

# Pashmina Goat Farming in Cold Arid Desert of Ladakh: A Geographical Study of Changthang Region

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## Abstract

Mountainous areas are environmentally the most fragile eco-systems. A strategy for resource development in these delicate geo-ecological settings should be region-specific and environment friendly. The mechanization of agriculture suited to the large plains is not advisable in mountainous areas having higher degree of slope, thin soil cover, poor soil moisture and humus content. Under such circumstances crop farming has to be augmented through other area-specific economic activities. The Changthang region of Ladakh is one such ecologically fragile region which is most vulnerable to negative anthropogenic impact. The rearing of Changra goats is an important economic activity of the people popularly known here as Changpa. The Pashmina harnessed from these Changra or Pashmina goats is a very precious kind of wool, which is used as a raw material to manufacture Pashmina shawls, fetching handsome returns in the domestic and international market.

**Keywords:** Pashmina, Changthang, Pastoral, Cold Desert, Nomadic, Dehairing, Livestock, Changpa, Sustainability.

## 1. Introduction

Pashmina, a prince of specialty hair fiber is one of the finest natural fibers. Encyclopedia of textiles (1980) defines specialty hair fibers as the rare animal fibers which possess special qualities of fineness and luster. Pashmina is the down fibers or undercoat derived from domestic Changthang or Pashmina goat

(*Capra hircus*), which is a special breed of goat indigenous to high altitudes of Himalayas in Nepal, Pakistan and Northern India. Pashmina can also be defined as the down (undercoat) fiber derived from Cashmere goats with a diameter of 30 microns or less<sup>1</sup>. Pashmina has derived its name from the Persian word 'Pashm' meaning, soft gold, the king of fibers. It is well known for its fineness, warmth, softness, desirable aesthetic value, elegance and timelessness in fashion. It is most luxurious fiber which is much softer than superfine merino wool of the same diameter with the result it commands much higher price. On equal weigh basis, it is having 3 times more insulating capacity as that of wool.

Pashmina is the under fur of hairy quadrupeds in elevated land, north of Himalayas from the goats producing material for Cashmere shawls. Four types of fibers Mohair, Pashmina, Cashgora, Guard hair based on physical characteristics of various breeds are obtained from various goats. Among these fibers Pashmina with less than 19  $\mu$  diameter is the most precious and occupies prime position owing to its firmness, warmth, durability, lightness, softness and ability to absorb dyes and moisture compared to the others. It is used for manufacturing costliest shawls, stoles, rumals and other quality apparels. Countries like South Africa, U.S.A and Turkey are famous for Mohair production; Mongolia, India, former U.S.S.R for Pashmina production and New Zealand for Cashgora production, China, Iran and Afghanistan for both Pashmina and guard hair production. China is the major contributor (70 per cent) followed by Mongolia (20 per cent) of the world's cashmere production of 15000mt and rest 10 per cent is

produced in USSR, India, Turkey and Pakistan. India with two recognized Pashmina breeds Changthangi and Chegu contributed with almost static annual production of 50 tonnes (<1 per cent) during last decade of total Pashmina production of world. The Changthangi goats with population of 206014<sup>ii</sup> are distributed in high altitude of (3700 to 4500 masl) cold arid Ladakh region of Jammu and Kashmir<sup>iii</sup> while as Chegu breed is distributed in cold arid trans-Himalayan mountain ranges from Himachal Pradesh to Uttaranchal at an altitude of more than 3000 m. the average Pashmina production of Changthangi breed is superior to Chegu breed with fiber fitness at par. The fiber from Changthangi goat with 10-14  $\mu$  diameters- an important determinant of quality, though produced in lesser quantity compared to other breeds of the world is considered best and warmest. Shawls and apparels prepared from the fiber are famous for their soft feel, natural luster, sheen and luxury in the world's fashion capitals.

The present study takes into account the problems and prospectus of Pashmina goat farming in the Changthang region of Ladakh and the initiatives directed towards organised development of Changthangi goat by considering the performance of goats under field condition and the altitudinal variations prevailing in various zones and villages of Changthang. The breed reared under the pastoralist nomadic system relates to those live stock rearers who have adopted to the environment with their flocks and herds that act as their main source of economy.

## Geographical Setting of the Study Area

Set deep in the Indian Himalayas on the western edge of the Tibetan plateau, Ladakh or 'Little Tibet' is one of the highest and driest inhabited places on the earth lying between the geographic coordinates of 34° 10' 12"N 77° 34' 48"E/34.17°N 77.58°E. Ladakh is the highest plateau of the Indian state of Jammu and Kashmir with much of it being over 3000 m (9800ft). Ladakh is a land abounding overwhelming physical features and set in an enormous and stunning environment<sup>iv</sup>. It is bounded by two of the world's mightiest mountain ranges, the Karakoram in the north and the Great Himalaya in



the south. It is traversed by two other parallel chains, the Ladakh Range and the Zaskar Range. Ladakh covers an extensive area of 86904 sq. kms which spans the Himalayan and Karakoram mountain ranges and the upper Indus River valley<sup>v</sup>. Apart from the natural boundaries of mountain which surrounded it on its north and south, the artificial boundaries exist as well. On the north east of Ladakh is Sinkiang territory of China, on the east Tibet and towards south east are Lahul and Spiti districts of Himachal Pradesh. To the south west lies valley of Kashmir, and to the North West is Pakistan and also the Pak-occupied Ladakh portion of Gilgit and Skardu. To the North West are found the subsidiary ranges of Karakoram, Hispar, Rakaposi and Harmosh.

**Fig.1**

The Ladakh region exhibits complex topography. The most striking and obvious feature of the Ladakh's landscape are the mountains and the aridity<sup>vi</sup>. It contains lofty mountains which show greater relative relief than any other place on the earth. The main ranges and valleys form a system of parallels in the south east to the North West direction as that of greater Himalaya. The mountain system that emerges from the north west are Kunlun, aghil, Karakorum,

kailash, Ladakh, Zaskar and the great Himalayan range. Lying in these great mountains are the great longitudinal valleys of Zaskar, Indus, Shyok and a no of side valleys such as Nobra, Drass, Pangong and Suru. These valleys are drained by some great rivers which originate from the glaciers on these lofty mountains. The drainage system of Ladakh includes the rivers of Indus, Zaskar, Shyok and Nobra. Ladakh is the high altitude desert as the Himalayas create a rain shadow, denying entry to monsoon clouds. The region is virtually devoid of any rain fall which is just below 20 cms per year. The main source of water is the winter snowfall on the mountains. Recent flooding in the region has been attributed to abnormal rain patterns and retreating glaciers, both of which might be linked to global warming. The regions on the north flank of the Himalayas- Dras, the Suru valley and Zaskar-experience heavy snowfall and remain cutoff from the rest of region for several months in the year as the whole region remains cut off by road from the rest of the country. Summers are short, though they are long enough to grow crops. The summer weather is dry and pleasant. Temperature ranges from 3°C to 35°C in summer and minimums ranges from -20°C to -35°C in winter.

Our focus here has mainly be on Changthang region which is a high altitude plateau in western and northern Tibet extending into southeastern Ladakh with vast highlands and giant lakes. From Eastern Ladakh, Changthang stretches approximately 1600 km east into Tibet, as far as the state of Qinghai. All of it is geographically part of Tibetan Plateau. As for as our study is concerned we have selected the Ladakhi Changthang area of Jammu and Kashmir as our study area.

## Methodology

Changthangi Pashmina goats with population of 206014 are mostly concentrated in Changthang sub-division of Ladakh which is also known as Pashmina belt of Jammu and Kashmir. In addition 52999 non-descript goats are reared mainly for chevron and milk in other parts of Leh also yield Pashmina but are uneconomical due to low harvest of Pashmina and short staple length. In this study the primary data collected by field survey was used. Random sampling technique was incorporated and 42 households were selected from three villages namely Pangmik, Tangtsi and Chuchul of Changthang region. A pre-tested questionnaire was used to collect data from various respondents. The questionnaire was designed in accordance with the objectives of the study. The records were collected through interviews with village farmers. The records included birth weight, lactation period, calving

period, age, kidding, yield of Pashmina, disease occurrence, marketing values etc.

The secondary data on Changthangi goats and other livestock species related to population dynamics, geographical distribution, and production system was collected from field functionaries of sheep husbandry department and various other livestock census reports of Ladakh autonomous hill development council Leh (LAHDC). After successful collection of data, the data was tabulated, analyzed and interpreted in order to gauge the results.

## Results and Discussion

The habitat of Pashmina goats is spread throughout the mountaineers regions of Central Asia. The areas of distribution for these breeds range from China proper through Xinjing into Tibet and Mongolia to Kirghizia in and there are also other down producing goats in Russian Republic, Afghanistan and Iran. The leading Pashmina producing countries in the world include China, Iran, Mongolia, Australia, New Zealand, Britain, Afghanistan, Pakistan and India. Out of the total world's Pashmina production, China is producing 2/3th followed by Mongolia which contributes 1/4th. Even though India contributes only about 1 per cent of the world's Pashmina, but the Pashmina produced in India is best of the whole and occupies unique position. In India, Pashmina is obtained from Ladakh region of Jammu and Kashmir, Lahul and Spiti valley of Himachal Pradesh, Uttar Kashi, Chamoli and Pithargarh districts of Uttaranchal. The Pashmina obtained from Jammu and Kashmir is known as Changthangi Pashmina whereas that obtained from H.P and Uttaranchal is known as Chegu Pashmina.

## Livestock and Pasture Rotation

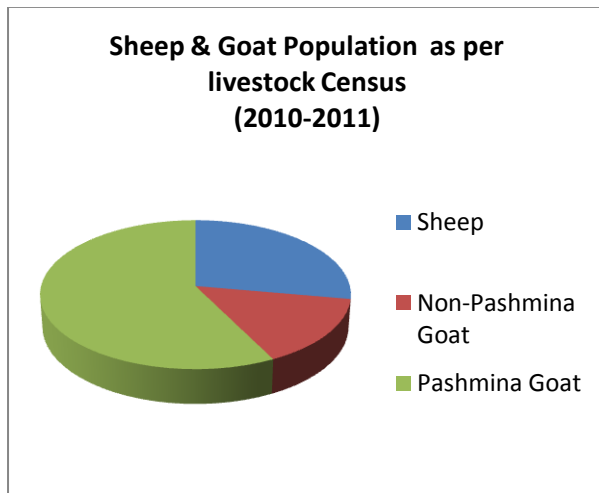
The nomads of Changthang primarily keep sheep, goats, yaks and horses. Sheep provide meat for their own consumption or for trading, wool likewise for their own needs or to sell as well as milk for three months of the year mainly for their own consumption as a drink and as a basic ingredient for the production of yoghurt, butter and cheese. Sheep are also used to carry burdens and they can carry up to 10 kg for a distance of 12 kms per day. Of equal importance to the Changpa nomads are goats. The most valuable product that the Changthang goats provide for the people apart from the hide (pelt), meat and milk-is the Pashmina wool. The nomads use this purely for trading and do not keep any for them. The Changra (northern goats) are a special breed of goat which are found only in this region

(and in the ecologically comparable regions in Mongolia), in the extreme cold of winter a sort of under layer of the finest wool grows, called Pashmina. This Pashmina wool is combed out, cleaned and sold. The mighty yak is also an indispensable animal for the nomads. The female yak produces milk all year round, and yaks are the principal animal for facilitating transportation of tents and all worldly possessions for the ten or so moves per year that the nomads have to make. Two yaks alone are needed to transport both halves of the heavy black nomad tent, weighing someone 20 kg, to the next grazing area. Horses are also used to transport goods from time to time, but most of all they are used for riding. For the nomad, they are always a status symbol. In the real nomadic areas of Rupshu, Korzok and Kharnak animal population greatly out numbers the human population. Unfortunately there are huge discrepancies in the statistics relating to the population densities of both, but certain average values give some indication. Now in Ladakhi Changthang, there are not only Ladakhi nomads but also Tibetans. Since the Dalai lama fled from Tibet, over 10000 Tibetan refugees have come to Ladakh, many of whom are nomads from the Tibetan part of changthang<sup>vii</sup>.

wither and girths at chest were estimated as  $27.7 \pm 2.0$  cm and  $29.9 \pm 1.6$  cm, respectively. Darokhan and Tomar (1983a) reported comparatively lower chest girth and body length and higher height at wither at birth. The whole body was found to be covered with a fine undercoat of Pashmina and long hair. The face and muzzle were devoid of hair. The ears were small, erect and stumpy while the horns possessed a typical character. The horn curved first upward then backward, downward and onward. The body was found to be straight and heavy.

### Breed Characteristics

The goat (*Capra hircus*) is a mammal belonging to the subfamily Caprinae of the family Bovidae. The goats produce a double fleece consisting of the fine, soft undercoat of hair mingled with a straighter and much coarser outer coating of hair called guard hair. These goats are of medium type, their height ranges from 60 - 80 centimeters. The average weight of male and female Pashmina goats is about 45 and 35 kilograms respectively. They possess wide horns; have blocky builds, and refined features. Pashmina goats occur in different colours. White tends to be dominant but black, brown, red, cream, grey, and badger faced are very common. These goats tend to be alert and cautious, rather than docile and placid. These traits are largely due to their feral ancestry, relatively only a few generations back.

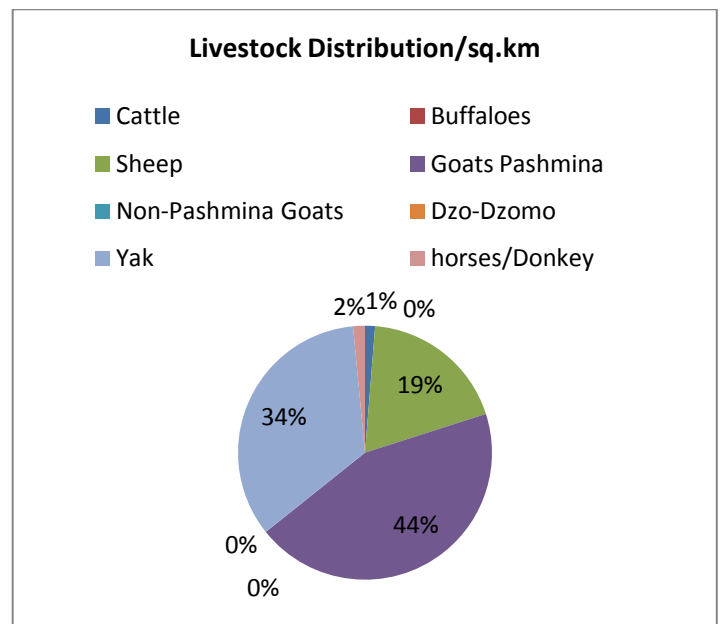


Source: Sheep Husbandry Deptt. Leh

Figure 2 Sheep and Goat Population

### Morphological Characters

The body colour of Changthangi goat varies from white to light brown with 88 per cent of the goats being white in colour and 12 per cent having a light brown colour. The colour of the head varied from white to black with some animals having a grey head. At the time of birth, the length of the animal was found to be  $26.0 \pm 0.2$  cm while the height at



Source: LAHDC Handbook, Leh

Figure 3 : Livestock Distribution

### Processing

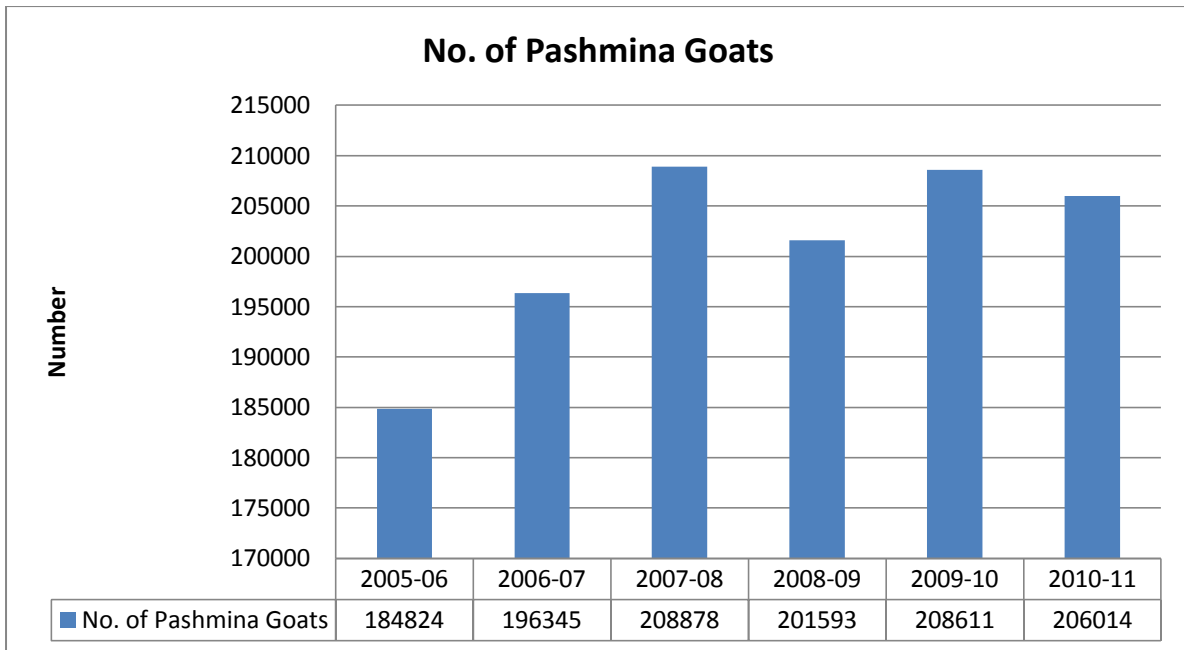
In Jammu and Kashmir State, processing of Pashmina is an old age practice. Pashmina products prepared in Kashmir are known for its quality throughout the world. Not only the quality of the fibers but the way of preparation involving sorting, dusting, spinning and especially weaving has given Pashmina products a special importance in the world. The steps involved in processing of Pashmina include:

1. Dusting: Since fleece from Pashmina goats contain extraneous material including dust, thorns etc, it is necessary to remove it, which is done either manually or passing through dusting machine.
2. Dehairing: Dehairing means removal of guard hairs or separation of guard hairs and fine fibers which is done with great care so as to minimize loss of valuable fibers. Dehairing can be done manually as well as by machine.
3. Combing: Pashmina is combed manually on especially available wooden combs. Combed Pashmina is obtained in the form of a loaf called Tumb followed by gluing usually with soaked powdered rice.
4. Spinning: Tumb is subjected to spinning on the traditional Charkha or spinning wheel so as to make yarn and is collected on small bobbins. Spun yarn is then doubled on hand reeler.
5. Dyeing: The spun wool is dyed before knitting and weaving. Only natural ingredients are used in the dyes, which produce different colours depending on the concentration used.
6. The range of colors of the hand-mixed dyes may vary as they are produced by a natural process. It is pertinent to mention that dyeing of the Pashmina is being done using mostly organic compounds.
7. Weaving and knitting: After washing or dyeing, yarn is weaved on local handlooms into various designs (Jamawar, kanizama etc).
8. Finishing: Finishing involves dyeing and embroidering for value addition, washing and pressing.

### Management Practices

The hardy and agile Changthangi animals are well adapted to the migratory life practiced under difficult conditions by Changpa. The Changpa live in their

traditional "Rebo" which consists of a circular tent with a heating arrangement in the centre. The herds are taken out each day for grazing stay there throughout the day and return to the villages or encampment by night. The herds remain migratory throughout the year and the grazing areas during summer and winter have been properly earmarked. The harsh natural conditions induce the animals to produce an undercoat in order to insulate themselves against the chilly weather. The animals are well adapted to survive on a poor and sparse diet, preferring scrub to richer grass. Normally goats moult at the beginning of the summer season, combing is then done by the end of winter with the aid of a combing device to get the maximum yield of Pashmina. The sexual cycle is dependent on photoperiodism and is triggered by the decreasing day length, the animals becoming sexually active from June onwards. Thus, breeding normally takes place during the month of November and December and kidding takes place during the April-May. During this time 98 per cent of kiddings are completed and the kid mortality has been found to be very low, i.e.3 per cent. For mating, one buck is sufficient to breed 40 does. Weaning of the young is normally practiced at the age of four months. The average daily milk production was observed as nearly 700 ml/animal with a lactation length of 5 months. The animals are normally kept in the open air with wire fencing. Normally highland grazing is followed during the month of July to September, while pasture grazing in lowland areas is undertaken during May to June and October to December. From January to April, goats are confined to stall feeding due to the very cold weather and snowfall. During stall feeding, the average amount of concentrate given to individual animals daily was estimated as 500 g for bucks, 400 g for does and 300 g for young animals, while daily fodder given to each individual averaged 1.5 kg to bucks and 1 kg each to does and young animals. The whole body was found to be covered with a fine undercoat of Pashmina and long hair. The face and muzzle were devoid of hair. The ears were small, erect and stumpy while the horns possessed a typical character. The horn curved first upward then backward, downward and onward. The body was found to be straight and heavy.



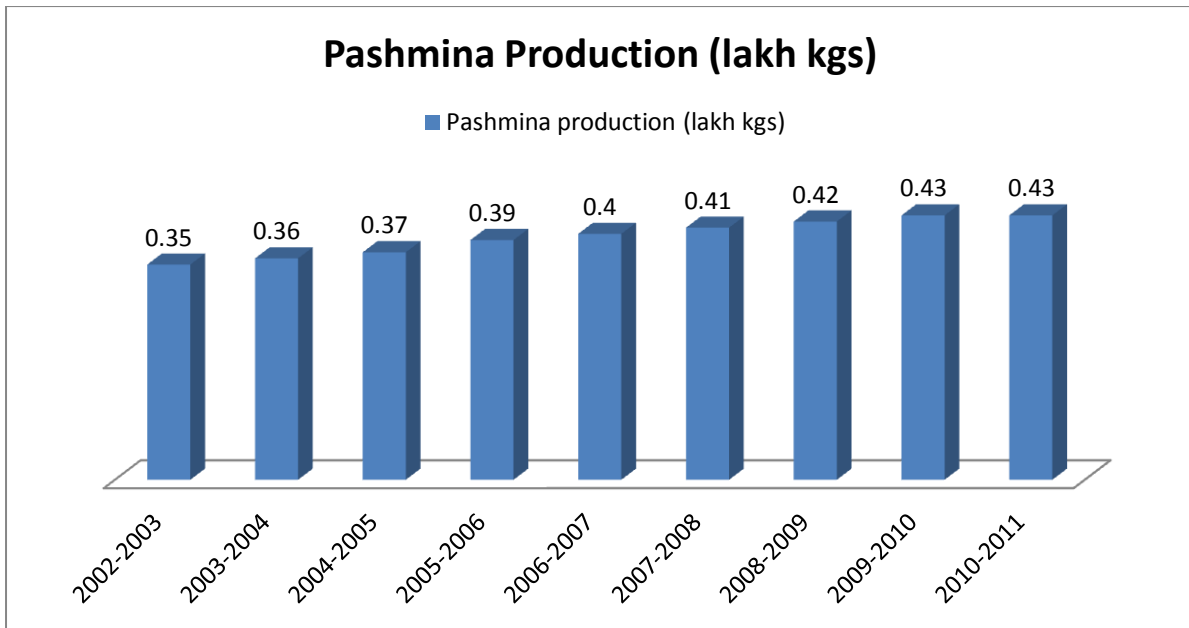
Source: LAHDC Handbook Leh

Figure 4: Number of Pashmina Goats

### Production parameters

The Pashmina yields of bucks, does, male hoggets and female hoggets are presented in and the fibre yield of different clippings in Kumar (2000) reported a slightly lower Pashmina yield by bucks and a relatively higher yield by does. Misra *et al.* (1998) described clipping fibre yield as  $\pm 6$  g,  $15.9 \pm 9$  g,  $227 \pm 9$  g,  $191 \pm 10$  g and  $195 \pm 20$  g in 1st, 2nd, 3rd, 4th and 5th clippings. While considering yearly yield, the Pashmina production during the third year was highest and this trend was similar to the findings of Misra *et al.* (1998). The staple length of Pashmina fibre was found to be higher than the findings reported by Kumar (2000) while Darokhan and

Tomar (1983b) revealed a significantly higher staple length than our estimates. The length of fibre was observed as higher in males than females, which was similar to the reports published by Kumar (2000). The fibre diameter in male and female goat was estimated as slightly lower than the findings stated by Kumar (2000). Acharya and Sharma (1980) revealed a significantly higher estimate of staple diameter. Koul *et al.* (1987) reported the number of primary and secondary follicles per sq. mm area as 4, 6 and 30, 39 in male and female Changthangi goats, respectively. Kumar (2000) estimated the percentage of down and scouring yield (%) in male and female goat as  $53 \pm 19$ ,  $49 \pm 19$  and  $85 \pm 9$ ,  $84 \pm 9$ , respectively.



Source: Handbook, LAHDC, Leh

Figure 5 :Pashmina Production

Even though products made of Pashmina wool command enviable prices the world over, its trade in the Valley has worn thin over the years largely due to government neglect and militancy. At 50 tonnes, India's yield constitutes a mere one per cent of the world's Pashmina production. Of this, 40 tonnes are derived from the around 1.6 lakh Pashmina goats found in the Ladakh region of Jammu and Kashmir. The Indian Council of Agriculture Research (ICAR) has now sanctioned a Rs 9.5-crore project to Sher-e-Kashmir University of Agriculture Sciences and Technology (SKUAST) to boost the production of Pashmina wool called 'A value chain on enhanced productivity and profitability of Pashmina fiber yield, the project is a national innovation project (NIP). The aim of the project is to push the production beyond one lakh kilograms in the coming years. A roadmap to involve more scientists, villagers who rear Pashmina goats and those associated with shawl industry has been prepared. Through the new central project, scientists will explore the reasons behind a high degree of inbreeding, poor husbandry practices, high kid motility and inadequate shelters for the goats that result in poor fibre yield. Of the total 15,000 metric tonnes Pashmina wool produced in the world, China's share is 70 per cent followed by Mongolia at 20 per cent. Our yield is very low compared to other Pashmina producing countries. We hardly shear 100 to 250 grams of wool from a single goat, while in other countries farmers produce around 700-900

grams of wool from a single goat. Pashmina is derived from Changthangi and Chegu goat breeds. While Changthangi is found in Ladakh, around 6,000 goats of the Chegu breed are found in Himachal Pradesh and Uttarakhand. After a global ban on Shahtoosh, wool derived from the hair of an endangered Tibetan antelope, people have started relying on the Pashmina wool. As of now, around 35,000 to 45,000 people in J&K are associated with its production<sup>viii</sup>. At the same time, people in Ladakh are showing less inclination towards breeding Changthangi goats and have forayed into the more lucrative option of the tourism sector.

### Reproductive parameters

The reproductive traits of animals are an important part of the farmers' ability to maintain the farm systematically and make the farming enterprise a profitable business. Kumar (2000) reported the age at first tuppung, age at first kidding, gestation period, kidding interval and litter size of Changthangi goat as  $668 \pm 18$  days,  $830 \pm 13$  days, 152 days,  $397 \pm 7$  days and 1, respectively. The percentage of female live births was found to be 49 %. The twinning rate was observed as very low, lower than the results revealed by Misra *et al.* (1998). However, the majority of the kidding was completed between November and December, while Misra *et al.* (1998) reported kidding in the month of September and

October. The farmers prefer natural service where one buck was sufficient to breed 40 does.

### Economics of pashmina production

As the major profession of people in Changthang is pastoral farming, a significant percentage of Pashmina goats are reared in the Changthang region of Ladakh. Almost 90 per cent<sup>ix</sup> of the population of the Changthang area survives on the income from goats and sheep, which is nearly \$ 8.4 million annually<sup>x</sup>. Ladakh produces more than 80 per cent of the total Pashmina yield of the country. The Pashmina prices have dwindled and swung between extremes during the last decade. The price of raw

Pashmina was \$ 63/kg during 1993-94, \$25/kg during 1996-97 and \$17/kg today. This price trend is mainly due to the involvement of middlemen. Unfortunately the local industry does not consume more than 5 per cent of the whole production and the remaining Pashmina is being sold outside Ladakh through middlemen. Thus, the real benefit is going to the middlemen while the end users and low-income growers are being exploited<sup>xi</sup>. The highest yield of Pashmina per animal was found to be from breeding bucks and does while the returns i.e. benefit cost ratio was highest in castrated bucks i.e. 1.49 (Rs. 765.02) followed by does i.e. 1.37 (Rs. 653.99) and breeding bucks i.e. 1.14 (Rs. 254.87) (Wani *et al.*, 1999).

Pashmina Goat  
Milk Yield (kg/Doe)

Age(years)	Milk yield kg/Doe/Month
1	-
2	-
3	25.3
4	27.7
5	33.0
6	32.3
7	29.5
8	24.1

Source: M.H.Wani (*Applied Biological Research*)

### Disease prevalence

Occurrence of diseases was found to be quite low in Changthangi goats. Most of the problems were related to growth, where stunted and retarded animals were common. Sometimes, animals were found to be suffering from diarrhoea which might be due to parasites or poisonous grasses. In kids, tapeworm, roundworm and coccidian infestation was also observed. The occurrence of pox was not so common. In large farms, vaccination was followed

for pox. Circling disease (Gid) caused by *Coenurus cerebralis* was a common incidence in Changthangi goats. Tick infestation was sometimes found. Deworming with anthelmintics and dipping with some antiparasitic drugs twice a year was being followed in some of the organised farms. However, these veterinary activities were not so common among the poorer small village farmers, who have a correspondingly higher mortality in their animals. Sometimes, genetic defects like cryptorchidism, stumpy ear, short legs, prognathism and mixture of body colour were found in some animals.



## Sheep Husbandry Department Preventive Measures Taken

BLOCK	Vaccinated			Dosed			Dipped		
	2008-2009	2009-2010	2010-2011	2008-2009	2009-2010	2010-2011	2008-2009	2009-2010	2010-2011
NYOMA	182072	68284	87500	48247	114538	116480	163033	156824	146421
DURBUK	5000	-	82400	12954	35078	52941	45820	58268	51074

Source: LAHDC Handbook (2010-2011)

### Conclusion

Pashmina, as a valuable fibre being produced by Changthangi goat, should be marketed properly in order to help the farmers derive greater economic benefit. Fodder banks may be established to supply fodder to the farmers during lean periods. A properly managed and well planned breeding programme should be adopted to enhance the performance of Changthangi goat. Field progeny testing should be taken up to produce good quality proven bucks which can be used to improve the local goat population. The livestock density is witnessed more in Changthang compared to overall district Leh, due to sole dependence of the population on livestock sector in general and domesticated small ruminants in particular. Pashmina production increased from 0.35 lakh kg in 2002-03 to 0.43 lakh kg in 2010-11<sup>xii</sup>. Population has also shown increase from 13444 persons in 2001 to 17023 persons according to 2018 projected report. However, other species registered a decline during the same period. The altitude was directly related to Pashmina production, fiber yield and quality of Pashmina. The rearing of Pashmina goats was economically viable in terms of gross, net, family labour income and employment generation. However, there existed a wide and marked gap in productivity of Pashmina flocks in various zones of Changthang owing to severity of constraints. There is an urgent need for pragmatic planning ensuring proper development of the breed through proper breeding strategy for enhancement of the Pashmina yield, livelihood, nutritional security, employment generation and export earning of the

country. The mortality rate need to be reduced by strengthening the feed, fodder to Changthangi rearers of subsidized rates during crisis period, besides providing shelter and lambing shed facilities. Potential pasture areas need to identified and protected through and integrated rural development programmes jointly with stakeholders. Liberal credit schemes need to be introduced so as to make the rearers able to purchase timely inputs which are most impeding factor in realizing productivity potential of the breed.

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