

## **Spatio-Temporal Pattern of Live Stock Husbandry in Dehradun District- A Block Wise Study**

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**Abstract:** Livestock husbandry is one of the important sub sectors of agriculture in India contributing a major portion of GDP to the country, thereby shaping the socio-economic conditions of the people. It has been practised as auxiliary activity in the process of production of different food and non-food grains crops since antiquity. Various kinds of livestock species like cattle, buffalo, goat, sheep, hen and pig etc. were reared as domesticated. In the present paper an attempt has been made to find out the growth and spatio-temporal distribution of livestock husbandry in Dehradun district of Uttarnchal. The study is based on the block-wise published data obtained from Statistical Bulletin of Dehradun district. The spatio-temporal pattern of livestock is determined with the help of six variables. Beside this, the analyses have been carried out by transforming and combining the data related to six variables, using 'Z' score to get the Composite Score. On the basis of Composite Score, development blocks have been categorized into three categories i.e. high, medium and low. Results of the aforesaid analysis shows that Dehradun district is one of the important districts in livestock population as well as in milk production. The high positive growth of livestock in the study area is due to increasing demand of buffalo beef at local, national as well as international level. The Sheep and Goat by comparison is more dominant in Chakrata and Kalsi blocks because the extensive dairy land in Chakrata block and in the adjoining other blocks of the district provide vast expanse of grazing land. As such, goat and sheep are reared with grazing facilities available. The present study reveals that the development of livestock has been recorded in the northern part of the district due to the favourable ecological and environmental conditions.

**Keywords:** Livestock husbandry, Marginal Farmers, socio-economic development, Livelihood, Dairy products.

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### **INTRODUCTION**

Live stock keeping in India and similar other countries have multiple objectives and dimensions. This plays multiple roles in rural systems and economy and has a strong human dimension, as manifested through socio-cultural risk and involvement of women [1]. Besides their well established role in agriculture livestock have crucial role in food security and as risk aversion mechanism for sustaining family, whenever there is crop failure. Role of livestock in generating employment and income in rural areas is well established and livestock development has become an important component of rural development programs i.e. "Equity and extending benefits directly to women" can be achieved through livestock development, since livestock distribution is less skewed than land. Livestock are a part of nature's chain for recycling nutrients, converting low quality and other agro-bye products into good quality and organic fertilizer. The later being important for retaining soil fertility and productivity in ecologically fragile hill region. Moreover the farmers always take holistic view and are

good example of systems manager who has to make decision on variety of factors.

Livestock husbandry is one of the important sub sectors of agriculture in Asia especially in tropical monsoon nations [2]. Livestock husbandry is an important segment of agriculture in Asian countries for the last several decades. It is an important source of income in agriculture sector contributing a major portion of GDP to the country, thereby shaping the socio-economic conditions of the people in the study area[3]. It has been practiced as auxiliary activity in the process of production of different food and non-food grains crops since antiquity. Various kinds of livestock species like cattle, buffalo, goat, sheep, hen and pig etc. were reared as domestic and subsistence animals. Traditional techniques and practices have been applied in the process of their rearing.

Commercial form of livestock husbandry rarely existed before the independence except in cases of milk production but at a small scale with little production to meet local demands. The demands of

livestock products is increasing day by day not only in India but all over world especially in developing and less developed countries which is expected to double by 2020 [4]. Cattle and buffalo in some cases in some selected areas have been reared and used for mainly to work in agriculture as draught animals [5]. Their dung is also very valuable and they were and still now used for manures as well as domestic fuels in many villages of study area.

Livestock farming, however, has been appearing one of the most important value added farming system adopted in the country. It is an important source of food security as it provides meat and milk and other dairy products, which enrich the nutrition intake [6]. Growing human population, rising per capita income and increasing livestock and fuelling rapid growth in the demand for food of animal origin in the developing countries [7].

The importance of livestock in India goes beyond the function of food production. It is an important source of draught power, manure for crop production and fuel for domestic use. Thus, by minimizing use of non-renewable energy, livestock make a positive contribution to the environment. Although crops and livestock are interdependent to a large extent, the later constitute an important mechanism for cropping with the risks of crop failure. In land-scarce economies livestock provide livelihood support in terms of income and employment generation to the millions of landless and small landholders.

Animal husbandry is making a significant contribution to the national economy and socio-economic development in the country. In rural India where over 15-20 per cent families are landless and about 80 per cent of the land holders belong to the category of small and marginal farmers, livestock is main source of livelihood [8]. Over a last decade or so, the population of buffalo and goat in most states are

increasing more rapidly than other species and they are considered the animals of the future for the country. Until recently, the buffalo was described as an animal of irrigated and assured rainfall areas where good quality of fodder is available, while semi-arid and arid areas considered cattle tract. Yet even in these areas buffalo is overtaking cattle.

Improved livestock management by small land holders would contribute to farm income, household nutrition and sustainability of livestock production. Mixed farming will be the choice of farmers in the hill agro ecosystem as livestock is an inseparable component of hill agriculture [9].

### Objectives

The present paper attempts to analyze spatio-temporal distribution and growth of livestock husbandry at the block level in the study area. The spatio-temporal distribution of livestock in the study area includes not only the total livestock at the block level but also the species wise distribution in the study area.

### DATABASE AND METHODOLOGY

The present study is based on the secondary data for the year 1981, 1991, 2001 and 2010 obtained from the statistical abstract of Dehradun district and development block has been chosen as the unit of analysis. The data regarding area, population, various species of livestock and other details pertaining to the Dehradun district was obtained from statistical bulletin and statistical office of the district. The method adopted here is to convert each set of figure into Standard score i.e. 'Z' score and the advanced cartographic and GIS techniques have been used in the analysis and interpretation of the present study.

The following six indicators were selected for measuring the level of livestock husbandry.

**Table-1: List of Selected Variables**

S.No	Variables	Definition
1	X1	Number of livestock per hectare of total area.
2	X2	Number of livestock per person.
3	X3	Number of cattles per hectare of cultivated area.
4	X4	Number of cattles per person.
5	X5	Number of poultry per hectare of total area.
6	X6	Number of poultry per person.

For measuring the relative score of various attributes of urbanization in Dehradun district. Standard score technique has been applied (Z-Score).

Where

$$Z_i = \frac{X_i - \bar{X}}{S.D.}$$

Z<sub>i</sub>= Standard score for the i<sup>th</sup> observation  
 X<sub>i</sub>= Original value of the observation  
 X= Mean for all the values of X  
 S.D=Standard Deviation of X

Further, the results of the standard score obtained for different indicators were aggregated in

order to find out the composite index or composite standard score (CSS) so that the regional differences in the levels of development of various blocks may be obtained on a uniform scale.

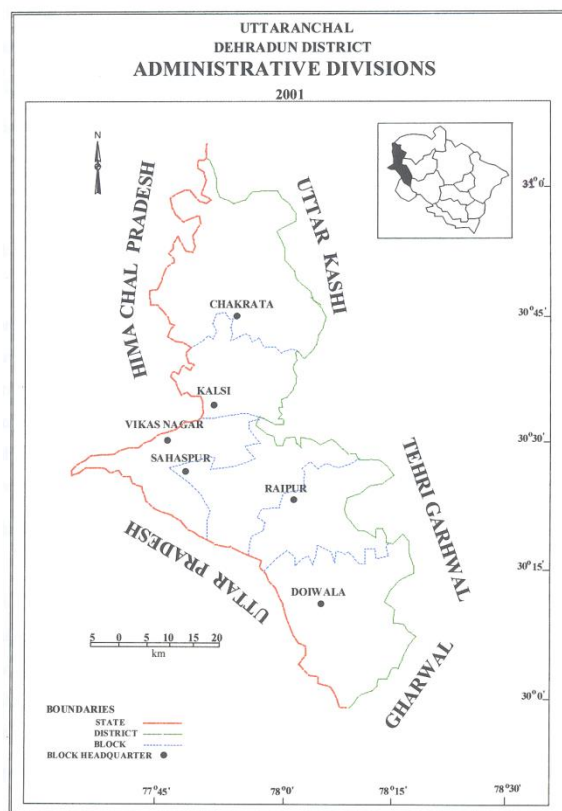
All the data have been arranged in descending order of composite standard score. The positive values relating to the blocks score show high level of livestock husbandry and negative value the low level of livestock husbandry.

In order to classify the blocks according to the magnitude of development, the composite scores are divided into three classes viz; high, medium and low.

### Study Area

Dehradun district is situated in the foothills of Himalayas and is facing severe environmental degradation due to various reasons, namely, improper land use patterns, deforestation activities, uncontrolled

urban sprawl, industrial and mining activities and population growth. The district lies between 29°58'00" N and 31°02'30" N latitudes and 77°34'05" E and 78°18'13" E longitudes (Fig.1), covering an area of 3088 SqKm. The total population, as per 2011 census, is 1.7 million the second highest in Uttarakhand after Haridwar. Out of the total population 55.90 per cent lives in urban regions of the district while 44.10 per cent lives in the rural areas. The district is divided into six community development blocks consisting of 764 villages. These blocks are Chakrata, Kalsi, Vikasnagar, Sahaspur, Raipur and Doiwala having 153, 204, 61, 120, 129 and 76 villages respectively. The decadal growth rate has jumped up from 25 per cent (1991-2001) to 32.48 per cent (2001-2011). The district has a gender ratio of 902 as against a state average of 963. The population density is 550 while the state's average is 189. The literacy rate is the highest in the state at 85.24 per cent (90.32 for males and 79.61 for females).



Source : Regional Office, Census of India, Dehradun District, Uttarakhand

**Fig-1: Map of Dehradun district**

## RESULTS AND DISCUSSIONS

### Pattern of Livestock Husbandry

The livestock form the farm force in Dehradun district. Almost all agricultural operations starting from the ploughing of land to the carting are performed by the livestock. It is a keystone in the farming and an integral part of the agricultural economy [10]. The

study reveals that Dehradun district has a large livestock population. The total number of livestock in the district as accounted during 2010 was 443182 heads. The block-wise variation in livestock population is shown in (Table 2). The largest share of livestock in the district was seen in Chakrata block (33.14 per cent) followed by Kalsi (21.27 per cent) and Vikas Nagar

blocks (13.79 per cent). The lowest share in livestock was seen in Raipur block (9.08 per cent). The total

livestock in Dehradun district comprise mainly four species. Their composition is quiet variable.

**Table-2: Block Wise Distribution of Total Livestock in Dehradun District (2010)**

S.No.	Development Blocks	Total Livestock	
		Number	Percent
1	Chakrata	146864	33.14
2	Kalsi	94251	21.27
3	Vikas Nagar	61136	13.79
4	Sahaspur	49328	11.13
5	Raipur	40251	9.08
6	Doiwala	51352	11.59
<b>Total</b>		443182	100.00

Source: Statistical Bulletin of Dehradun District 2010 [11].

**Table-3: Number of Various Categories of Livestock Species in Dehradun District (2010)**

S.No.	Development Blocks	Number of Livestock Species (2010)				
		Buffalo	Cattle	Sheep	Goat	Total
1	Chakrata	40621 (23.88)	40476 (29.13)	12870 (59.91)	52897 (46.96)	146864 (33.14)
2	Kalsi	25434 (14.95)	24118 (17.36)	5971 (27.79)	38728 (34.38)	94251 (21.27)
3	Vikas Nagar	27955 (16.43)	22255 (16.02)	555 (2.58)	10371 (9.21)	61136 (13.79)
4	Sahaspur	26311 (15.47)	18156 (13.07)	893 (4.16)	3968 (3.52)	49328 (11.13)
5	Raipur	20011 (11.76)	15572 (11.21)	625 (2.91)	4043 (3.59)	40251 (9.08)
6	Doiwala	29767 (17.49)	18371 (13.22)	568 (2.64)	2646 (2.35)	51352 (11.59)
<b>Total</b>		170099 (100.00)	138948 (100.00)	21482 (100.00)	112653 (100.00)	443182 (100.00)

Source: Statistical Bulletin of Dehradun District. 2010 [11].

Note: Figure in Brackets Show Percentages

The total livestock in Dehradun district comprise Buffalo (38.38 per cent), Cattle (31.35 per cent), Sheep (4.85 per cent) and Goat (25.42 per cent). The block-wise variation in the species-wise composition of livestock is shown in table 3. It reveals that maximum share of buffalo is seen in Chakrata block (23.88 per cent) followed by Doiwala (17.49 per cent) and Vikas Nagar (16.43 per cent) blocks. The largest share of Cattle was found in Chakrata block (29.13 per cent) followed by Kalsi (17.36 per cent) and Vikas Nagar (16.02 per cent) blocks. Similarly the largest share of sheep was seen in Chakrat block (59.91 per cent) followed by Kalsi (27.79 per cent) block. Following the same trend the largest share of goats was found in Chakrata block (46.96 per cent) followed by Kalsi block (34.38 per cent). The sheep rearing is meant

for producing wool. This is a source of livelihood in a large number of the shepherds in the region.

#### **Growth of Livestock Husbandry**

The study revealed that there were 3, 32,766 heads of livestock in Dehradun district during 2001. There is an overall growth of 33.18 per cent in the livestock number Dehradun district. The total number of livestock recorded during 2010 was 4, 43182 heads. The livestock population is not uniform in all the blocks of the district but it varied between 40,251 heads in Raipur block to 1, 46,864 heads in the Chakrata block during 2010. Other blocks also showed a good number of increases in livestock population. The block-wise change in total livestock during last decade is shown in Table 4.

**Table-4: Block-wise Change in Number of Livestock in Dehradun District (2001 to 2010)**

Development Blocks	Total Livestock		Decadal Change	
	2001	2010	Number	Percentage
Chakrata	101701	146864	45163	44.41
Kalsi	75825	94251	18426	24.30
Vikas Nagar	47610	61136	13526	28.41
Sahaspur	29352	49328	19976	68.06
Raipur	35411	40251	4840	13.67
Doiwala	42867	51352	8485	19.79
<b>Total</b>	<b>3,32,766</b>	<b>4,43,182</b>	<b>1,10,416</b>	<b>33.18</b>

Source: Statistical Bulletin of Dehradun District 2001 and 2010 [11-12].

**Table-5: Growth of Livestock Species in Dehradun District (2001 to 2010)**

Livestock Species	Number of Livestock Species		Difference	Growth (%)
	2001	2010		
Cattle	111347	138948	27601	24.79
Buffalo	122874	170099	47225	38.43
Sheep	12605	21482	8877	70.42
Goat	85940	112653	26713	31.08
<b>Total</b>	<b>332766</b>	<b>443182</b>	<b>110416</b>	<b>33.18</b>

Source: Statistical Bulletin of Year 2001 and 2010, Dehradun District[11-12].

Although all the blocks recorded a positive change but the maximum change was observed in Sahaspur blocks (68.06 per cent) followed by Chakrata (44.41 per cent), Vikas Nagar (28.41 per cent) and Kalsi (24.30 per cent) blocks. The block-wise variation in the number of livestock is shown in Table 4.

The change in growth of livestock species during the last decade was found to quiet variable. Table 5 shows changes in number and growth of different livestock species in Dehradun district during the period 2001 and 2010. The growth of livestock during the last decade is recorded to be 33.18 per cent. It is attributed to the high growth of Sheep (70.42 per cent) and sharp increase in all the other three categories of livestock species in the study area. The Buffalo, Goat and Cattle recorded 38.43, 31.08 and 24.79 per cent during the last decade.

#### Spatial Pattern of Livestock Development (1981)

##### (i) High level of Livestock Development (above +0.35)

This category consists of one block viz. Chakrata (0.67) as shown in Table 7. This block is located in the northern part of the district (fig. 2). Chakrata block record high level of livestock due to a variety of reasons like the number of livestock per hectare of total area and number of livestock per person is more as well

as number of cattles per hectare of cultivated area and per person is also prominent but the position of poultry is not strong in this region.

##### (ii) Medium Level of Livestock Development (+0.35 to -0.35)

Four blocks come under this medium category, namely, Kalsi (0.31), Vikas Nagar (-0.19), Sahaspur (0.08) and Doiwala (0.04). Kalsi is located in the north of the district; Vikas Nagar is situated in the western part while Sahaspur covers the central part and Doiwala lie in the southern part of the district. In Kalsi block, number of livestock per hectare of total area, number of livestock per person, number of cattles per hectare of cultivated area and number of cattles per person are strong while the poultry per hectare of total area as well as number of poultry per person is weak. While Vikas nagar block shows positive z-score in term of number of poultry per hectare of total area and number of poultry per person. Table 7.

##### (iii) Low Level of Livestock Development (below - 0.35)

This low category comprises of one block i.e. Raipur (-1.41). Raipur is situated in the central part of the district. In the blocks most of the variables show negative z-score. So the concentration of livestock in this block is not prominent.

**Table-6: Distribution of livestock in Dehradun District**

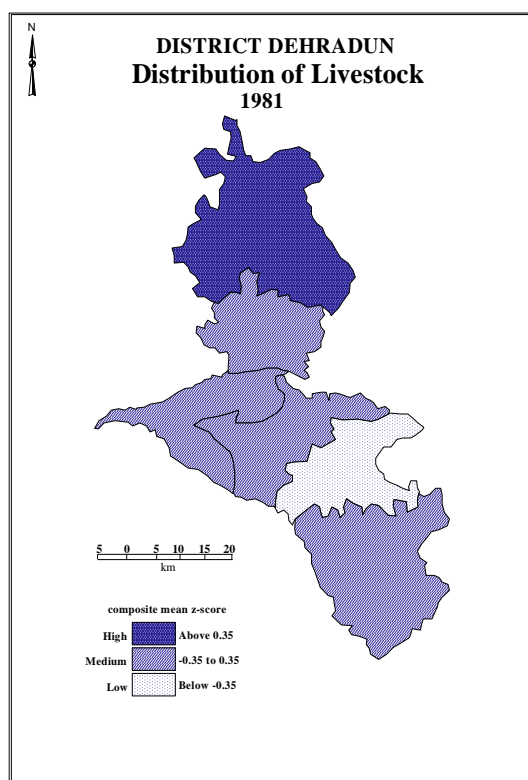
Blocks		Number of livestock per ha. of total area	Number of livestock per person	Number of cattle per ha. of cultivated area	Number of cattle per person	No. of poultry per ha. of total area	No. of poultry per person
Chakrata	1981	2.12	1.91	3.68	0.74	0.15	0.14
	1991	2.11	1.58	3.83	0.61	0.15	0.11
	2001	3.02	1.97	5.72	0.68	0.26	0.17
Kalsi	1981	1.76	1.66	3.06	0.54	0.27	0.25
	1991	1.75	1.37	3.18	0.45	0.26	0.21
	2001	2.21	1.61	4.78	0.51	0.35	0.26
Vikas Nagar	1981	1.01	0.58	2.23	0.28	0.77	0.44
	1991	1.02	0.43	2.40	0.21	0.77	0.32
	2001	1.32	0.45	3.16	0.21	1.03	0.35
Sahaspur	1981	0.81	0.59	2.68	0.29	0.83	0.60
	1991	0.81	0.40	2.63	0.20	0.83	0.42
	2001	0.83	0.37	2.65	0.19	2.89	1.29
Raipur	1981	0.67	0.11	3.04	0.06	0.24	0.04
	1991	0.67	0.09	3.03	0.04	0.24	0.03
	2001	0.96	0.07	2.73	0.04	0.31	0.03
Doiwala	1981	1.46	0.56	3.11	0.25	0.70	0.27
	1991	1.46	0.36	2.81	0.16	0.70	0.17
	2001	1.45	0.27	3.31	0.13	1.34	0.25
District	1981	1.21	0.49	2.93	0.21	0.52	0.21
	1991	1.21	0.36	2.94	0.16	0.52	0.15
	2001	1.46	0.35	3.56	0.15	1.16	0.28

Source: Statistical Abstracts of Dehradun District, 1981, 1991, 2001, Uttaranchal [11-14].

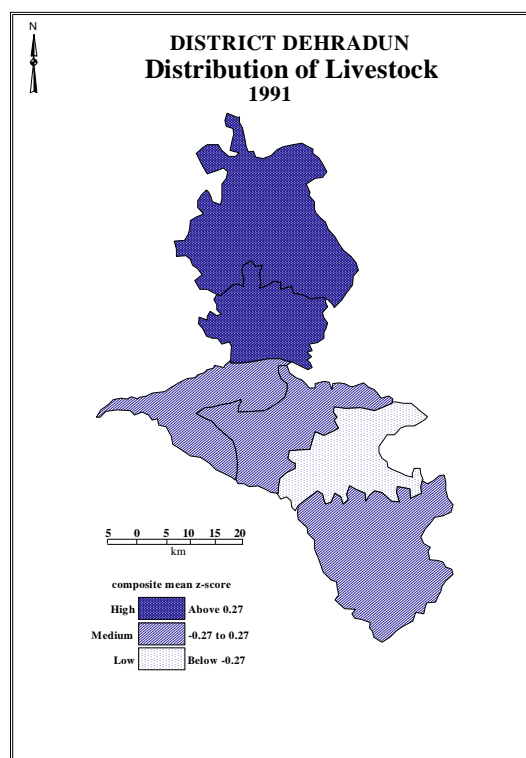
**Table-7: Livestock on the basis of composite mean z-score**

Blocks		Number of livestock per ha. of total area	Number of livestock per person	Number of cattle per ha. of cultivated area	Number of cattle per person	Number of poultry per ha. of total area	Number of poultry per person.	Composite index
Chakrata	1981	1.44	1.42	1.48	1.58	-1.13	-0.75	0.67
	1991	1.45	1.44	1.70	1.57	-1.13	-0.71	0.72
	2001	1.83	1.64	1.77	1.77	-0.84	-0.54	0.94
Kalsi	1981	0.81	1.07	0.19	0.75	-0.73	-0.20	0.31
	1991	0.80	1.09	0.40	0.81	-0.76	0.00	0.39
	2001	0.76	1.14	0.94	1.00	-0.74	-0.32	0.46
Vikas Nagar	1981	-0.51	-0.45	-1.56	-0.33	0.93	0.75	-0.19
	1991	-0.50	-0.44	-1.16	-0.33	0.93	0.78	-0.12
	2001	-0.41	-0.47	-0.49	-0.36	0.00	-0.09	-0.30
Sahaspur	1981	-0.86	-0.44	-0.60	-0.29	1.13	1.55	0.08
	1991	-0.87	-0.49	-0.70	-0.38	1.13	1.50	0.03
	2001	-1.05	-0.58	-0.95	-0.45	2.02	2.19	0.19
Raipur	1981	-1.10	-1.11	0.14	-1.25	-0.83	-4.30	-1.41
	1991	-1.12	-1.00	0.10	-1.14	-0.83	-1.28	-0.88
	2001	-0.88	-1.00	-0.88	-1.13	-0.78	-0.88	-0.92
Doiwala	1981	0.28	-0.48	0.29	-0.46	0.70	-0.10	0.04
	1991	0.28	-0.56	-0.34	-0.57	0.70	-0.28	-0.13
	2001	-0.24	-0.72	-0.36	-0.73	0.34	-0.34	-0.34

Source: Calculated by the author



**Fig-2: Spatial Pattern of Livestock Development (1981)**



**Fig-3: Spatial Pattern of Livestock Development (1991)**

### Spatial Pattern of Livestock Development (1991)

#### (i) High level of Livestock Development (above + 0.27)

This high category consists of two blocks, namely, Chakrata (0.72) and Kalsi (0.39). These blocks cover the upper part of the study area. They record an increase in composite z-score from the scores of 1981. In 1981 only Chakrata block was under the high grade as shown in Table 7.

#### (ii) Medium Level of Livestock Development (+0.27 to -0.27)

In 1991 three blocks, namely, Vikas Nagar (-0.12), Sahaspur (0.03) and Doiwala (-0.13) come under the medium category. Vikas Nagar and Sahaspur are located in the central part of the district while Doiwala block is located in the southern part of the study area.

#### (iii) Low Level of Livestock Development (below - 0.27)

In 1991 only one block come under this low category i. e. Raipur block (-0.88) which is situated in the south central part of the district Fig. 3. This block shows lack of number of livestock, number of cattles as well as in number of poultry. This block is most developed as well as most populated.

### Spatial Pattern of Livestock Development (2001)

#### (i) High level of Livestock Development (above 0.33)

The two blocks, Chakrata (0.94) and Kalsi (0.46) have attained the high grade of livestock development as in 1981 and 1991 Table 7. Table shows that the composite z-score of livestock in these two blocks has increased from 0.67 to 0.94 in Chakrata and 0.31 to 0.46 in Kalsi. Both the blocks are located in the northern part of the district Fig. 4. In these blocks the contribution of livestock and cattles are more.

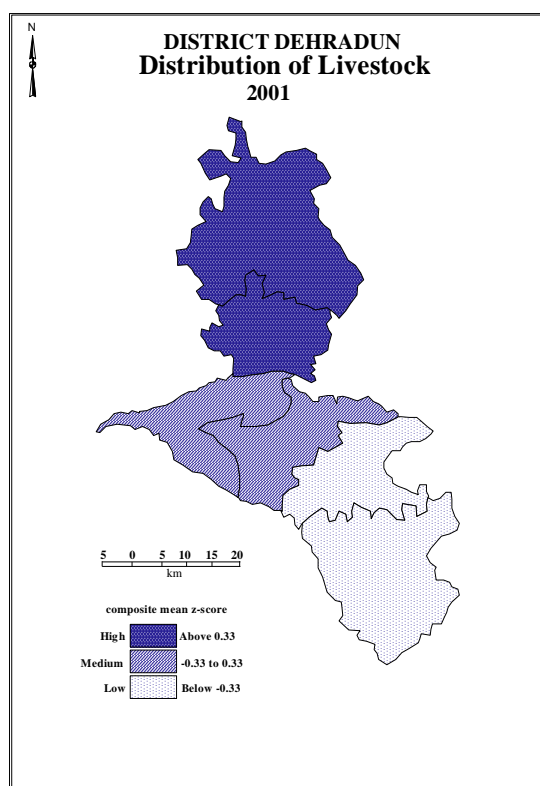
#### (ii) Medium Level of Livestock Development (+0.33 to -0.33)

Two blocks namely Vikas Nagar (-0.30) and Sahaspur (0.19) come under the medium grade. In the last two decade the Vikas Nagar and Sahaspur block always come under the medium grade and these blocks are located in the west and central part of the district. In these blocks number of poultry shows a very strong position while the other variable shows negative z-score.

#### (iii) Low Level of Livestock Development (below - 0.33)

In 2001 two blocks come under this low category, namely, Raipur (-0.92) and Doiwala (-0.34) as shown in Table 7). Raipur and Doiwala are situated in the Southern part of the district Fig. 4. Doiwala was under the medium grade in 1981 as well as in 1991 but in 2001 it came under the low grade. Whereas Raipur

block remained always under the low grade in all the decades of 1981, 1991 and 2001 as shown in figs. 2, 3 and 4.



**Fig-4: Spatial Pattern of Livestock Development (2001)**

## CONCLUSION AND SUGGESTIONS

The level of change in production of various livestock is the reflection of physio-socio-economic development of concerned area. India is one of the leading producers among developing countries and having a good position in livestock number and milk production. In India buffalo having first position in their numbers due to the effect of white revolution. Dehradun district is one of the important districts in livestock population as well as in milk production. The high positive growth has been observe in the study area is due to the increasing demands of buffalo beef at local, national and international level. The Sheep and Goat by comparison is more dominant in Chakrata and Kalsi blocks because the extensive dairy land in Chakrata block and in the adjoining other blocks of the district provide vast expanse of grazing land. As such, goat and sheep are reared with grazing facilities available.

On the other hand Chakrata and Kalsi blocks record high level of livestock development, because these blocks are less populated and have more rural pockets. Vikas Nagar and Sahaspur blocks located in the centre of the district show medium level of livestock development in all the three decades. In the previous decades Doiwala block was under the medium grade

but in the last decade it came under the low grade whereas Raipur block shows low level of livestock development in all the three decades. The present study reveals that the development of livestock has been recorded in the northern part of the district due to the favourable ecological and environmental conditions.

Livestock is one of the major contributors to the degradation of the environment and to soil erosion. There is no doubt that there is an urgent need for a strong policy with appropriate guidelines and sustainable administrative machinery to control and regulate the animal population.

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