983 and 2003 over 1997, which was attributable to the acute drought in the year 1987 and 2002 in the state.

**Growth rate of livestock population**

The annual growth rate has been considered as change in population of livestock species in two consecutive years as a per cent of the previous year. Growth pattern of different livestock population in Rajasthan during the inter census period 1956-2012 have been depicted in Table 2.

**Cattle:** The cattle population showed a mixed trend in different inter-census period with the positive trend during 1956-61, 1972-77, 1977-83, 1988-92, 1992-97, 2003-07 and 2007-12 and negative trend in 1961-66, 1966-72, 1983-88, 1997-2003. From the table, it was evidenced that out of eleven inter-census periods, the growth rate was found to be negative for four inter-census periods. The cattle population recorded a maximum annual growth during the inter census period 2002-07 with 11.66 per cent and lowest (-18.91%) during the period 1983-88. Cattle population has been declined by compound growth rate of 0.56 per cent during the whole period 1956-2012. Negative growth rate of cattle over the period might be due to the fact that cattle are losing their importance.

**Table 2: Species-wise inter census period growth rate of livestock population of Rajasthan during 1956 and 2012**

| Particulars | Per cent change over previous year | | | | | | | | | | | CGR (1956-2012) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1956-61 | 1961-66 | 1966-72 | 1972-77 | 1977-83 | 1983-88 | 1988-92 | 1992-97 | 1997-2003 | 2003-07 | 2007-12 | |
| Cattle | 8.81 | -0.10 | -4.98 | 3.42 | 4.71 | -18.91 | 6.54 | 4.22 | -10.73 | 11.66 | 9.94 | -0.56 |
| Buffalo | 16.84 | 5.06 | 8.99 | 10.22 | 19.15 | 5.52 | 21.94 | 25.48 | 6.74 | 6.51 | 16.99 | 13.08** |
| Sheep | -0.18 | 19.66 | -2.84 | 16.15 | 35.15 | -26.23 | 26.08 | 14.58 | -29.75 | 11.30 | -18.86 | 3.54** |
| Goat | -7.77 | 28.21 | 17.81 | 1.19 | 25.78 | -18.49 | 21.15 | 10.81 | -0.76 | 27.93 | 0.76 | 8.89** |
| Camel | 30.74 | 14.58 | 13.94 | 1.01 | 0.52 | -4.96 | 3.85 | -10.43 | -25.47 | -15.30 | -22.79 | -2.91 |
| Pigs | -0.79 | 16.63 | 40.00 | 11.41 | 38.08 | 15.57 | 21.91 | 19.86 | 11.43 | -38.25 | 13.96 | 14.80** |
| Other animals | -1.07 | -12.22 | -10.61 | 12.08 | -2.79 | -15.16 | 5.05 | -6.85 | -19.98 | -24.70 | -4.54 | -7.33** |
| Total livestock | 3.34 | 11.84 | 3.74 | 6.38 | 20.05 | -17.43 | 18.17 | 12.19 | 5.36 | 15.32 | 1.89 | 5.36** |

****Compound growth rate significant at 1% level of significance. Figures presented in the year 1956 are in thousand number.**

**Table 3:** Temporal changes in livestock products in Rajasthan (19985-86 to 2014-15)

| Particulars | Milk | | Meat | | Eggs | | Wool |
|---|---|---|---|---|---|---|---|
| | P | PCA | P | PCA | P | PCA | P |
| Unit | 000 Tonnes | gm/day | 000 Tonnes | kg/annum | Million No. | No./ annum | Lakh kilogram |
| 1985-86 | 4146 | 297.20 | 17.29 | 0.45 | 196.58 | 5.14 | 160.36 |
| 1986-87 | 4168 | 291.43 | 17.57 | 0.45 | 208.93 | 5.33 | 181.00 |
| 1987-88 | 3911 | 266.89 | 18.95 | 0.47 | 213.72 | 5.32 | 165.00 |
| 1988-89 | 4036 | 268.96 | 20.13 | 0.49 | 225.77 | 5.49 | 170.00 |
| 1989-90 | 4217 | 274.58 | 21.30 | 0.51 | 230.00 | 5.47 | 159.00 |
| 1990-91 | 4339 | 276.19 | 23.50 | 0.55 | 280.50 | 6.52 | 160.00 |
| 1991-92 | 4474 | 278.54 | 24.00 | 0.55 | 316.67 | 7.20 | 164.64 |
| 1992-93 | 4586 | 277.65 | 25.50 | 0.56 | 349.20 | 7.72 | 167.39 |
| 1993-94 | 4958 | 292.12 | 27.34 | 0.59 | 395.70 | 8.51 | 170.79 |
| 1994-95 | 5103 | 292.82 | 29.93 | 0.63 | 416.95 | 8.73 | 172.11 |
| 1995-96 | 5449 | 304.71 | 31.66 | 0.65 | 436.39 | 8.91 | 174.29 |
| 1996-97 | 5873 | 320.27 | 35.42 | 0.71 | 482.17 | 9.60 | 186.87 |
| 1997-98 | 6487 | 345.19 | 38.38 | 0.75 | 503.66 | 9.78 | 188.09 |
| 1998-99 | 6923 | 359.68 | 42.33 | 0.80 | 534.36 | 10.13 | 188.80 |
| 1999-00 | 7260 | 368.48 | 47.46 | 0.88 | 558.22 | 10.34 | 192.02 |
| 2000-01 | 7455 | 369.83 | 51.13 | 0.93 | 571.53 | 10.35 | 194.11 |
| 2001-02 | 7718 | 374.43 | 56.25 | 1.00 | 602.17 | 10.66 | 196.71 |
| 2002-03 | 7848 | 372.72 | 58.61 | 1.02 | 635.91 | 11.02 | 193.84 |
| 2003-04 | 8054 | 374.61 | 62.86 | 1.07 | 672.16 | 11.41 | 149.00 |
| 2004-05 | 8310 | 378.71 | 64.32 | 1.07 | 693.26 | 11.53 | 150.49 |
| 2005-06 | 8713 | 389.21 | 67.84 | 1.11 | 702.9 | 11.46 | 154.05 |
| 2006-07 | 10310 | 451.60 | 69.00 | 1.10 | 663.10 | 10.60 | 156.85 |
| 2007-08 | 11377 | 488.85 | 80.00 | 1.25 | 673.09 | 10.56 | 154.50 |
| 2008-09 | 11932 | 503.11 | 83.81 | 1.29 | 645.17 | 9.93 | 126.77 |
| 2009-10 | 12330 | 510.35 | 92.00 | 1.39 | 671.30 | 10.14 | 125.29 |
| 2010-11 | 13234 | 537.90 | 107.00 | 1.59 | 669.70 | 9.94 | 122.78 |
| 2011-12 | 13512 | 539.47 | 122.22 | 1.78 | 960.54 | 14.00 | 131.92 |
| 2012-13 | 13946 | 547.12 | 151.72 | 2.17 | 1033.49 | 14.80 | 140.07 |
| 2013-14 | 14574 | 561.98 | 174.89 | 2.46 | 1190.17 | 16.75 | 150.34 |
| 2014-15 | 16934 | 642.00 | 180.59 | 2.50 | 1320.20 | 18.27 | 144.63 |
| CGR (%) | 5.27 | 2.95 | 8.25 | 5.86 | 5.87 | 3.53 | -0.86 |

P = Production, PCA= Per capita availability, CGR = Compound growth rate

**Buffalo**: The inter-census growth of buffalo population was found to be positive till the year 2007-2012 which is the favourable indication for the dairy development of the state. This might be due to successful implementation of various dairy development programmes of Government. The rate was found to the highest (25.48%) during the period 1992-97 and lowest (5.06%) during the period 1961-66. The compound growth rate of buffalo during the period 1956 to 2012 was registered with 13.08 per cent. Positive and significant growth rate of buffalo over the period might be due to the fact relatively higher productivity and higher price realisation from buffalo milk than cow milk on account of higher fat and solid not fat content.

**Sheep:** The sheep population showed a mixed trend like the cattle in different inter-census period with the positive trend during 1961-66, 1972-77, 1977-83, 1988-92, 1992-97, 2003-07 and 2007-12 and negative trend in 1956-61, 1966-72, 1983-88, 1997-2003. The sheep population recorded a maximum annual growth during the inter census period 1977-83 with 35.15 per cent and lowest (-26.23%) during the period 1983-88. Sheep population has increased by the compound growth rate of 3.54 per cent during the period 1956-2012.

**Goat**: The goat population decreased at the rate of 7.77 per cent during the period 1956-61. The goat population has improved and remained the positive for subsequent four periods (1961-66, 1966-72, 1972-77 and 1977-83) followed by a decline in the period 1983-88, increase in period 1988-92 and 1992-97, again had a dip during the period 1997-2003 and finally showed a positive trend during last two periods (2003-07 and 2007-12). The goat population recorded highest annual growth during the inter census period 1961-66 with 28.21 per cent and lowest (-18.49%) during the period 1983-88. Goat has significantly increased by compound growth rate of 8.89 per cent during the period 1956-2012.

**Camel**: The camel population undulate between positive and negative growth rate over different periods from 1956-2012. The growth of camel population was continuously declined and remained positive up to the year 1977-83 with the values of 30.74, 14.58, 13.94, 1.01 and 0.52 per cent for the period 1956-61, 1961-66, 1966-72, 1972-77 and 1977-83, respectively. Thereafter, it showed the negative growth during the subsequent periods till 2007-12 except 1988-92 with the values of 4.96, 10.43, 25.47, 15.30 and 22.79 per cent for the period 1983-99, 1992-97, 1997-2003, 2003-07 and 2007-12, respectively. The camel population recorded a maximum growth during the inter census period 1956-61 with 30.74 per cent and lowest (-25.47%) during the period 1997-2003. Camel has declined by rate of 2.91 per cent during the entire period 1956-2012.

**Pig:** The growth of pig population had a positive trend over all the inter-census period except during the periods 1956-61 and 2003-07 where it was -0.79 and -38.25 per cent, respectively. The rate was found to highest (40%) during the period 1966-72 and lowest (-38.25%) during the period 2003-07. The compound growth of pig was registered 14.80 per cent during the period 1956-2012.

**Other animals:** The inter-census growth of other animal population was found to be negative till the year 2007-2012 except two periods of 1972-77 and 1988-92 where it was 12.08 and 5.05 per cent, respectively. The compound growth rate of other animals was registered negative and significant with 7.33 per cent during the period 1956-2012.

**Total livestock:** The total animal population was found positive growth for first five periods (1956-61, 1961-66, 1966-72, 1972-77 and 1977-83) followed by a decline in the period 1983-88 and finally showed a positive growth during last five periods (1988-92, 1992-97, 1997-2003, 2003-07 and 2007-12). The total animal population recorded highest growth during the period 2003-07 with 15.32 per cent and lowest (-17.43%) during the period 1983-88. Total animal population significantly grew at the compound rate of 5.36 per cent during the entire period 1956-2012.

**Output from Livestock Sector**

Consistent with the increasing livestock population, output from this sector had witnessed an increase. The production and per capita availability of livestock output presented in the Table 3, revealed that the total milk production in the state had gone up from 4146 thousand tonnes in 1985-86 to 16934 thousand tonnes in 2014-15. Annual milk production in Rajasthan has grown more than four times since 1985-86. Compound growth rate in milk production was close to 5.27 per cent (1985-86 to 2014-15). The increase in milk production was accompanied with its increasing per capita availability. It is remarkable to note

that the per capita availability of milk showed a substantial increased in state from 297.20 gm/day in 1985-86 to 642.00 gm/day in 2014-15 with certain dips in between with compound rate of 2.95 per cent. In state, it was higher (642 gm/annum) than ICMR recommendation (300 gm/day) and world average (265 gm/day) since 1994-95.

**Table 4:** Demand-supply gap in livestock products in Rajasthan

| Year | Gap | | |
|---|---|---|---|
| | Milk (gm/capita/day) | Egg (No./capita/annum) | Meat (kg/capita/annum) |
| 1985-86 | -2.80 | -174.86 | -10.50 |
| 1986-87 | -8.57 | -174.67 | -10.50 |
| 1987-88 | -33.11 | -174.68 | -10.48 |
| 1988-89 | -31.04 | -174.51 | -10.46 |
| 1989-90 | -25.42 | -174.53 | -10.44 |
| 1990-91 | -23.81 | -173.48 | -10.40 |
| 1991-92 | -21.46 | -172.80 | -10.40 |
| 1992-93 | -22.35 | -172.28 | -10.39 |
| 1993-94 | -7.88 | -171.49 | -10.36 |
| 1994-95 | -7.18 | -171.27 | -10.32 |
| 1995-96 | 4.71 | -171.09 | -10.30 |
| 1996-97 | 20.27 | -170.40 | -10.24 |
| 1997-98 | 45.19 | -170.22 | -10.20 |
| 1998-99 | 59.68 | -169.87 | -10.15 |
| 1999-2000 | 68.48 | -169.66 | -10.07 |
| 2000-01 | 69.83 | -169.65 | -10.02 |
| 2001-02 | 74.43 | -169.34 | -9.95 |
| 2002-03 | 72.72 | -168.98 | -9.93 |
| 2003-04 | 74.61 | -168.59 | -9.88 |
| 2004-05 | 78.71 | -168.47 | -9.88 |
| 2005-06 | 89.21 | -168.54 | -9.84 |
| 2006-07 | 151.60 | -169.40 | -9.85 |
| 2007-08 | 188.85 | -169.44 | -9.70 |
| 2008-09 | 203.11 | -170.07 | -9.66 |
| 2009-10 | 210.35 | -169.86 | -9.56 |
| 2010-11 | 237.90 | -170.06 | -9.36 |
| 2011-12 | 239.47 | -166.00 | -9.17 |
| 2012-13 | 247.12 | -165.20 | -8.78 |
| 2013-14 | 261.98 | -163.25 | -8.49 |
| 2014-15 | 342.00 | -161.73 | -8.45 |

Further increases in per capita income and changing consumption pattern would lead to acceleration in demand for milk and milk products in the state and thus would give a boost to this sector (Gandhi and Mani, 1995; Kumar, 1998 and Dastagiri, 2001, Kaur and Bhullar, 2012).

Another important product of livestock is meat whose production had increased from 17.29 thousand tonnes in 1985-86 to 180.59 thousand tonnes in 2014-15 in the state with compound rate of 8.25 per cent. Its per capita availability showed an increasing trend with 5.86 per cent growth during the same period. Despite large sheep and goat population, per capita availability of meat (2.5 kg/annum) was very low as compared to world availability (14 kg per year) and ICMR recommendation (10.95 kg per year).

As regard eggs, its production has increased from 196.58 million number in 1985-86 to 1320.20 million number in 2014-15 which registered around 5.87 per cent growth. The per capita availability of egg was increasing with fluctuations in few years. Its per capita annual availability in state was lower (18.27 eggs/annum) than ICMR recommendation (180 eggs), in spite of continuous increase in its production. When the requirements of meat, milk and egg are computed in terms of ICMR recommendation, there exist a big gap between demand and supply of all the three livestock products in India during 2009-10 (Borah and Halim, 2014).

As regard other products, total wool production in 1985-86 was 160.36 lakh kilograms and it has decreased to 144.63 lakh kilograms in 2014-15. The highest production of wool was noted during 2001-02 at 196.71 lakh kilograms. Its compound growth rate was at meagre -0.86 per cent per annum. Reason for negative growth in wool production might be due to low productivity of wool. Further, growth of wool production was directly related with sheep population.

**Gap between demand and supply of livestock products**

In order to formulate an effective policy for the growth and development of livestock sector, it is crucial to know the demand and supply situation of various livestock products. For the successful attainment of food security, it is of prime importance that the nutrient requirement as prescribed by ICMR (300gm milk/capita/day, 180 egg/

capita/annum and 10.95 kg meat/capita/annum) should be meet. A perusal of the Table 4 revealed that the demand supply gap in milk production was found to be negative till the year 1994-95. Thereafter, it showed the positive gap during the subsequent periods till 2014-15. The demand supply gaps for eggs and meat in Rajasthan were registered negative throughout the all study period clearly indicating that demand was still much greater than supply during reference period. Further, it was observed that there was slight improvement in gap for meat and eggs during the later period.

## CONCLUSION

The present study concluded that an increasing trend in number of total livestock population was observed from 1956 to 2012, except in the years 1988 and 2003. Moreover a general decline in all livestock species in state was attributable to the acute drought in the year 1987 and 2002 in the state. The recent census evinced an impressive growth for all livestock species excluding sheep, camels and other animals. The trends in different species of animals in the state indicate that a shift has taken place in favour of more productive milch animals. Although this shifting is one of the good indicator for dairy development but qualitative improvements in breeds of milch animals in the state was very poor yet. Actual demand for milk is met with increased milk production while it was not happened in case of meat and egg over the period of time. The human population of Rajasthan state is predominantly vegetarian; thus, supply might meet actual demand for egg and meat for non-vegetarian, but when take into account the whole human population depend on animal products for their dietary protein requirement falls short of per capita availability in egg and meat.

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