

## GROWTH AND INSTABILITY OF BOVINE POPULATION IN RAJASTHAN (DISTRICT LEVEL)

MAHENDRA SINGH

(Assistant professor, Motilal Nehru College, Delhi University, New Delhi-110021, Mail ID msingh\_mlnc2002@yahoo.com)

### ABSTRACT

To find growth pattern and instability in bovine population in Rajasthan at district level. Annual Compound Growth Rate (ACGR) and Instability Index for Cattle and Buffalo population were estimated at district level between 1977 to 2012. It was observed that Annual Compound Growth Rate (ACGR) was higher in case of buffalo in all years except 2003 to 2007 where only ACGR of cattle exceeded to buffalo. ACGR of buffalo was never found negative but same for cattle was found negative in two periods. From 1983 to 1988 ACGR was -4.10 percent at state level even negative for all districts and in 1997 to 2003 it was -1.85 percent and negative for majority of districts that was not the case for buffalo so it indicating towards the fact that buffalo were preferred over the cattle. Average of ACGR was higher for buffalo population in all districts except Ganganagar. In case of Instability it was high in case of cattle and lower in buffalo.

### PART-1 INTRODUCTION

Agriculture and allied sector was important in Rajasthan as it was major contributor in state domestic product in 2012-13, contribution was 27.97 percent at current prices (Economic review 2012-13). It is important sector of Rajasthan economy just not because of only it was good contributor in SGDP but because of dependency of large population of the state for the livelihood. As per 70 th round NSSO (2014) Table 2 shows about distribution of agricultural household per 1000 and out of them 913 were engaged in cultivation and 861 were in livestock production. This fact indicate the presence of mixed agriculture and livestock production system in the state. As per agricultural statistics 2011-12 of Rajasthan gross irrigated area was 25.98 percent and net irrigated area was 20.78 percent only so it can be said that performance of agriculture in Rajasthan largely depends on whether condition. As Rajasthan is known as one of the rain fed or desert state so animal husbandry is a major supportive economic activity as this fact also came out in 70 th round "NSSO (2014) on Table 7 A-11" which shown that net monthly receipt from cultivation was around 42.69 percent and from farming of animals was around 13.16 percent which was quite significant.

Table 1: AREA UNDER THE CROP TO GROSS AREA IN RAJASTHAN IN 2011-12

CATEGORY OF CROPS	TOTAL GROSS AREA(Hectare)	PERCENT TO GROSS AREA
(A) FOODGRAIN CROPS	14440069	58.93
I. CEREALS	9990834	40.77
II. PULSES	4449235	18.16
(B) OILSEEDS	4626437	17.25
(I) FODDER CROPS	3386165	13.82
Other Crops	2052698	10.00
TOTAL CROPPED AREA	24505369	100.00

Source: Agricultural statistics 2011-12, Govt. of Raj. Jaipur

As per table 1 Food grains were grown on 58.98 Percentage to gross area, on 17.25 percent area oilseeds and on 13.82 percent for fodder crops. As a known fact crop residual of most of the crop and product remain after extracting oil was being used for animal. More than 90 percent of area was used for crops that was direct or indirect useful for livestock so agriculture was mainly being used as a source of food security for households and supplier of inputs to related sector which was livestock sector.

One the one hand majority population of the state depends on agricultural sector and agriculture was itself not reliable as only 39.49 percent of the net sown area was irrigated in 2011 in the state. Agriculture mostly depends on weather conditions more over on occurrence of rainfall. Due to vast area in the state, it possesses various types of physical features. There is a considerable variation in rainfall and temperature within the state. Rajasthan covers the complete 'Great Indian Desert'- the Thar and parts of semi-arid climatic zone It covers about 61 percent of the total area of the state, and is widely known as the Great Indian Desert the Thar. Aravalli Hill ranges run from south-west to north east through the heart of the state. Aravalli hills which divide the desert in the west from the relatively fertile east. To the west and the north west of these hills, there is a region, which comprises 11 districts. Almost two-third of Rajasthan's total area is either desert or semi-desert. Beside rainfall agriculture in Rajasthan continues encounter several problems like declining farm incomes, size of land holdings, ecological degradation and over capitalization etc. In such a situation district level study is required to check issue properly.

Livestock are treated as an assets in rural areas and even today they were seen as symbol of prosperity. Pandey U. K. (1995) rightly summarized that "besides having vast employment potential, this sector provides not only milk, egg, meat, wool, hides and skins, dung, bones, hooves and drought power but also stabilizes the farm incomes." Among the livestock cow and buffalo were traditionally reared for the milk production and drought power, camel for drought power and ovine for food production. As per details given on table 2 Rajasthan was having 133.24 lakh cattle, 129.76 lakh buffaloes, 216.66 lakh goats. Distribution of livestock shown a prosperous picture of state in India, it own 11.25 percent nation's total livestock wealth, 6.98 percent of nation's cattle, 11.94 percent buffaloes, 13.95 sheep and 16 percent of nation's goats.

Table 2: Relative Position of Rajasthan in India in Livestock Population in 2012

S.No.	Name of Livestock	Rajasthan (In thousands)	All India (In thousands)	Percentage out of India
1	Cattle	13324	190904	6.98
2	Buffaloes	12976	108702	11.94
3	Sheep	9080	65069	13.95
4	Goats	21666	135173	16.03
5	Pigs	238	10294	2.31
6	Horses & ponies	38	625	6.08
7	Mule	3	196	1.53

8	Donkey	81	319	25.39
9	Camel	326	400	81.50
10	Yaks	0	77	0.00
11	Mithun	0	298	0.00
	Total Live-stock	57732	512057	11.28

Source: 19th Livestock census-2012, State/District Wise Reports volume-I, Govt. of India, Delhi

### ORGANIZATION OF STUDY:

The paper is divided into four part first one is introductory in second part literature review, research gap, objectives of the study was taken, next is third part in which data source methodology will be discussed, In forth part results will be discussed and finally in fifth part summary and conclusion will be discussed.

### PART-II

#### LITERATURE REVIEW

Pandey U.K. (1995) studied about the profile of livestock economy region wise comprising northern, western, southern and eastern of India. Composition of growth and density of bovine has been undertaken and found that growth of indigenous cattle was positive at combined level but growth of in milk buffalo was significantly higher in all regions. As far drought animal concern they are losing importance.

Chand R. (1995) in a study to examine growth and composition and intensity of livestock in Himachal Pradesh. Growth rate of cattle was negative in entire period and population of buffalo was increasing at a faster rate. In case of breeding stock of bovine proportion of buffalo was more than cattle and proportion was also found increasing.

Kumar, V., Sharma, H.R. and Sharma, R.K. 2004 Assuming limited livelihood options in the hilly reasons like Himachal Pradesh form crucial crop-livestock mixed system study made to find out compositional change of livestock population and its ecological implication. Study revealed that the buffaloes and goats were increasing and cattle and sheep were decreasing. Crossbreed cattle was found replacing indigenous during 1990s.

Birthal P S and Jha A K(2005) Population of indigenous cattle both male and female decreasing from 1992 to 2003 and female buffalo increased 19.7 percent and sheep increased 21 percent. Production of livestock product in all categories milk of cow and buffalo, meat small and large ruminant, egg and wool increased in absolute term and annual growth rates were also positive in 1981-90 entire period 1991-2003. It was further shown that share of crops decreasing over the period of time 72.1 percent in TE 1982/83 and became 66.8 percent in TE 2002-03 but share of livestock sector was increased from 19.1 to 25.2 percent in the same period. Distribution of livestock was highest among the marginal land holders followed by small land size holders.

Anjani Kumar, Steven Staal, K. Elumalai and Dhiraj K. Singh (2007) Carried out study to seek performance and factors influencing development of the Livestock sector in North-Eastern region (NER) of India. Share of livestock increased in majority NER states as highest positive

change was in Arunachal Pradesh followed by Meghalaya and declining change in Nagaland then Assam net change in combined NER states was found declining. Compound annual growth in NSDP and agriculture sector Compound annual growth in livestock sector was reported highest in Nagaland and lowest in Assam growth in NER was reported slower than national level. Composition of livestock production was said changing. The change was decline in all NER states in bovine population and rise in population of poultry between 1992 and 2003. Marginal land holders were found with highest livestock holders. Milk production in entire NER was found increasing except Manipur highest in Tripura followed by Arunachal Pradesh. On the basis of different data set authors argued that livestock sector has redistributive effect and reducing income inequality.

Anjani Kumar and Dhiraj K. Singh (2008) In study to observed pattern of development of livestock across in different ago-economic regions of India at district level in five regions namely are: "arid, coastal, hill and mountain, irrigated and rain-fed regions". It was concluded that milch livestock were preferred then others it was clear from the fact that population of buffalo found increasing where population of indigenous cattle was found decreasing in all the regions. Indigenous cattle population has declined mainly because of decline use of the male in agricultural operations with growing mechanization of agriculture. Growth of buffalo was slower than of crossbred cattle except in the irrigated region. The density of buffalo and cattle was also found the highest in irrigated region. Population of crossbred/improved animals has increased at a considerably high rate in all the regions except irrigated region.

Ramesh Chand and S.S. Raju (2008) Depicted about increasing share of livestock in output of agriculture with the help of national accounts statistics data. Growth rate of livestock output in value term was higher in milk group than meat group in majority study period. Credit for higher growth in milk output was given to institutional support during and after operational flood program for started in the year 1970. In respect of value of livestock output at current prices livestock has highest proportion nearly two third occupied by milk group. Share of dung was found decreasing sharply due to low growth rate because "collection and stocking of dung are very time consuming and considered as inferior activities".

P S BIRTHAL and V K TANEJA (2012) Performance of livestock was demonstrated that share of livestock sector was increasing and annual growth of livestock from 1980-81 to 2008-09 was found more than crops and entire agricultural sector. Share of marginal land holders was depicted separately and emphasized on the fact that share of marginal householders was increased in all respects like share in land proportion, percentage share in livestock in all categories during three periods 1981-82, 1991-92 and 2002-03. Share of livestock in employment in agriculture was reported smaller than agriculture and its proportion were increasing in all segments of land holders. Employment of women share was highlighted and it was above 69 percent and increased in all segment of land holding.

## RESEARCH GAP

It was felt deeply that there were too much work in the field of livestock at national level but if we talk about the Rajasthan then it is not true. Only few study were found even these were focused on state level with few data points out of them study with covering all districts are very limited or can say none. This study was covering all districts and with having large coverage of time from 1977 to 2012. So this study will be a significant addition in this field.

**OBJECTIVES OF THE STUDY:**

In such a scenario where livestock have very supportive role in household's income and crucial for the rural area

1. To find structural change and growth of Bovine in Rajasthan at district level from 1977 to 2012.
2. To find instability in Bovine population in Rajasthan at district level.

**PART-III****DATA SOURCE AND PERIOD OF STUDY**

For the present study data base were mainly secondary from various published sources. Basic statistics, Agricultural statistics and other publications published from "Directorate of economics and statistics, various census reports, reports of Animal Husbandry, Statistical Abstract of Rajasthan". Livestocks population and other data for reference were taken from NSSO reports. Period of the study was for state level from 1977 to 2012 at district level.

**MERGER OF DISTRICTS:**

The study covers 26 districts of Rajasthan state as were present before 1982. At present, there are 33 districts in Rajasthan. In order to make data comparable adjustments have been made by merging the newly created districts with the districts they were carved out from. The information of population of cattle and buffalo related to seven newly created districts has been merged with their respective original districts from which they were carved out. Baran is merged with Kota, Dholpur with Bharatpur, Karauli with Sawai Madhopur, Rajsamad with Udaipur, Hanumangarh with Ganganagar and Dausa with Jaipur. Pratapgarh was made of tehshils taken from three districts so during merge weight of area of tehshil was given.

**METHODOLOGY**

To fulfill the objective secondary data were obtained and then were analyzed with simple as well as specific tools as been used by several other scholars.

**Average**

Simple Average for Y

$$\sum Y_i / N$$

Y = Value of variable

$$i = 1, 2, 3, \dots, n$$

N= Total number of variable

**Compound Annual Growth Rate**

To compute annual growth rate with the date with a particular gap formula of compound growth rate was used

$$\text{Compound Annual growth rate} = [ ( Y_{\text{present}} / Y_{\text{initial}} )^{1/n} - 1 ] \times 100$$

Y present = Value of variable at present level

Y initial = Value of variable at beginning

n = Number of years

### **Instability Index:**

Instability Index was as also used by “Chand R and Raju S.S. (2009) and Kumar Anjani and Jain Rajni, (2013)” as other researchers did to find out instability in agriculture. Same tool was used in livestock.

Instability index = Standard deviation of Natural Logarithm  $(Y_{t+1}/Y_t) \times 100$

$Y_{t+1}$  = Value of variable at next level

$Y_t$  = Value of variable at present level

## **PART-IV**

### **RESULTS AND DISCUSSION**

For the shake of convenience the this part is divided in three sub parts. In first sub part growth of cattle from 1977 to 2012 was discussed in second sub part growth of buffalo from 1977 to 2012 was discussed and in third part instability index will be consider.

#### **GROWTH OF CATTLE FROM 1977 To 2012**

As per table 3 Annual Compound Growth Rate (ACGR) of Cattle from 1977 to 1983 in Rajasthan was almost stagnant in this period and it was 0.70 percent. Majority of districts were showing either negative or very slight positive growth. Highest positive ACGR was in Jaisalmer 13.21 percent followed by Bikaner 8.17 percent, Ganganagar 4.34 percent, Barmer 4.03 percent, and in Dungarpur 3.23 percent. Highest positive ACGR Pali -2.12 percent, Bhilwara -2.07 percent, Ajmer -1.56 percent, Jhunjhunun -1.30 percent and Alwar -0.63 percent. Stagnant growth was observed in Jaipur 0.01 percent, Chittaurgarh 0.01 percent and in Nagaur 0.03 percent.

Annual Compound Growth Rate (ACGR) of Cattle from 1983 to 1988 was found negative in all districts and overall AGCR was -4.10 percent. Lowest ACGR was in Barmer -13.80 percent followed by Jaisalmer -13.34 percent Sirohi -11.27 percent Jalor -9.17 percent, Pali -8.57 percent, Jodhpur -8.22 percent, Alwar -7.24 percent, and Udaipur -6.25 percent. Smallest negative ACGR was in Kota -0.13 percent and then Bikaner -0.16 percent.

Annual Compound Growth Rate (ACGR) of Cattle from 1988 to 92 was 1.53 at state level and majority of districts were on positive side with two districts having highest double digit namely Barmer 12.21 percent and Sirohi 10.60 percent then Jodhpur with 9.27 percent and Pali 7.40 percent.

Table 3: Compound Growth rate of Cattle in Rajasthan from 1977 to 2012

SNo.	District	1977-83	1983-88	1988-92	1992-97	1997-03	2003-07	2007-12	Average of CGR 1977-2012
1	Ajmer	-1.56	-5.61	4.77	1.44	-7.21	6.23	0.64	-0.19
2	Alwar	-0.63	-7.24	-4.97	-2.37	-1.91	1.89	1.04	-2.03
3	Banswara	1.86	-0.75	0.97	1.63	2.16	-0.47	0.45	0.84
4	Barmer	4.03	-13.80	12.21	7.60	0.08	4.37	4.34	2.69
5	Bharatpur	0.24	-4.83	-9.92	-3.30	-1.36	3.28	3.82	-1.72
6	Bhilwara	-2.07	-1.74	4.22	-0.68	-3.59	-0.86	4.27	-0.06
7	Bikaner	8.17	-0.16	0.17	4.26	1.37	2.47	6.19	3.21
8	Bundi	-0.23	-0.58	0.27	-0.55	-3.41	1.21	-2.35	-0.81
9	Chittaurgarh	0.01	-1.65	0.92	-2.31	-0.02	2.33	-7.11	-1.12
10	Churu	0.72	-2.21	0.70	4.89	-7.02	4.45	6.28	1.12
12	Dungarpur	3.23	-4.24	2.66	1.11	0.67	0.55	-2.55	0.21
13	Ganganagar	4.34	-1.31	3.76	1.31	1.20	6.30	2.84	2.63
14	Jaipur	0.01	-3.54	-2.25	-2.62	-1.44	4.70	3.79	-0.19
15	Jaisalmer	13.21	-13.34	-7.28	27.03	-4.01	9.44	4.49	4.22
16	Jalor	1.05	-9.17	3.53	1.64	-2.53	4.47	0.12	-0.13
17	Jhalawar	0.72	-1.09	-1.20	-1.31	-0.13	0.49	-2.65	-0.74
18	Jhunjhunun	-1.30	-4.65	-2.49	1.49	0.05	9.28	5.84	1.17
19	Jodhpur	-0.13	-8.22	9.27	6.43	-4.10	5.91	5.34	2.07
20	Kota	0.68	-0.13	-1.13	-1.30	-3.25	1.90	-1.28	-0.64
21	Nagaur	0.03	-4.45	1.53	-0.26	-4.83	3.60	3.71	-0.10
22	Pali	-2.12	-8.57	7.40	0.06	-6.28	5.35	0.03	-0.59
23	Sawai Madhopur	-0.13	-2.59	-5.18	-2.93	-6.18	0.69	-2.32	-2.66
24	Sikar	0.46	-2.36	-4.03	0.03	-1.45	6.75	5.40	0.68
25	Sirohi	0.13	-11.27	10.60	1.52	-2.21	1.95	-0.81	-0.01
26	Tonk	-0.50	-3.56	0.62	-2.47	-6.77	2.90	-1.55	-1.62
27	Udaipur	0.66	-6.25	5.25	0.80	0.15	-1.13	3.03	0.36
28	Total	0.72	-4.10	1.53	0.91	-1.85	2.80	1.91	0.27

Sources: Compiled from data collected from: Statistical Abstract Rajasthan, Various issues and Livestock Census 2012

ACGR of Cattle from 1992 to 1997 was on positive in majority of districts and at state level it was 0.91 percent. Districts on stagnant side were Udaipur 0.03 percent and Pali 0.06 percent. Jaisalmer was shown highest ACGR 27.03 percent others were Barmer 7.60 percent Jodhpur

6.43 percent Churu 4.89 percent and Bikaner 4.26 percent. On the lower side Bharatpur -3.30 percent, Sawai Madhopur -2.93 percent and Jaipur -2.62 percent.

Situation was just get opposite in the period between 1997 to 2003 and around three fourth districts were found with negative growth with highest negative ACGR Ajmer -7.21 percent was on top then Churu with -7.02 percent on second then Tonk -6.77 percent, Pali -6.28 percent and Sawai Madhopur with -6.18 percent was main contributor, some of them shown insignificant positive growth like in Barmer 0.08 percent and in Jhunjhunun it was 0.05 percent. Positive side ACGR was hold by Banswara 2.16 percent then Bikaner 1.37 percent and Ganganagar 1.20 percent.

Between 2003 to 2007 ACGR was positive at overall Rajasthan level it was 2.80 percent and 23 out of 26 districts were showing positive growth with highest number Jaisalmer 9.44 percent was the on top place then Jhunjhunun with 9.28 percent having second highest ACGR then Sikar 6.75 percent Ganganagar 6.30 percent and Ajmer 6.23 percent. Three districts showing contraction were Udaipur -1.13 percent, Bhilwara -0.86 percent and Banswara -0.47 percent. Between 2007 to 2012 ACGR was 1.91 percent at Rajasthan level with 18 districts with positive growth. Churu with 6.28 percent was on highest then Bikaner 6.19 followed by Jhunjhunun 5.84, Sikar 5.40 and Jodhpur 5.34.

Average AGCR in entire period of study was observed largest in Jaisalmer 4.22 percent followed by Bikaner 3.21percent, Barmer 2.69 percent, Ganganagar 2.63 percent, Jodhpur 2.07 percent, Jhunjhunun 1.17 percent, Churu 1.12 percent and districts with contraction in average AGCR were Sawai Madhopur -2.66 Alwar -2.03 Bharatpur -1.72 Tonk -1.62 and Chittaurgarh -1.12. Rest all 14 districts were shown Average AGCR below one percent and among them 8 districts were having below half percent change in Average AGCR

### **GROWTH OF BUFFALOES FROM 1977 To 2012**

As per table 4 Annual Compound Growth Rate (ACGR) of Buffalo from 1977 to 1983 in Rajasthan was 2.94 with 23 out of 26 districts having positive growth more than one percent. Both desert districts Jaisalmer 7.82 and Barmer 5.87 were on the top then Sikar 5.17 Ganganagar 5.11 and Bikaner 5.11. Three districts showing contraction in ACGR were Bhilwara -1.45 Ajmer -0.66 and Tonk -0.21.

From 1983 to 1988 overall growth was 1.10 percent. Highest ACGR was observed in Kota 6.15 followed by Bundi 5.20 Bharatpur 3.55 Jhalawar 2.68 Chittaurgarh 2.58 Sawai Madhopur 2.56. Lowest ACGR was in Jaisalmer -18.46 and then in Sirohi -3.84. Three districts showing insignificant positive ACGR were Pali 0.16 Jalor 0.24 Jhunjhunun 0.35.

ACGR was observed highest in the period between 1988 to 1992 and it was 5.0 percent at overall state level. Except two districts all 24 districts were shown positive ACGR among them 14 districts were having ACGR more then 5 percent, four districts having double digit ACGR number namely Jodhpur with 13.33, Sirohi 13.09, Barmer 12.34 and Jalor 11.29 percent.



Table 4: Compound Growth rate of Buffalo in Rajasthan from 1977 to 2012

SNo.	District	1977-83	1983-88	1988-92	1992-97	1997-03	2003-07	2007-12	Average of CGR 1977-2012
1	Ajmer	-0.66	-2.87	8.68	8.63	-2.08	5.09	5.47	3.18
2	Alwar	4.50	0.83	4.88	5.41	3.23	1.53	1.71	3.15
3	Banswara	1.55	0.92	4.69	4.11	2.51	1.39	2.52	2.53
4	Barmer	5.87	-3.30	12.34	10.90	5.96	4.57	6.48	6.12
5	Bharatpur	3.20	3.55	1.94	3.45	3.93	-5.95	8.78	2.70
6	Bhilwara	-1.45	1.36	7.42	2.75	-3.26	-0.73	8.30	2.05
7	Bikaner	5.11	-0.58	6.81	8.25	3.60	-0.28	8.06	4.43
8	Bundi	4.71	5.20	5.24	2.56	1.11	3.52	2.42	3.54
9	Chittaurgarh	2.31	2.58	6.80	0.95	0.56	3.84	0.35	2.48
10	Churu	1.10	-3.01	3.37	7.51	-1.35	2.49	6.39	2.36
12	Dungarpur	3.19	-2.89	4.29	3.25	3.41	1.91	-0.08	1.87
13	Ganganagar	5.11	1.43	6.10	2.93	-2.15	1.38	1.62	2.35
14	Jaipur	4.74	2.48	3.88	4.81	2.22	1.71	2.80	3.24
15	Jaisalmer	7.82	-18.46	-3.25	34.41	7.48	4.84	8.78	5.95
16	Jalor	4.78	0.24	11.29	7.86	2.08	3.66	2.65	4.65
17	Jhalawar	1.64	2.68	2.94	1.42	2.47	2.43	1.33	2.13
18	Jhunjhunun	3.81	0.35	3.50	7.08	1.23	-0.56	0.77	2.31
19	Jodhpur	4.76	-3.43	13.33	8.78	-2.45	9.93	3.02	4.85
20	Kota	2.57	6.15	1.04	4.19	0.88	4.42	1.48	2.96
21	Nagaur	3.31	1.30	7.88	8.23	-0.79	2.32	3.87	3.73
22	Pali	2.76	0.16	5.56	6.98	-1.70	2.48	-0.24	2.28
24	Sawai Madhopur	3.52	2.56	-0.26	4.98	0.43	2.44	4.12	2.54
25	Sikar	5.17	2.28	4.20	6.99	1.68	0.39	1.45	3.16
26	Sirohi	1.79	-3.84	13.09	6.14	2.10	3.48	2.32	3.58
27	Tonk	-0.21	-0.85	5.00	4.75	-1.54	8.00	4.69	2.83
28	Udaipur	1.01	-3.43	8.31	2.13	1.23	0.57	1.56	1.63
	Total	2.94	1.10	5.00	4.75	1.07	1.59	3.19	2.80

Sources: Compiled from data collected from: Statistical Abstract Rajasthan, Various issues and Livestock Census 2012

ACGR between 1992 to 1997 was 4.75 percent at state level with massive participation. All districts were showing positive growth and this time desert districts were doing best as Jaisalmer with 34.41 followed by Barmer 10.90, Jodhpur 8.78 and Bikaner 8.25. Other districts with major

ACGR were Nagaur 8.23 and Ajmer 8.63. Only one districts having ACGR below one percent was Chittaurgarh 0.95 and another below 2 percent was Jhalawar 1.42 rest all having more then 2 percent ACGR.

ACGR was not seen so much positive as in last two period between 1997 to 2003. Eight districts shown contraction in ACGR among them Bhilwara -3.26 Jodhpur -2.45 Ganganagar -2.15 Ajmer -2.08. Highest acceleration was found in ACGR in Jaisalmer 7.48 and in Barmer 5.96.

In the period between 2003 to 2007 situation improve little bit and over all ACGR was 1.59 percent with 22 district having positive side and only one significant exception district Bharatpur -5.95 percent. Districts having largest growth were Jodhpur 9.93 Tonk 8.00 Ajmer 5.09 Jaisalmer 4.84. In the duration from 2007 to 2012 overall ACGR was 3.19 percent and 24 districts were on the positive side and four among them were with ACGR more than eight percent these were Bharatpur 8.78 Jaisalmer 8.78 Bhilwara 8.30 Bikaner 8.06 only two districts showing contraction at very lower rate these are Pali -0.24 and Dungarpur -0.08.

Overall period under the study average of ACGR was giving a clear picture that all districts were having positive ACGR at state level 2.8 percent and from lowest in Udaipur 1.63 to highest in Barmer 6.12.

#### **INSTABILITY IN CATTLE AND BUFFALO POPULATION FROM 1977 To 2012**

As per table 5 it can be seen that instality was on lower side and it was 0.73 at Rajasthan level. Five districts of the state shown value of instability less than one these are Jhalawar 0.46 Banswara 0.48 Kota 0.66 Bundi 0.69 and Ganganagar 0.84 . Districts which were shown highest value of instability were Jaisalmer 5.57 Barmer 3.09 Sirohi 2.47 Jodhpur 2.32 and Pali with 2.15.

As per the table it can be seen that value of Instability Index for cattle was higher than Buffalo population in Rajasthan from 1977 to 2012. Only seven districts where instability in buffalo was higher than cattle namely Jaisalmer, Bhilwara, Ganganagar, Bikaner, Kota, Banswara and Jodhpur. Value of Instability Index for cattle in five districts having instability below one percent were Jhalawar 0.46 Banswara 0.48 Kota 0.66 Bundi 0.69 Ganganagar 0.84 and disricts with high index value in cattle were Jaisalmer 5.57 Barmer 3.09 Sirohi 2.47 Jodhpur 2.32 Pali 2.15.

Value of Instability Index for Buffalo was 0.46 at overall state level. Largest value was of Jaisalmer 12.04 and it was the only district having index value in double digit then other districts having higher value were Jodhpur 2.33 and Barmer 2.14

Table 5: Instability Index for Cattle and Buffalo population in Rajasthan from 1977 to 2012

District	Inst Index for cattle	Inst Index for buffalo
Ajmer	1.94	1.87
Alwar	1.22	0.73
Banswara	0.48	0.50
Barmer	3.09	2.14
Bharatpur	1.71	1.48
Bhilwara	1.15	1.67
Bikaner	1.36	1.55
Bundi	0.69	0.69
Chittaurgarh	1.12	0.69
Churu	1.99	1.56
Dungarpur	1.08	1.08
Ganganagar	0.84	1.08
Jaipur	1.11	0.55
Jaisalmer	5.57	12.04
Jalor	1.79	1.29
Jhalawar	0.46	0.25
Jhunjhunun	1.79	1.05
Jodhpur	2.32	2.33
Kota	0.66	0.76
Nagaur	1.37	1.19
Pali	2.15	1.22
Sawai Madhopur	1.06	0.74
Sikar	1.41	0.97
Sirohi	2.47	1.89
Tonk	1.35	1.30
Udaipur	1.21	1.11
Rajasthan	0.73	0.46

Sources: Compiled from data collected from: Statistical Abstract Rajasthan, Various issues and Livestock Census 2012

## PART-V

### CONCLUSION

Annual Compound Growth Rate (ACGR) was higher in case of buffalo in all years except 2003 to 2007 where only ACGR of cattle exceeded to buffalo. ACGR of buffalo was never found negative but same for cattle was found negative in two periods from 1983 to 1988 it was -4.10

percent and in 1997 to 2003 it was -1.85 percent. During 1983-88 ACGR for cattle was negative for all districts and 1997-2003 ACGR was negative for majority of districts that was not the case for buffalo so it indicating towards the fact that high productive buffalo were preferred over the cattle.

Story at district level has not much of difference if we look at Average ACGR. Average ACGR was higher for buffalo population in 25 out of 26 districts only Ganganagar was exception of it. In Buffalo all district has shown positive Average ACGR between 1983 to 2012 among them lowest was in Udaipur 1.63 then Dungarpur 1.87 but in case of cattle situation was not satisfactory. Average ACGR was slightly positive and majority districts were on negative side and only few of them were having higher Average ACGR.

In case of Instability it was high in case of cattle and lowest in buffalo. Jaisalmer was only district with highest instability index with value 12.04 and majority of districts were having smaller number of index.

## REFERENCES

1. Pandey, U.K. 1995. The livestock economy of India: A profile. *Indian J. Agric. Econ.*, 3: 264-282
2. Chand, Ramesh (1995), "Livestock in Himachal Pradesh: Factors Affecting Growth, Composition and Intensity", *Indian Journal of Agricultural Economics*, Vol. 50, No. 3, July-September, pp. 299-310.
3. Kumar, V., Sharma, H.R. and Sharma, R.K. 2004. Livestock economy of Himachal Pradesh: growth pattern, ecological implications and state policy. *Agric. Econ. Res. Rev.*, 17(1): 57-76
4. Birthal, P.S and Jha, A.K. (2005) Review on emerging trends in India's livestock economy: Implications for development policy, *The Indian journal of animal sciences*, 75(10), 1227-1232, October
5. Kumar Anjani, Staal Steven, K. Elumalai and Singh D. K. (2007) Livestock Sector in North-Eastern Region of India: An Appraisal of Performance, *Agricultural Economics Research Review* Vol. 20 July-December pp 255-272
6. Kumar Anjani, and Singh D. K. (2008), Livestock Production Systems in India: An Appraisal Across Agro-Ecological Regions, *Ind. Jn. of Agri. Econ.* Vol. 63, No. 4, Oct.-Dec.
7. Chand Ramesh and Raju S.S.(2008), Livestock Sector Composition and Factors Affecting Its Growth, *Ind. Jn. of Agri. Econ.* Vol. 63, No. 2, April-June
8. Kumar Anjani and Jain Rajni, (2013) Growth and Instability in Agricultural Productivity: A District Level Analysis, *Agricultural Economics Research Review* Vol. 26 (Conference Number) pp 31-42
9. 19th Livestock census-2012, State/District Wise Reports, ministry of agriculture department of animal husbandry, dairying and fisheries Krishi Bhawan, New Delhi
10. National Sample Survey Organisation (NSSO) (2014), Key Indicators of Situations of Agricultural Households in India, 70 th Round, National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of India, New Delhi, May.