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Research article

LIVESTOCK CONCENTRATION AND ASSOCIATION IN HIGHLAND REGIONS: A GEOGRAPHICAL STUDY OF KASHMIR VALLEY

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ABSTRACT: The integration of crops and livestock has always remained a way of life since the beginning of agriculture. It provides the major extra contribution to agriculture through manure as a fertilizer apart from wool, meat, milk and eggs that grant a regular supplementary income and employment not only to producers in the rural areas but also huge size of population engaged in secondary and tertiary sectors of the economy. The Livestock sector has emerged as one of the key components of agriculture in Kashmir Valley in recent years. For a growing human population, the development of livestock sector is indispensable to address the requirement of fat and protein. From a livelihood perspective, livestock is considered as an important instrument in poverty alleviation. The present study has therefore been undertaken to explore the changes in spatial distribution and growth of livestock in Kashmir Valley from 2007 to 2012. An attempt has also been made to study the spatio-temporal changes in the livestock combinations in Kashmir Valley. The study reveals that the population of cattle and sheep has become steadily more important in the livestock economy of the study area during the past decade and show a relatively high growth rate between 2007 and 2012. The goat, yak, buffaloes and equines have recorded relatively low growth rate. The results of livestock combination depicts that more people in Kupwara still practise the traditional system of livestock rearing than in other districts of Kashmir Valley.

Key Words: Livelihood, Livestock Combinations, Spatio-temporal, Equines, Traditional System.

INTRODUCTION

Livestock is socially and economically very significant sector due to its multi-functional outputs and socio-cultural security. Livestock as an economic activity constitute even more important part of agro-ecological and socio-economic system in the mountain areas, where crop production is constrained due to small land holdings, poor soil fertility, inclement weather and short growing season (Kumar, *et al*. 2009). Livestock are the best means to convert local vegetative biomass into useful products and work. Among all geographical factors that help to determine the development of livestock farming, climate plays a very significant role. It is primarily responsible for the formation of botanical environment. The suitability of particular breed of animal with its climate depends on the quality of feed and fodder which is available naturally or which can be grown in that climate quite as much as on physiological adaptations of the breed to the climate. Thus the importance of livestock in fragile ecosystems goes beyond its food production function (Birthal and Negi, 2012). Livestock has long been recognized as an important source of income and employment in the rural areas throughout the developing and under developed part of the world. The increase in the demand and supply of livestock and livestock products rose up exorbitantly at global level because of increasing urbanization, burgeoning population growth as also improved income levels, changing life styles and consumption of high calorie food. Various kinds of livestock species like cattle, buffalo, goat, sheep, hen and pig etc. were reared as domestic and subsistence animals (Khan, 2012). Generally, the economy of Kashmir valley is mainly dependent on agriculture in lower and middle altitudes, and as the elevation increases, it mainly depends on animal (Singh, 2006).The Valley of Kashmir has a precious wealth of livestock in the form of cattle, buffalo, sheep, goats, equines etc. The cattle and sheep are considered the most important tool for the development of rural economy. So livestock plays a vital role for upliftment of livestock farmers in Kashmir Valley. Thus the present study attempted to explore the spatial distribution and combinations of livestock in Kashmir Valley.

STUDY AREA

The Valley of Kashmir extends from (35^0 and 22″ to 34^0 and 43″ north) and (73^0 and 52″ to 75^0 42″ east) covering an area of about 15,440 sq km. The Valley lies between Pir Panjal and main Himalaya (Himadari). The spindle shaped Valley has a basin about 85 miles (140km) long and 25 miles (40kms) wide. (Raza, *et al*., 1978). Average height is about 1850 metres above sea level, but the surrounding mountains which are generally snow clad rise from 3000 to 4000 metres above sea level.

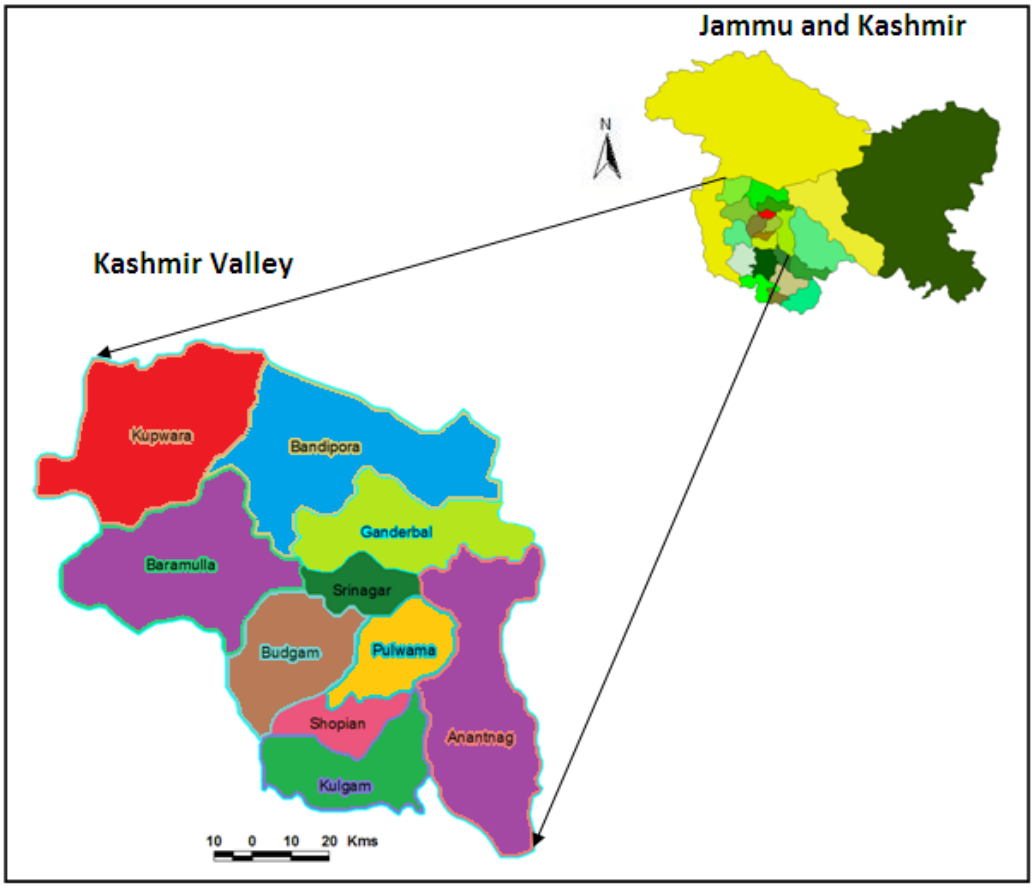


Fig.1: Location of study

OBJECTIVES

The study has been carried out with the following broad objectives:

(a) To study the spatio-temporal change among livestock population in Kashmir Valley.

(b) To identify the livestock combination regions in Kashmir Valley.

METHODOLOGY

The present study is based on the secondary sources of data. The relevant data has been collected from Directorate of Animal Husbandry, Kashmir, Directorate of Sheep husbandry, Lal mandi Srinagar, Integrated Sample Survey and Animal Husbandry Departments of various districts to find out the spatio-temporal dynamics of livestock in Kashmir Valley. The various categories of livestock differ greatly from each other in their body weights, land and food requirements. So, for the regional comparison of the distribution pattern or the pressure of livestock, the absolute number can give a proper picture. Therefore, an attempt has been made in this study to standardize units having the same food requirements. The conversion scale which was used by Jasbir Singh was adopted for converting livestock in to livestock units. Rafiullah's method has been employed for calculating livestock combinations.

Livestock Standard Unit (LSU)

Livestock cannot be ascertained with the help of absolute numbers since these are not standard units: the various types of livestock having the same food requirement are not enumerated in a standard unit.

The various categories of livestock differ greatly in their requirements of feed, fodder, labour and economic returns. It would be vague to equate, say one sheep with one cow or one buffalo. So all the livestock of the districts have been weighted into livestock standard units (LSU) in accordance with the age and live weight (350 Kg). Therefore, an attempt has been made in this study to standardize units having same food requirements.

Table 1: Livestock Unit Equivalents

LIVESTOCK TYPE	LIVESTOCK UNIT
Crossbred cows, crossbred bulls, horses, buffaloes, 2.5 years and above	1.00
Local cows, local bulls, over 3years of age.	0.70
Ponies, mules, above 3 years.	0.60
Young stock of local cattle, horses, ponies, mules ages 1-2.5 years.	0.50
Young stock of crossbred cattle 1- 2.5 years.	0.60
Young stock of local cattle less than 1 year age.	0.30
Rams, ewes and goats over 1 year.	0.14
Sheep and goats less than 1 year.	0.07

Source: Modified after Singh, j., (1974)

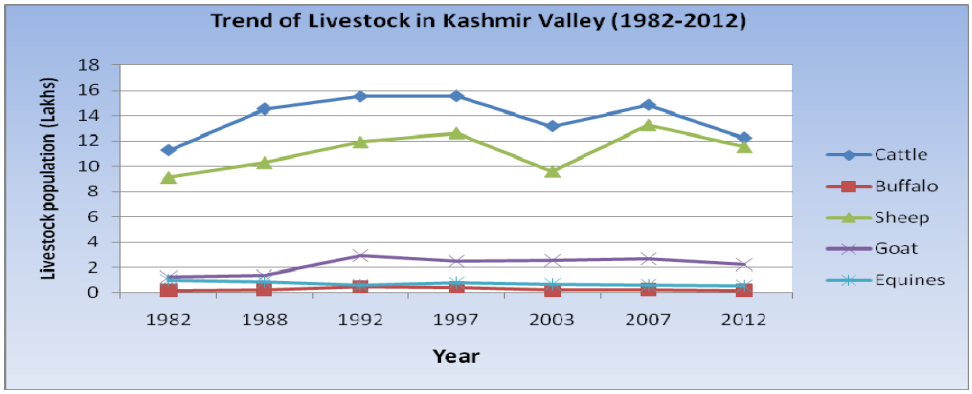
Trends in Growth of Livestock Population

Population of all major species of livestock (cattle, buffalo, Yak, sheep, goat and equines) have been constantly decreasing over the years. However, growth rate is different for various species. Growth rate of cattle and sheep is higher than other species of livestock. Cattle and sheep have mainly been used for milk and meat production and with mechanization gaining movement in 80s and 90s, cattle-population increased at a nominal rate. Introduction of crossbreeding for improved milk and meat production resulted in increased interest in cattle and sheep rearing in the 80s and 90s. In small ruminants, the growth-rate is much higher in sheep than goats. Sheep meat is preferred by customers in Kashmir Valley and is usually sold at a higher price in most parts of the study area. Equine population has shown a decreasing trend over the years. Development, in areas of equine production is resulting in better road access and mechanical transport, thus the utility of equines as means of transport of men and baggage is decreasing. The trend analysis depicts that cattle and sheep always dominated the livestock production systems in the valley of Kashmir. The priority of maintaining a sufficient number of crossbred cattle and sheep populations was mainly because of the rising demand for milk and milk products.

Table 2: Trend of Livestock Population in Kashmir Valley (1982 to 2012) in Lakhs

Species	1982	1988	1992	1997	2003	2007	2012
Cattle	11.23	14.50	15.49	15.52	13.13	14.81	12.19
Buffalo	0.18	0.22	0.45	0.40	0.19	0.24	0.16
Sheep	9.08	10.25	11.90	12.60	9.56	13.25	11.51
Goat	1.25	1.36	2.95	2.47	2.55	2.67	2.25
Equines	0.98	0.85	0.62	0.79	0.68	0.58	0.54
Total	22.72	27.18	31.41	31.78	26.11	31.55	26.65

Source: Directorate of Animal Husbandry Kashmir & Financial Commissioners office (Statistical Wing)



Source: Directorate of Animal Husbandry Kashmir & Financial Commissioners office (Statistical Wing)

Fig. 2

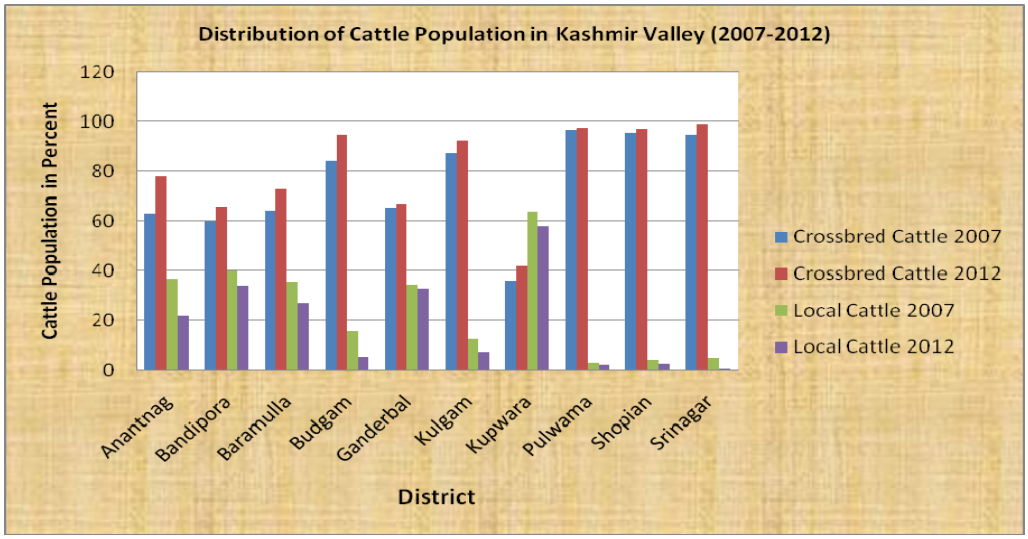
Distribution of Crossbred/ Local Animals:

Cross-breeding of indigenous stock with exotic animals is a well known strategy for improving the productivity of indigenous stock, mainly of cattle, sheep and pigs (Kumar and Singh, 2008). Various centrally and state sponsored cattle development schemes were implemented for the improvement of indigenous breeds in the valley of Kashmir. With an intention to find out the extent of adoption of cross-bred animals, percentage were estimated and are presented in Table 1.3. In the cattle, cross-breds comprised 76.76 percent and local 23.24 percent, as against 69.28 were cross-bred and only 30.72 percent were local in 2007. During this period, the proportion of cross-bred sheep increased 84.56 percent in 2012 and it was 70.74 percent in 2007. The local population of sheep decreased; in 2012 0nly 15.44 percent were local, as against 29.26 percent in 2007. The district wise variation in the adoption of cross-bred technology are glaring. In the Kashmir Valley Srinagar district had the highest population of cross-bred cattle in 2012 followed by Shopian, Pulwama, Budgam and Kulgam, as against this Kupwara had the highest local cattle population followed by Bandipora, Ganderbal, Baramula and Anantnag. In the case of sheep, in the Valley of Kashmir Pulwama district had the highest proportion of cross-bred sheep in 2012 followed by Shopian, Kulgam, Ganderbal and Budgam, as against this Kupwara had the highest proportion of local sheep followed by Baramula, Bandipora, Srinagar and Budgam. A higher proportion of cross-bred cattle and sheep in the Kashmir Valley was not only due to adoption of cross-bred animals but was more due to a significant decline in the population of both indigenous male and female cattle and sheep population. Studies have shown that varying level of adoption of cross-bred technology, higher in some districts and lower in others indicate that livestock sector still had the potential which could be harnessed through a higher adoption of cross-bred animals in places where its adoption was comparatively lower for productivity gains. (Chandel and Malhotra, 2006).

Table 3: **Distribution of Crossbred / Local Cattle and Sheep Population in Kashmir Valley (2007-2012)**

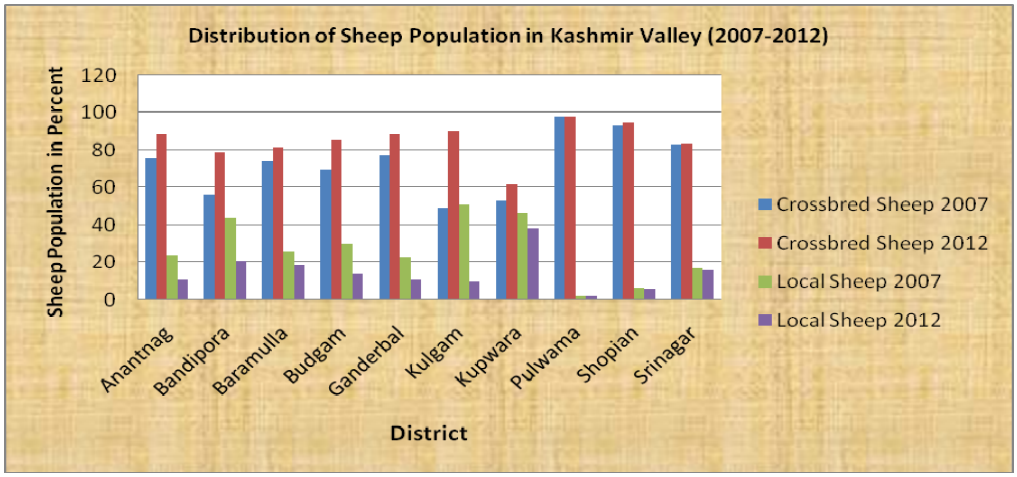
District	Crossbred Cattle		Local Cattle		Crossbred Sheep		Local Sheep	
	2007	2012	**2007**	2012	**2007**	2012	**2007**	2012
Anantnag	**62.96**	77.95	**37.04**	22.05	**75.80**	88.93	**24.20**	11.07
Bandipora	**59.84**	65.76	**40.16**	34.24	**56.19**	78.96	**43.81**	21.04
Baramulla	**64.38**	72.85	**35.62**	27.15	**74.50**	81.40	**25.50**	18.60
Budgam	**84.29**	94.98	**15.70**	5.42	**69.71**	85.66	**30.29**	14.34
Ganderbal	**65.59**	66.88	**34.41**	33.12	**77.12**	88.86	**22.88**	11.14
Kulgam	**87.27**	92.59	**12.73**	7.41	**49.24**	90.31	**50.76**	9.69
Kupwara	**36.04**	41.85	**63.96**	58.15	**53.28**	61.86	**46.72**	38.14
Pulwama	**96.99**	97.77	**3.01**	2.23	**97.99**	97.84	**2.01**	2.16
Shopian	**95.85**	97.18	**4.15**	2.82	**93.33**	94.91	**6.67**	5.79
Srinagar	**94.92**	99.26	**5.08**	0.74	**83.03**	83.82	**16.97**	16.68
Kashmir valley	**69.28**	76.76	**30.72**	23.24	**70.74**	84.56	**29.26**	15.44

Source: Livestock Census of India 2007 & 2012



Source: Livestock Census of India 2007 & 2012

Fig. 3



Source: Livestock Census of India 2007 & 2012

Fig. 4

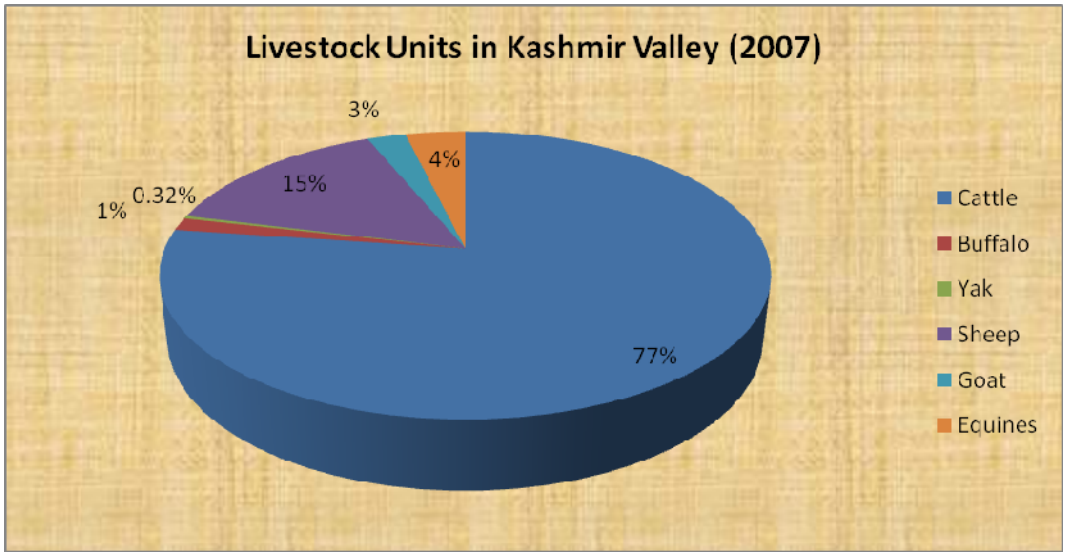
Spatio-Temporal Analysis of Livestock Composition

Cattle, buffaloes, yaks, goats, sheep and equines constitute the livestock composition in the Valley of Kashmir. The composition and distribution of livestock units in Kashmir Valley is given in Table 4. This clearly shows that Kashmir Valley has a large livestock population. The total number of livestock units in the region as calculated during 2007-08 was 12.85 lakh units. In terms of district wise number of livestock units it was highest in Baramula district where it was 2.37 lakh units and lowest in district Shopian where it was 0.57 lakh units. The rearing of various species of animals was very common but their composition and distribution vary from the low lying river Valleys to the highly elevated mountain region. The areas upto 1700 metres above sea level have more animals of high yield varieties (HYV) than to the areas above it. Cattle and sheep are being kept for dairy and meat purposes. Crossbreeding of local cattle and sheep for improved milk and meat production has become popular in Kashmir Valley for the past decade. The milk and meat producing animals is high in low lands than in high land of Kashmir Valley. It is mainly because of the feasible, climatic conditions and easy availability of feed, fodder, market and road accessibility.

Table 4: Livestock units in Kashmir Valley (2007-2012)

Percentage of Livestock Units to total in Kashmir Valley														
Districts	**Cattle**		**Buffalo**		**Yak**		**Sheep**		**Goat**		**Equines**		**Total Livestock Units (Lakhs)**	
	2007	2012	**2007**	2012	**2007**	2012	**2007**	2012	**2007**	2012	**2007**	2012	**2007**	2012
Anantnag	**80.00**	80.52	**2.06**	1.13	**0.09**	0.04	**11.07**	13.47	**1.30**	0.82	**5.48**	4.02	**1.72**	1.82
Bandipora	**70.73**	70.76	**1.02**	1.28	**3.48**	2.08	**16.35**	17.73	**3.52**	4.05	**4.9**	4.1	**1.12**	1.19
Baramula	**64.09**	62.48	**2.05**	1.96	**0**	0	**27.48**	30.16	**2.87**	2.95	**3.51**	2.45	**2.37**	2.57
Budgam	**82.62**	74.84	**0.65**	0.26	**0**	0	**10.50**	19.16	**3.07**	3.37	**3.16**	2.37	**1.63**	1.96
Ganderbal	**73.43**	68.21	**1.47**	0.49	**0.19**	0.44	**15.92**	17.58	**3.17**	3.11	**5.82**	10.17	**0.74**	0.86
Kulgam	**82.16**	73.55	**1.40**	2.07	**0**	0	**13.36**	20.69	**1.40**	1.26	**1.68**	2.43	**1.01**	1.21
Kupwara	**82.41**	82.28	**1.39**	1.75	**0**	0	**9.06**	11.21	**3.17**	1.57	**3.97**	3.19	**1.94**	2.11
Pulwama	**82.63**	82.51	**1.14**	0.85	**0**	0.05	**11.50**	12.35	**1.95**	1.05	**2.78**	3.19	**1.12**	1.18
Shopian	**75.85**	73.22	**1.69**	2.96	**0**	0	**16.87**	18.24	**0.59**	0.31	**5.00**	5.27	**0.57**	0.65
Srinagar	**88.31**	86.57	**0.10**	0.03	**0**	0	**9.10**	10.87	**1.41**	1.12	**1.08**	1.41	**0.57**	0.70
Kashmir Valley	**77.18**	74.73	**1.42**	1.31	**0.32**	0.21	**14.86**	18.13	**2.43**	2.12	**3.79**	3.5	**12.85**	14.28

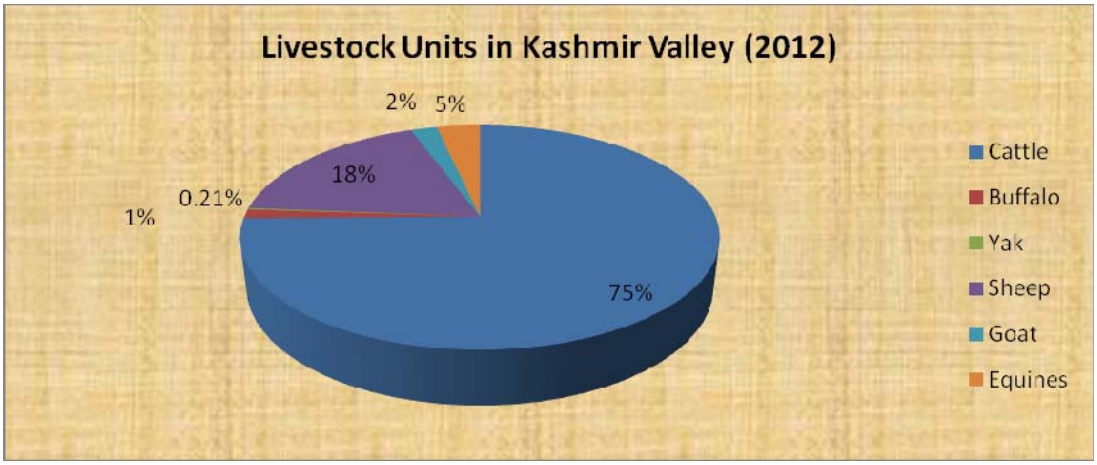
Source: Livestock Census of India 2007 & 2012



Source: Livestock Census of India (2007)

Fig. 5

The Table 1.4 also reveals that the number of livestock units in the region have increased from 12. 85 lakh units in 2007 to 14. 28 lakh livestock units in 2012. In terms of district wise number of livestock units it was highest in Baramulla district where it was 2.57 lakh units and lowest in Shopian district where it was 0.65 lakh units.



Source: Livestock Census of India, (2012)

Fig. 6

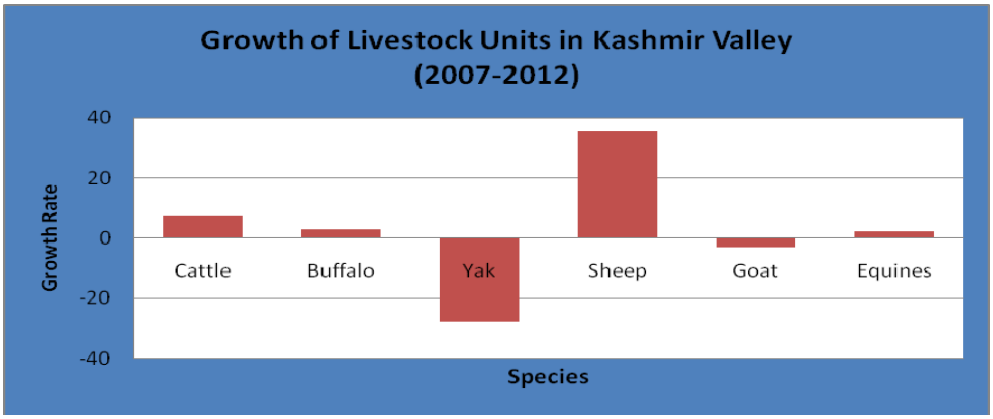
Current Growth of Livestock Species:

A careful examination of Table 1.5 indicates that cattle, sheep, buffalo and equines are the species in Kashmir valley which have shown positive growth during the period from 2007 and 2012, while as goat and yaks have shown a negative growth. The highest growth was found among sheep which was 35.64 percent and 7.58 percent in cattle. In terms of district wise growth of cattle in Kashmir valley it was highest in Shopian which was 55.69 percent and lowest in Pulwama district 5.10 percent. The highest growth of sheep was recorded in Budgam district at 119.14 percent and lowest in Pulwama district 12.92 percent. The total growth of buffalo during the last five years is +2.66 percent. The highest growth of buffalo was found in Shopian district which was 98.03 percent and lowest in Ganderbal -62.05 percent respectively. The total growth of yaks during the period of five years between 2007 and 2012 was -28.17 percent. The highest growth of yak was found in Ganderbal district which is 178 percent. The district which recorded the lowest growth of yak population was Anantnag -55 percent. The total growth of equines in Kashmir Valley during the last five years was 2.17 percent. In terms of district wise growth in Kashmir valley, the highest growth of equines was found in Ganderbal district 102.32 percent. The district which recorded the lowest growth of equines was Anantnag -2.37 percent.

Table 5: Growth of Livestock units in Kashmir Valley (2007-2012)

Districts	Growth of Livestock Units in Kashmir Valley (2007-2012)					
	Cattle	Buffalo	Yak	Sheep	Goat	Equines
Anantnag	5.98	-42.36	-55	28.66	-31.66	-22.37
Bandipora	6.13	32.57	-35.93	15.11	22.20	-11.19
Baramullah	5.45	2.78	0	18.77	11.09	24.54
Budgam	8.86	-52.74	0	119.14	32.25	-0.10
Ganderbal	7.39	-62.05	178	27.64	13.46	102.32
Kulgam	6.89	75	0	84.85	7.07	0.72
Kupwara	8.28	37.03	0	34.32	-45.91	12.79
Pulwama	5.10	-20.86	0	12.92	-43.47	21.08
Shopian	55.59	98.03	0	22.73	-40.35	19.61
Srinagar	19.05	-55	0	45.03	-2.70	55.32
Kashmir Valley	7.58	2.66	-28.17	35.64	-3.02	2.17

Source: Livestock Census of India 2007 & 2012



Source: Livestock Census of India, 2007 & 2012

Fig. 7

Livestock Combination Analysis

Owing to temperamental predilections, farmers of this region extend patronage to various kinds of livestock for various enterprises. It is customary to have many types rather than a single one, as exhibited by the previous figures. Thus it is obvious that concentration on a single class of livestock is not common. So to prevail upon the peasantry of the significance of maintaining livestock categories in concentrations, the livestock combinations need to the elicited. In this direction it shows the ways in which different types of livestock are raised in combination with the various enumeration units. The delineation and identification of livestock regions is of paramount importance for suggesting an appropriate strategy of livestock development that is ecologically viable, economically beneficial and socially applicable. In the present study livestock combination regions have been identified by using Rafiullah's method of combination analysis. A systematic account of all these categories has been given as under. The Table 1.6 shows diverse livestock combinations in various districts of Kashmir Valley from 2007 to 2012 livestock censuses. The combination analysis has revealed six combination categories in 2007 and only three in 2012.

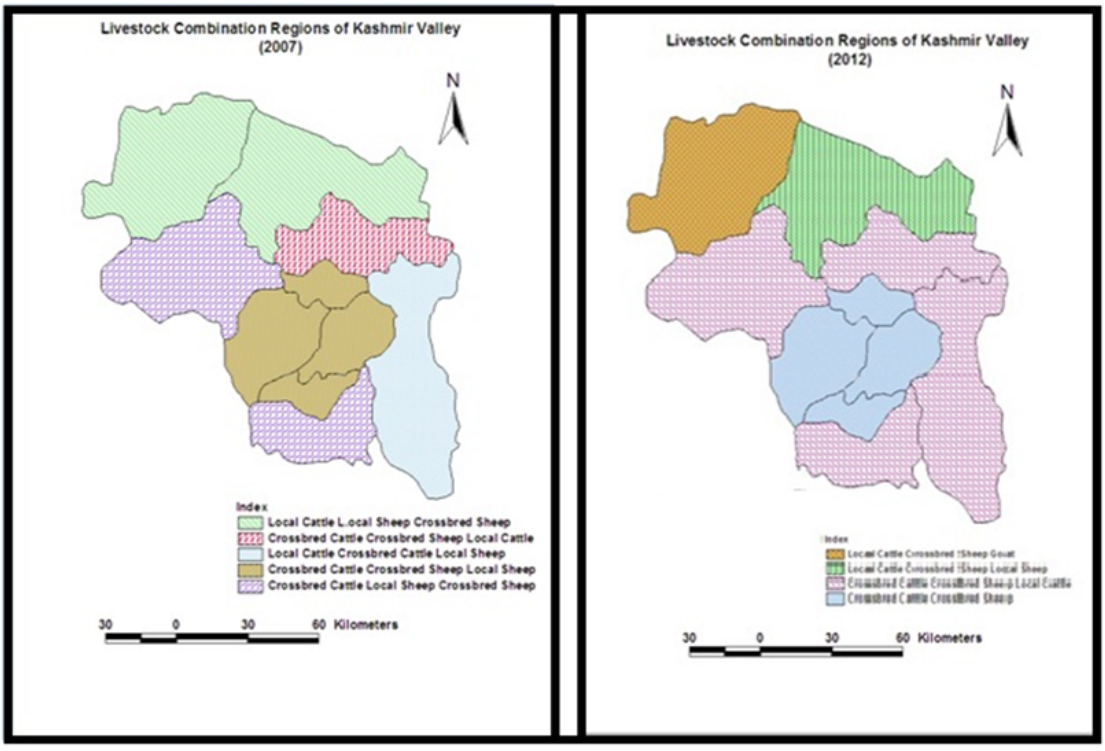
The analysis of Table: 6 reveals that local cattle dominate only in Kupwara district of Kashmir Valley. The results show that livestock combinations are directly related to physical-socio-economic environment and changes in the technological development of Kashmir Valley. In 2007 there were five livestock combinations but due to technological advancement changes occurred in livestock combinations in Kashmir Valley, thrust is going on to increase in production per animal and a reduction in animal numbers. The livestock combination changed from local breed to cross-bred in majority of the districts particularly in Srinagar, Pulwama, Budgam, Ganderbal and Shopian districts. However, no change was found in livestock combination in Kupwara district. The socio-economic conditions of the farmers are not favourable for modernization of livestock sector as most of the people living in this district are Gujjars who are very much conservative in their approach to modernize the composition of their livestock.

Table 6: Livestock Combinations in Kashmir Valley from 2007-2012

District	Livestock Combination	
	2007	2012
Anantnag	**Local cattle, C.B. cattle, Local sheep**	C.B. cattle, C.B .sheep, Local cattle
Bandipora	**C.B. cattle, local sheep , C.B. Sheep**	C.B. cattle, C.B. sheep, Local cattle
Baramulla	**C.B. cattle, local sheep, C.B. Sheep**	C.B. cattle, C.B. sheep, local cattle
Budgam	**C.B. Cattle, C.B. Sheep, Local Sheep**	C.B. cattle, C.B. sheep
Ganderbal	**C.B. Cattle, C.B. Sheep, Local Cattle**	C.B. cattle, C.B. sheep , Local cattle
Kulgam	**C.B. Cattle, Local Sheep, C.B. Sheep**	C.B. cattle, C.B. sheep, Local Cattle
Kupwara	**Local Cattle, local sheep, C.B. Sheep**	Local cattle, C.B. sheep, goat
Pulwama	**C.B. Cattle, C.B. Sheep, Local Sheep**	C.B. cattle, C.B. sheep
Shopian	**C.B. cattle, C.B. sheep, Local Sheep**	C.B. cattle, C.B. sheep
Srinagar	**C.B. Cattle, C.B. Sheep, Local Sheep**	C.B. cattle, C.B. sheep

Source: Livestock Census of India 2007 & 2012

Livestock Combination Regions of Kashmir Valley



Source: Livestock Census of India- 2007 and 2012

Fig. 8

CONCLUSION

The study reveals that cattle and sheep constitutes about 93 per cent of the total livestock units of the Kashmir valley. Due to the robust launching of livestock hybridization programme in Kashmir valley the number of livestock is fastly being replaced by the crossbreeding animals. The livestock composition has changed in favour of milch and meat animals and the percentage of cross-bred/improved animals has been increasing, though wide district level diversities have been observed in the adoption of cross-bred/improved cattle. The results depict that in small ruminants, the growth rate is much higher in sheep than goats, which are mainly found in high altitude zones of Kashmir Valley reared by Gujars and Bakerwals. The equine population has shown a decreasing trend mainly because of the better road access and mechanical transport, the utility of equines as a means of transport of men and baggage is decreasing day by day and they are mainly used by tourists in areas like Sonamag, Gulmarg, and Pahalgam etc. for recreational purpose and also army during harsh winter conditions as a means of transport. The livestock combinations revealed that no one part of the region is dominated by a particular type of livestock to exclude all others instead a mixed character is more or less visible in all over the Kashmir Valley. The results of livestock combination depicts that people in Kupwara district still practice the traditional system of livestock rearing who are very much conservative in their approach to modernize the composition of their livestock than in other districts of Kashmir Valley where people opt crossbreeding of local cattle and sheep with exotic semen for improved milk and meat production.

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