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Impact of Crossbreeding Technology on Milk Producing Efficiency of Dairy Animals in Different Agro-ecological zones of Kashmir Himalayas

Rafiq Hussain Andrabi[*] Harmeet Singh[**] Tariq Ahmad Lone[***]

Department of Geography and Regional Development

University of Kashmir-190006

ABSTRACT

The study was conducted to assess the existing milk producing efficiency of indigenous and crossbred cows like Holstein Friesians and Jersey cows in terms of milk yield, age at first calving, post partum heat, lactation length, dry period, calving interval and lactation yield across different agro-ecological zones (AEZs) of Kashmir valley, as these aspects have a profound influence on the efficiency of milk production. For this study, a total of 250 dairy cows were selected randomly from five different agro-ecological zones of Kashmir valley i.e., Zone I, Zone II, Zone III, Zone IV and Zone V. Significant difference was found within the milk yield ($p<0.01$), age at first calving ($p<0.01$), post partum heat ($p<0.01$), lactation length ($p<0.01$), dry period ($p<0.01$), calving interval ($p<0.01$) and lactation yield ($p<0.01$). It was observed that productive and reproductive efficiency of crossbred species mainly Jersey and Holstein Friesian remains at the top followed by local/ Indigenous species. The study concludes that the crossbred cows are the best performers than the indigenous cows in dairy potentialities in the study area. It also reflects that due to the robust launching of livestock hybridization programme in the study area, the number of livestock is rapidly being replaced by the crossbreeding animals in order to meet the growing milk demand of the burgeoning human population.

Keywords: Agro-Ecological Zones• Crossbreeding Dry Period Efficiency • Indigenous• Lactation •

I INTRODUCTION

The reproductive performance of the herd or animal is a key indicator of sustainability of a dairy farming system. However, assessment of productive and reproductive performance depends on composite parameters to assess overall performance evaluation [1] The important parameters that determine cattle reproductive and productive efficiency are age at first service, age at first calving, birth weight, total milk yield, average milk yield per day, calving to first service interval and calving interval [2]. They also reported that these parameters are important in terms of economics of dairy management. Similarly, [3] reported that the most important

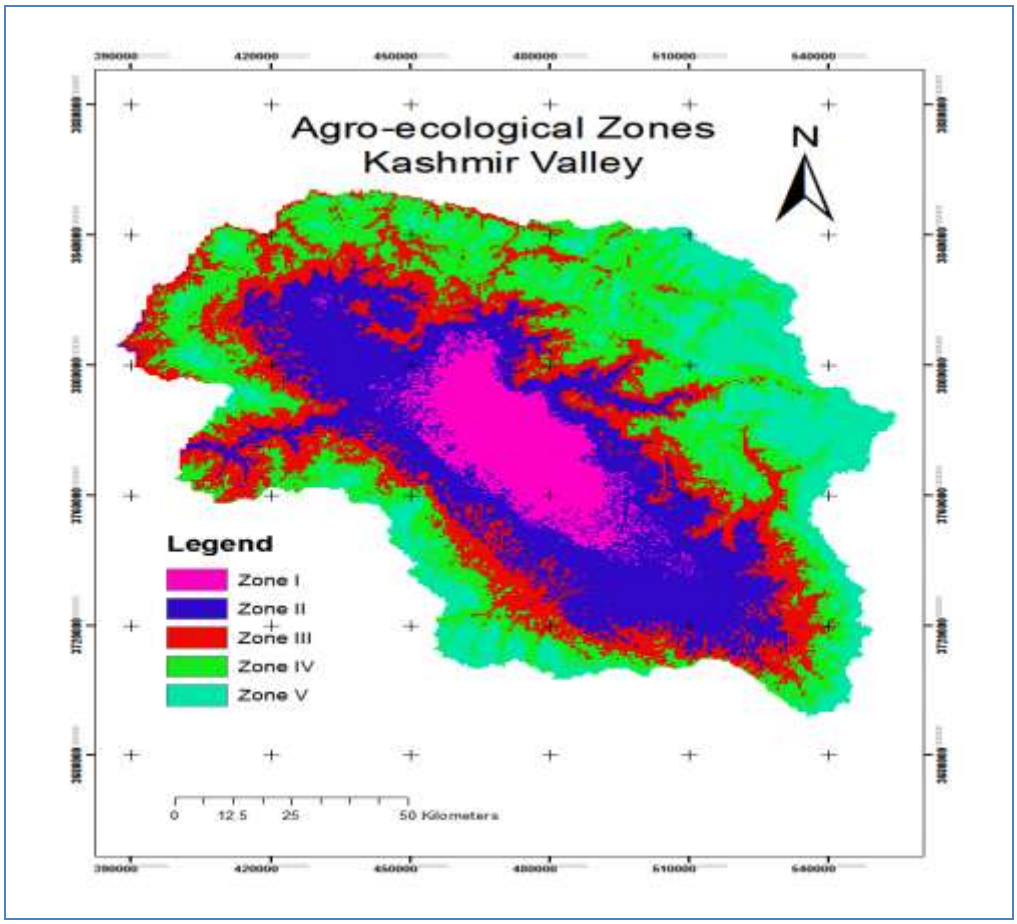
[*] Research Scholar Ph. D Department of Geography, University of Kashmir
[**] Senior Assistant Professor, Department of Geography, University of Kashmir
[****] Research Scholar Ph.D Department of Geography, University of Kashmir

parameters to measure the farm income are calving interval, age at puberty, service per conception, and gestation length and birth weight of fetus and among which calving interval is considered as probably the best index of a cattle herd's to measure reproductive efficiency. Like other developing countries, India is also practicing improvement of individual cow productivity through crossing the indigenous/ local cattle with breeds like Holstein Friesian and Jersey. However, the performance of the crossbred cattle varies with different agro-ecological conditions. Milk production in our state is also largely affected by a combination of factors namely; genetic make-up in terms of the use of improved breeds selected for milk production, a favorable nutritional environment and improved managerial practices. Consequently, genetic make-up of dairy animals plays a great role in the variation of milk yield and composition. Milk production is therefore a factor of genotype-environment interactions. It is important to balance selection for both production and functional traits. Livestock sector is a very important component of the economy of the State of Jammu and Kashmir. The majority of population (80%) in the state are engaged in agriculture and other allied activities. Almost every rural family maintains livestock in the form of cattle, buffalo, sheep, goat, poultry, pack animals etc., sustaining on the income generated through sale of milk, meat, egg, mutton, wool, poultry birds, skin, hides etc. Cattle, sheep and poultry amongst all the livestock that are considered the most important tool for development of our overwhelmingly agrarian economy. The department of animal husbandry, Kashmir through the application of scientific and technological practices is engaged in development of livestock and poultry industry for increasing the production of major livestock products viz: milk, egg and poultry meat. These major livestock products have shown a steady growth since fifties, when the first five year plan was launched. The contribution of the livestock sector towards the gross domestic product of the state is significant. At present 13% of the gross domestic products of the state is contributed by the animal husbandry sector. The native cattle of the study area have low productivity but disease resistance capacity is higher than that of crossbred species. To develop the performance of native cattle, up gradation is necessary. The profitability of dairying depends upon the sound management and selection of better genotype which determine the level of production either farm or individual level. Most of the cattle population in the study area is crossbred mainly Jersey and Holstein Friesian. They are larger in size and their milk production capacity is much larger than that of indigenous breeds. The average milk production of crossbred cows yield from 2500-3000 liters per lactation of 305 days. The average milk production of local cow is very low and it varies between 500-1000 liters per lactation period of 305 days.

II STUDY AREA

Kashmir valley is an integral part of western Himalayan system. The physical limits of the valley coincide with the drainage basin of Jhelum River. The Valley of Kashmir extends from $32^0 22'$ to $34^0 43'$ N and $73^0 52'$ to $75^0 42'$ E covering an area of around 16,000 sq km. The Valley lies between Pir Panjal on its south and greater Himalayan range to its North. The spindle shaped Valley has a basin about 85 miles (140km) long and 25 miles (40kms) wide. [4](Raza, *et al*., 1978). Average height is about 1850 meters above sea level, but the surrounding mountains which are generally snow clad rise from 3000 to 4000 meters above sea level. The location of Kashmir valley at a high altitude in the north-western Himalayas, enclosed within high mountain ranges gives it a peculiar character with its own climatic peculiarities. The presence of large number of meadows locally called

"margs" makes it suitable to support a large livestock population the study area was mainly divided in to five agro-ecological zones i.e. Zone I, Zone II, Zone III, Zone IV and Zone V. The zone first is having an altitude of about 2000 meters above the sea level, covers an area of about 1495.98 sq.kms, zone II is having an altitude of 2000-3000 meters above the mean sea level occupies an area of about 4372.98 sq.kms. Similarly zone III, having an altitude of 3000-4000 meters above the sea level covers an area of about 3752.89 sq.kms, zone fourth is having an altitude of 4376.87 meters ASL, covers an area of about 4376.87 sq.kms. Similarly the zone V is having an altitude of about 5000 meters above mean sea level covers an area of about 2757.00 sq.kms.



Source: Toposheets, 1971, & Digital Elevation Model (DEM)

Fig. 1

II OBJECTIVES

The present study has been conducted with the following broad objectives:

1. To study the distribution of livestock in different agro-ecological zones of Kashmir valley.
2. To make a comparative study in milk producing efficiency of different breeds of dairy animals in different agro-ecological zones of the study area.

III DATA BASE AND METHODOLOGY

The present study has been carried by conducting both primary as well as secondary source of data. For collecting primary data a structured questionnaire was specifically designed. A total of 250 milch animals from different agro-ecological zones i.e., Zone I, Zone II. Zone III, Zone IV and Zone V were selected. The zonation was done on the basis of altitude, Slope, aspect, temperature, precipitation and grass growing days and soil moisture Table 1.1. Out of which 50 were local dairy cows, 125 were Holstein Friesian, and 75 were Jersey. The animals which had at least two or three lactation periods were chosen for the present study. The data pertaining to indicators of biological efficiency such as age at first calving, lactation period, dry period, calving interval, daily milking average, lactation yield were recorded for all types of animals for comparison. The information on the above mentioned parameters were also collected from Sheri-Kashmir University of Agriculture Science and Technology, Kashmir (SKUAST-K).

IV DISTRIBUTION OF DAIRY ANIMALS IN KASHMIR VALLEY

Many factors influence the distribution of dairy cattle in Kashmir valley such as, the climate, proximity to market and availability of feed and fodder resources. The composition of livestock had changed noticeably during the period. The crossbred cattle dominated the livestock production system and constituted over 95 per cent of livestock population in the study area. The Kashmir valley is cattle dominated, crossbred cattle occupies the major portion and constitutes 53 percent of the total dairy animals in the study area, followed by goat which occupies 27 percent, local cattle occupies 17 percent and buffalo constitutes a meager shear of only 1 percent of the total dairy animals. The dominance of cattle in the livestock production system of the study area could be explained by the fact that cattle feed on the crop by-products and residues, which are related to net sown area, irrigation and rising demand for cow milk. The crossbred population has increased by 21 percent but indigenous population has decreased by 15.7 percent. The animal husbandry in the valley has vast scope for exploitation and quick economic returns. On the other hand, population growth, urbanization and income growth further emphasize the need of improvement of animal husbandry to meet the massive global increase in demand for food of animal origin and animal products. The highest concentration of crossbred cattle are found in Zone I, II, and III. The highest concentration of crossbred milch cows in these regions was mainly due to the fact that majority of the area of these regions lie in the vicinity of urban centers. The farmers get remunerative returns from crossbred cows. The law of distance decay operates in the modernization of livestock in general and crossbred cows in particular as one proceeds away from urban centre. Most of the urban centers of Kashmir valley are located in zone I and II where there is high demand for milk and milk by-products and thus, the farmers are getting remunerative returns from these exotic breeds which has resulted in an increase in their number in those regions of the valley.While as in zone IV and V indigenous milch cattle are the most dominant, as these regions are mostly dominated by the transhumance Gujjars those who are traditional in their attitude and thus are not in favor of modernizing their livestock.

Table 1: Distribution of Dairy animals in different agro-ecological zones of Kashmir Valley

Agro-ecological Zones	Species of Dairy Animals				
	Crossbred cattle	Local cattle	Goat	Buffalo	Total Dairy Animals
I	2,08,854 (64.17)	33,116 (10.17)	82,921 (25.46)	674 (0.20)	3,25,565
II	5,08,186 (62.96)	94,997 (11.77)	1,99,015 (24.65)	4,914 (0.62)	8,07,112
III	2,07,373 (42.40)	1,26,277 (25.83)	1,46,807 (30.01)	8,617 (1.76)	4,89,074
IV	51,859 (27.74)	64,889 (34.72)	66,579 (35.61)	3,623 (1.93)	1,86,950
V	19,504 (24.25)	34,111 (42.38)	25,707 (31.94)	1,155 (1.43)	80,477
Kashmir valley	9,95,776 (52.73)	3,53,390 (18.70)	5,21,029 (27.57)	18,983 (1.00)	18,89,178

Source: Directorate of animal husbandry Kashmir (2016). Figures in braces are in per cent

V **PRODUCTION OF MILK**

Increasing milk production has been the goal of livestock development policy in India, since the beginning of the planning era. India ranks first in milk production, accounting for 18.5 % of world production, achieving an annual output of 146.3 million tons during 2015-16 as compared to 139.69 million tons during 2014-15 recording a growth of 6.26 % (Economic Survey 2015-16). The estimated milk production in Kashmir Valley during 1992 was 330 thousand metric tons and which has increased to 1310.76 thousand metric tons in 2016 showing an increase of 297 per cent, only as a result of the planned efforts of the government to bring White Revolution in the region. Most of the cattle population in the study area is crossbred type. They are larger in size and their milk production capacity is much higher than that of indigenous breed. An analysis of Table 4: reveals that crossbred cows contribute 1126.6 thousand metric tons of milk (85.95 %), local cows 117.49 thousand metric tons (8.96 %), goats 42.63 thousand metric tons (3.25 %) and buffaloes 24.04 thousand metric tons (1.84 %). The higher milk production from crossbred dairy cows is mainly due to their higher efficiency. About 682.74 thousand metric tons of milk is produced annually in the valley of Kashmir, out of which crossbred animals contribute 87 per cent, 10.00 per cent by local cattle, 1.17 per cent by Buffaloes and 1.57 percent by goats. The spatial pattern of milk production among various regions of the study area show that highest milk production is found in zone II , followed by zone III , and zone I. The lowest milk production is found in zone IV and V.

Table 2: Breed wise Distribution of Milk Production in Kashmir Valley (2016)

Agro-ecological Zones	Milk Production (000 mts)					
	Crossbred cattle	Local cattle	Goat	Buffalo	Total	
I	226.41 (96.28)	6.31 (2.68)	2.14 (0.92)	0.29 (0.12)	235.15	
II	503.21 (95.41)	17.59 (3.33)	4.69 (0.88)	1.93 (0.36)	527.4	
III	295.38 (89.04)	25.17 (7.58)	7.45 (2.24)	3.72 (1.14)	331.72	
IV	60.86 (52.17)	35.16 (30.14)	12.97 (11.11)	7.65 (6.58)	116.64	
V	40.74 (40.75)	33.26 (33.31)	15.38 (15.40)	10.45 (10.54)	99.83	
Kashmir valley	1126.6 (85.95)	117.49 (8.96)	42.63 (3.25)	24.04 (1.84)	1310.76	

Source: Directorate of animal husbandry Kashmir, Field study (2016) Figures in braces are in per cent

VI Per capita availability of milk in different agro-ecological zones of Kashmir valley:

The per capita availability of milk is 322 grams/ day or 118 Kg/ year in India, which is much higher than the world average of 107 kg/year. The nutritional advisory committee of Indian Council of Medical Research has recommended a minimum quantity of 250 grams/ day or 91 kg/ year [5] this clearly shows a wide gap between the availability and requirement of milk. In Kashmir Valley the per capita availability of milk is 506 grams/day or 204 kg/year. Thus the per capita availability of milk in Kashmir Valley is above the national average of 118 kgs/year and also above the world average of 107 kg/year. Table 5: represents spatial pattern of daily per capita availability of milk in Kashmir Valley. The per capita availability of milk shows wide variations among the agro-ecological zones of the Valley. The highest per capita availability of milk is recorded in zone II i.e., 712 grams/ day or 260 kg/year. The availability of milk in zone I is found to be 421 grams/ day or 154 kg/year. Similarly in zone III the per capita availability of milk is found to be 536 grams/ day or 196 kg/year. In zone IV the per capita availability is found to be 357 grams/ day or 130 kg/year. The lowest per capita availability is found in zone V i.e., 300 grams per day or 110 kg/year.

Table3: Per capita availability of milk in different agro-ecological zones of Kashmir Valley

Agro-ecological zones	Human Population	Milk Production (000 tonnes)	PCA (gms)
I	18,12,478	235	421
II	20,30,514	527	712
III	16,95,416	332	536
IV	8,95,772	117	357
V	6,48,945	100	300
Kashmir valley	70,83,125	1310	506

Source: Directorate of animal husbandry Kashmir, Field study (2016)

The per capita availability of milk reveals that in Kashmir Valley the agriculturally advanced zones in general are giving much preference to dairy farming and consequently the per capita availability of milk and total milk production is higher in these zones as compared to far flung and backward zones of the Valley which have not favourable environment for dairy development as the winters continue here for a longer period. The farmers of the backward zones do not keep quality milch stock for commercial purpose, but they keep local dairy cows at subsistence level. The main impediment in the development of dairy farming in Kashmir Valley is not the climate vagaries, poor grazing and inadequate marketing alone, but such fundamental one as the poor genetic potentials of the existing stock and the acute shortage of feed and fodders just as important. At present the scarcity of dairy stuffs is the greatest obstacle in the way of improving the productivity of these dairy cows in different zones of Kashmir valley.

VII RESULTS AND DISCUSSION

A comparison of each parameter revealed a considerable difference between various breeds of dairy animals. The milk yield, age at first calving, lactation length, lactation yield, calving interval, dry period and post partum heat are the important features associated with dairy animals that are vital for the economic sustainability of a dairy farm. Reduction in the age at first calving and dry period leads to an increase in lactation yield and productive life of the dairy animals and economy of a dairy farm. The information on the reproductive performance of different species of dairy animals is depicted in the Table 4:

Table 4: Productive traits of Different Species of Diary Animals in different agro-ecological zones of Kashmir Valley

Agro-ecological zones	Specie of Dairy animal	Milk yield (Liters/Day) (Mean ±SD)	Age at first Calving (months) (Mean ±SD)	Post Partum heat (Days) (Mean ±SD)	Lactation Length (Days) (Mean ±SD)	Dry Period (Days) (Mean ±SD)	Calving Interval (Days) (Mean ±SD)	Lactation yield (Liters) (Mean ±SD)
I	Local cow	3.65±0.57	38.90±4.36	165.13±18.27	263.60±36.23	170.56±28.67	638.65±35.84	1098.69±135.90
	Jersey	7.86±2.14	34.58±5.89	120.70±15.72	300.96±49.43	110.86±39.24	558.10±55.61	2155.26±450.22
	Holstein Friesian	9.73±2.59	35.15±2.90	128.05±23.81	305.78±21.91	128.84±33.57	450.89±41.19	3270.42±598.46
	F-Value	45.59*	8.74*	11.01*	47.87*	52.34*	134.95*	54.36*
	Level of Significance	**	**	**	**	**	**	**
II	Local cow	4.00±0.73	41.66±4.38	167.56±18.72	253.47±46.97	179.85±25.95	645.56±36.63	958.82±245.89
	Jersey	6.93±1.63	35.06±6.48	128.00±13.75	270.40±48.35	125.10±30.52	570.43±38.04	1978.90±437.49
	Holstein Friesian	8.47±2.41	36.21±2391	138.05±27.50	295.36±43.33	137.94±25.08	468.05±51.72	3107.05±563.19
	F-Value	41.34*	9.14*	20.30*	51.12*	46.36*	160.86*	55.86*

	Level of Significance	**	**	**	**	**	**	**
III	Local cow	3.51±0.73	46.57±4.45	177.13±10.27	235.95±49.11	185.30±38.27	645.21±51.08	920.69±30.47
	Jersey	5.50±1.59	36.96±7.38	136.76±18.44	265.60±1.04	138.10±39.96	588.93±69.09	1910.20±461.65
	Holstein Friesian	7.57±2.41	38.73±3.21	147.94±27.47	290.84±33.72	145.67±21.97	506.78±54.01	3040.57±578.94
	F-Value	83.39*	23.06*	18.20*	38.40*	39.33*	107.02*	19.78*
	Level of Significance	**	**	**	**	**	**	**
IV	Local cow	3.21±0.73	41.56±4.48	167.56±19.72	243.47±36.97	176.85±25.95	618.56±46.63	910.82±245.89
	Jersey	5.30±31.63	36.06±6.33	121.00±13.85	293.40±48.05	107.10±30.52	520.43±48.04	1890.90±437.49
	Holstein Friesian	7.01±2.41	37.21±2.91	132.05±27.65	313.36±23.33	136.94±25.08	493.05±41.72	2900.05±553.19
	F-Value	51.34*	8.14*	18.30*	41.12*	36.36*	139.96*	45.76*
	Level of Significance	**	**	**	**	**	**	**
V	Local cow	2.69±0.63	44.47±4.45	160.13±20.27	205.95±39.11	190.30±28.27	633.21±51.08	880.69±20.27
	Jersey	4.60±1.22	37.96±6.38	115.76±17.44	288.60±104	116.10±29.96	558.93±89.09	1865.20±451.65
	Holstein Friesian	6.57±2.41	37.73±3.21	143.94±27.47	295.84±43.72	136.57±21.87	526.78±44.01	2738.57±579.94
	F-Value	73.29*	13.06*	10.22*	48.60*	29.33*	101.02*	13.88*
	Level of Significance	**	**	**	**	**	**	**

Source: Field Work, (2016)
** Significant at 1 % level (0.01)

7.1 Milk Yield

The daily milk average has been considered as an important indicator because it is ultimately milk average that gives a fair return to the farmer. The milk production of indigenous cattle is low as compared to improved breeds of cattle. The average milk yield was observed to be 3.65±0.57 for local breed, while as for Jersey and Holstein Friesian it was observed to be 7.86±2.14 and 9.73±2.59 respectively in Zone I. The average milk yield in Zone II was 4.00±0.73 for local breed and 6.93±1.63, 8.47±2.41 for Jersey and Holstein Friesian. Similarly, in Zone III, the average milk yield was observed to be 3.51±0.73 for local breed and 5.50±1.59, 7.57±2.41 for Jersey and Holstein Friesian. The average milk yield was observed to be 3.21±0.73 for local breed, while as for Jersey and Holstein Friesian it was observed to be 5.30±31.63 and 7.01±2.41, respectively in Zone IV and the average milk yield in Zone V was observed to be 2.69±0.63 for local breed and 4.60±1.22, 6.57±2.41 for Jersey and Holstein Friesian.

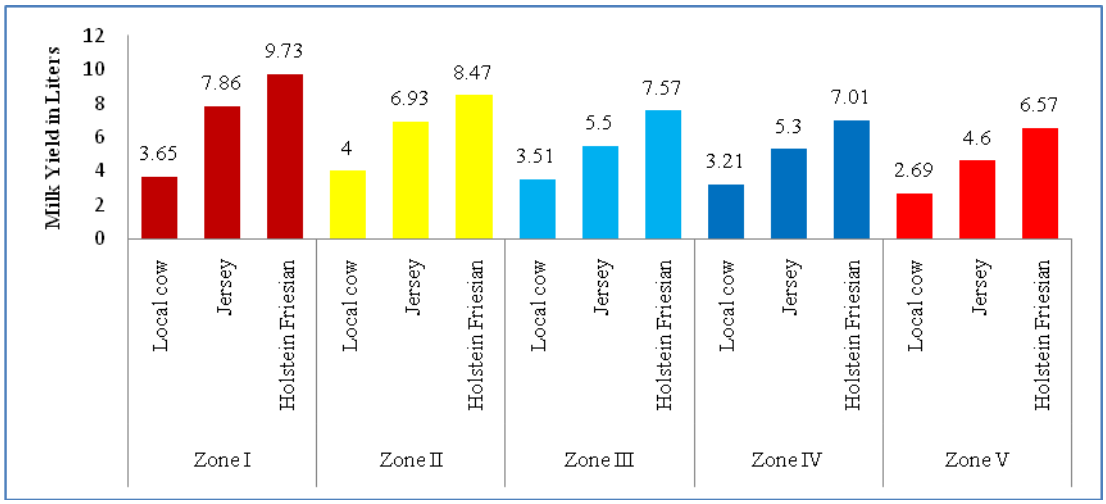
Table 5: Milk Yield

Pair Wise Comparison (The figures are in P values)

Species of animal	Local Cows	Jersey	Holstein Friesian
Local Cows	-	< 0.00	< 0.00
Jersey	< 0.00	-	< 0.00
Holstein Friesian	< 0.00	< 0.00	-

The pair wise comparison reveals that significant difference ($p<0.01$) was found among various breeds of dairy animals. Among the different types of cows highest milk production was recorded in case of Holstein Friesian cows and lowest was recorded in case of indigenous cow.

Milk yield of different species of dairy animal in Kashmir Valley



Source: Field Study, (2016)

Fig. 2

7.2 Age at first calving: Age at first calving was recorded to be 38.90±4.36, 34.58±5.89, 35.15±2.90 for local, jersey and Holstein Friesian respectively in Zone I, while as in Zone II the age at first calving was observed to be41.66±4.38, 35.06±6.48, 36.21±2391 for local, jersey and Holstein Friesian respectively. Similarly in Zone III, the average age at first calving was found to be 46.57±4.45, 36.96±7.38, 38.73±3.21 for local jersey and Holstein Friesian respectively. The average age at first calving in zone IV was observed to be 41.56±4.48, 36.06±6.33, 37.21±2.91 for local, jersey and Holstein Friesian respectively. Similarly the average age at first calving in zone V was observed to be 41.56 ± 4.48, 36.06 ± 6.33, 37.21 ± 2.91 for local, jersey and Holstein Friesian respectively.

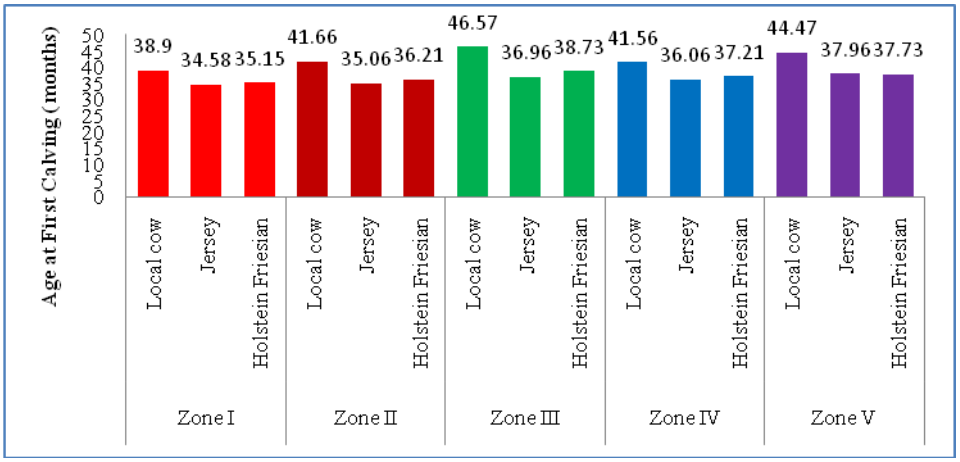
Table 6: Age at first calving

Pair Wise Comparison (The figures are in P values)

Species of animal	Local Cows	Jersey	Holstein Friesian
Local Cows	-	< 0.00	0.003
Jersey	< 0.00	-	0.68
Holstein Friesian	0.003	0.68	-

The age at first calving of different genetic groups of dairy animals differed significantly ($p<0.01$). The highest age at first calving was found among the indigenous cows and lowest age at first calving was found in Jersey followed by Holstein Friesian cows in different agro-ecological zones of Kashmir valley

Age at first calving of different species of dairy animals in Kashmir Valley



Source: Field Study, (2016),

Fig. 3

7.3 Lactation yield: The lactation yield was observed to be 1098.69±135.90 for local breed, while as for Jersey and Holstein Friesian it was observed to be 1098.69±135.90 and 3270.42±598.46 respectively in Zone I. The lactation yield in Zone II was 958.82±245.89 for local breed and 1978.90±437.49, 1978.90±437.49 for Jersey and Holstein Friesian. Similarly in Zone III the average lactation yield was observed to be 920.69±30.47 for local breed and 1910.20±461.65, 3040.57±578.94 for Jersey and Holstein Friesian. The lactation yield was observed to be 910.82±245.89 for local breed, while as for Jersey and Holstein Friesian it was observed to be 1890.90±437.49 and 2900.05±553.19 respectively in Zone IV. Similarly the lactation yield in Zone V was observed to be 880.69±20.27 for local breed and 1865.20±451.65, 2738.57±579.94 for Jersey and Holstein Friesian respectively.

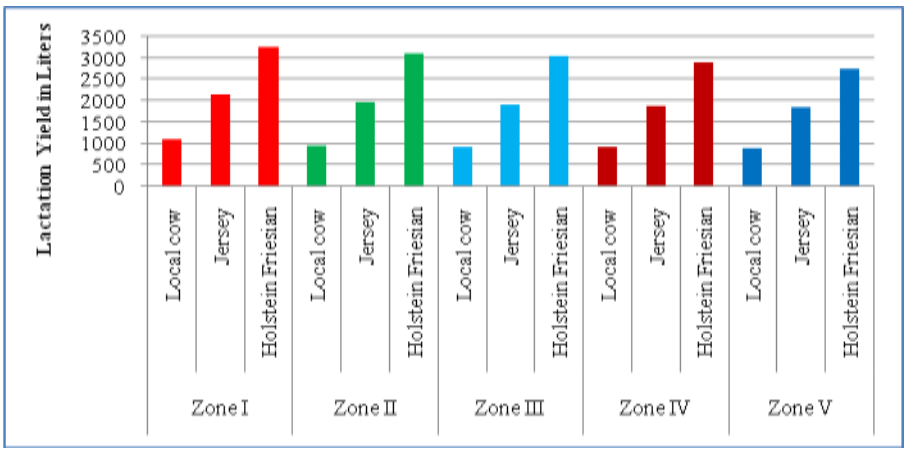
Table 9: Lactation Yield

Table 7. Pair Wise Comparison (The figures are in P values)

Species of animal	Local Cows	Jersey	Holstein Friesian
Local Cows	-	< 0.00	< 0.00
Jersey	< 0.00	-	< 0.00
Holstein Friesian	< 0.00	< 0.00	-

The statistical analysis showed that there was a significant difference among the lactation yield of different types of dairy animals. It was found that the lactation yield of Holstein was maximum and the lowest lactation yield was found in local cows in different agro-ecological zones of the study area.

Lactation yield of different species of dairy animals in Kashmir Valley



Source: Field Study, (2016)

Fig. 4

7.4 Lactation length: The lactation length between different breeds of dairy animals was observed to be 263.60±36.23 300.96±49.43, 305.78±21.91 for local, jersey and Holstein Friesian respectively in Zone I while as in Zone II it was found to be 253.47±46.97, 270.40±48.35 and 295.36±43.33 for local, jersey and Holstein Friesian respectively. Similarly in Zone III, the lactation length was found to be 235.95±49.11, 265.60±1.04, and 290.84±33.72 for local, jersey and Holstein Friesian respectively. The lactation length in Zone IV was observed to be 243.47±36.97, 293.40±48.05, 313.36±23.33 for local, jersey and Holstein Friesian respectively. Similarly in Zone IV the lactation length was found to be 205.95±39.11, 288.60±104, 295.84±43.72 for local, jersey and Holstein Friesian respectively.

Table 8: Lactation Length

Pair Wise Comparison (The figures are in P values)

Species of animal	Local Cows	Jersey	Holstein Friesian
Local Cows	-	0.001	< 0.00
Jersey	0.001	-	0.93
Holstein Friesian	< 0.00	0.93	-

The study reveals that there was statistically significant difference among the different breeds of cattle in lactation length ($p< 0.01$) Table 10.The pair wise comparisons reveals that there was significant difference among Holstein Friesian, Jersey and local cows. The lactation length was higher in Holstein Frisian cows followed by Jersey and the lowest was found in local cows.

7.5 Dry period: The dry period in Zone I was found to be 170.56±28.67 for local while as for jersey and Holstein Friesian it was observed to be 110.86±39.24 and 128.84±33.57 respectively. The dry period in Zone II was found to be 179.85±25.95, 125.10±30.52, 137.94±25.08 for local, jersey and Holstein Friesian respectively. Similarly, in Zone III the average dry period was observed to be 185.30±38.27, 138.10±39.96, 145.67±21.97 for local, jersey and Holstein Friesian respectively. The dry period in Zone IV was found to be 176.85±25.95 for local while as for jersey and Holstein Friesian it was observed to be 107.10±30.52 and 136.94±25.08 respectively. Similarly in Zone V the dry period was observed to be 190.30±28.27, 116.10±29.96 and 136.57±21.87 for local, jersey and Holstein Friesian respectively

Table 9: Dry Period

Pair Wise Comparison (The figures are in P values)

Species of animal	**Local Cows**	**Jersey**	**Holstein Friesian**
Local Cows	-	< 0.00	< 0.00
Jersey	< 0.00	-	0.001
Holstein Friesian	< 0.00	0.001	-

The mean dry period of various species of dairy animals reveals that statistically it differs significantly ($p<0.01$).Statistical analysis reveals that there was significance difference among Holstein Friesian cows, jersey and local cows. It was observed that highest dry period was found among local cows followed by Jersey and lowest dry period was observed in Holstein Friesian.

7.6 Calving interval: The calving interval in Zone I was found to be 638.65±35.84, 558.10±55.61 and 450.89±41.19 for local, jersey and Holstein Friesian respectively. In Zone II, the calving interval was observed to be 645.56±36.63 for local while as for jersey and Holstein Friesian it was found to be 570.43±38.04 and 468.05±51.72 respectively. Similarly in Zone III the average calving interval was observed to be 645.21±51.08. While as for jersey and Holstein Friesian, it was observed to be 588.93±69.09 and 506.78±54.01 respectively. The average calving interval in Zone IV was found to be 618.56±46.63, 520.43±48.04 and 493.05±41.72 for local, jersey and Holstein

Friesian respectively. Similarly in Zone V, the average calving interval was found to be 633.21±51.08 for local while as for jersey and Holstein Friesian it was found to be 558.93±89.09 and 526.78±44.01 respectively.

Table 10: Calving Interval

Pair Wise Comparison (The figures are in P values)

Species of animal	Local Cows	Jersey	Holstein Friesian
Local Cows	-	< 0.00	< 0.00
Jersey	< 0.00	-	0.33
Holstein Friesian	< 0.00	0.33	-

The mean calving interval of various species of dairy animals reveals that statistically it differs significantly ($p<0.01$). Among the different species of dairy animals, the highest calving interval was found in local cows and the lowest in Holstein Friesian followed by Jersey cows.

VIII CONCLUSION

The study reveals that productive and reproductive performance is satisfactory in cross-bred cattle than the indigenous cattle. It depicts that productive efficiency of Holstein Friesian and jersey cows were better than that of indigenous species. Although our native local cows produce little milk than crossbred cows, though native breed was adjusted with our climatic conditions. If we want to improve the productive and reproductive efficiency of different breeds of dairy animals more research is needed. Experiment on productive and reproductive efficiency indicated that the milk production of crossbred cattle is higher than that of local cows. For the improvement of the breed of cows, at first we have to consider the productive and reproductive efficiency of different crossbreds existing in our country and then they have to be adopted with our native climate. Therefore a selection programme is to be implemented by considering the breed characteristics of the cows and that will be our great gain. The study has assessed the livestock profiles and their dynamics across different agro-ecological zones of Kashmir valley. The distribution of livestock has indicated higher concentration of crossbred cattle and sheep in the Valley together constituting over 90% of the total livestock population in the study area. The changing species mix of livestock population over the years in the valley seems to have influenced the speed of intensification.

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