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OUTLINE OF TRAINING MATERIAL FOR FIBRE VALUE ADDITION AT FARM LEVEL

PROJECT NEPAL – FUNDED BY EU – NEPAL
TRADE AND INVESTMENT PROGRAMME (TIP)



**DRAFT REPORT TIP PASHMINA
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Executive summary

The farmers of Upper Mustang and surrounding mountain districts of the Nepal Himalayas raise a local breed of goat known as Chyangra, which produces cashmere, termed pashmina in Nepal. The Nepal Trade and Investment Programme (TIP) plans to increase Chyangra pashmina fibre production and transformation capacities, among farmers in the Himalayas of Nepal. As part of this strategy, comprehensive training material and corresponding Standard Operating Procedures for fibres' harvesting, handling, fibre value addition and traceability will be developed.

This report presents detailed, current technical and scientific material for a training programme aimed at goat farmers, leader farmers, local professionals and national stakeholders in Nepal. The training material in this report will be further elaborated, transforming material from this report into practical guidelines in the context of Nepal, to be demonstrated at field training sessions in the Himalayan project areas in early spring 2022.

The report begins by summarising the biological characteristics of cashmere production by goats. Since cashmere is an internationally traded commodity, the different national definitions of cashmere are given (USA, China and EU). This is followed by a discussion of the physical parameters that define the international commercial value of cashmere. Some different cashmere goats raised in the world are illustrated, and how scientists in some countries have improved the economic benefits by selective breeding of cashmere goats. World production figures of cashmere are presented, along with trends over time of farm gate prices in some countries. Patterns are shown of how wholesale prices are sensitive to quality parameters, particularly fibre diameter, colour and yield. An appreciation is then given of the particular technical processes that cashmere must undergo in order to become a final product. Lastly, there is a brief profile of the mechanical processes required to end up with wearable cashmere garments for the consumer.

GLOSSARY OF KEY TERMS USED

Combed:	process of harvesting cashmere down from a goat by using a comb
Dehairing:	separating the coarse guard hair from the cashmere by hand or (usually) by machine
Down:	fine diameter undercoat of a double-coated goat (e.g. cashmere)
Fleece:	entire coat of a goat, containing both coarse outer guard hair and down undercoat
Guard hair:	coarse outer hair of a double-coated goat
Scouring:	washing dirt, vegetable matter, dust, natural oils and dung from the cashmere
Shearing:	process of cutting the entire fleece from a goat
Spinning:	twisting the fibre into a thread (yarn)
Weaving:	quality of less fine diameter fibre used in weaving textiles on a loom
Worsted:	type of woven textile, typically suit fabric
Yarn:	thread made by spinning fibre

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INTRODUCTION

Cashmere – referred to as pashmina in some parts of Asia - is the thin, soft undercoat fibre produced by different local goat breeds in regions with extremely cold winters. The fine inner down has a global commercial value as “cashmere”, which is usually strictly defined, measured and priced by textile companies before purchasing from farmers or agents. The coarse outer guard hair has little commercial value. There are an estimated 100,000 cashmere-producing goats known as Chyangra in Nepal, kept by mountain farmers in the Himalayas (Bhattarai et al. 2019).

Goat farmers can harvest cashmere from their goats in springtime if they wish to either use or sell the cashmere. In some parts of Asia, including the Himalayas, farmers have traditionally harvested cashmere for centuries. The cashmere can either be sold in the raw state – known as greasy – or processed at home to make yarn which can be woven or knitted into clothing for the family or for sale. This is, however, not a tradition among the Tibetan ethnic groups who raise Chyangra goats in Upper Mustang of Nepal.

At present, only some Chyangra goat farmers in Upper Mustang district of Nepal actually harvest and sell the cashmere from their goats in springtime. Harvesting is done by two methods: 1) by shearing the entire fleece off the goats, or 2) by combing out the inner cashmere fibre from the coat when the down is moulting and leaving the outer coarse coat intact. Commercial companies usually prefer to buy combed cashmere as it is more profitable to process than the sheared fibre. From the farmers' perspective, it is preferable to comb rather than shear their goats in springtime, as unpredictable weather means sheared animals without their guard coats are vulnerable to cold and rain which can make them sick and die. Goat farmers in Upper Mustang are aware of this risk of shearing, and this is one reason why they do not shear their goats in spring and sell the whole fibre.

While combing out the inner valuable cashmere, is preferable to shearing the whole fleece, both from a commercial and a production aspect, currently not all Chyangra farmers in Upper Mustang own or have access to combs for harvesting cashmere. The farmers are not confident on how and when to comb, or even if it is worth their while to comb their goats. Farmers instead can shear their goats later in the spring season, and this is a technology they are familiar with. Nevertheless, farmers may not find a market for this sheared fibre, or a good price compared to combed cashmere. This is a lost opportunity for Chyangra goat farmers in Nepal to gain some extra income. They can be trained on how to comb the cashmere from their goats earlier in springtime. Some Nepali fibre processors are now very interested in buying combed cashmere from Chyangra farmers in Nepal.

For all these reasons, Chyangra goat farmers and Nepali textile manufacturers will benefit from having goat farmers trained and motivated to comb the cashmere from their goats in springtime and prepare the cashmere for sale to processors in Kathmandu. If farmers are enabled to comb their goats this will add value to the naturally produced annual cashmere which is presently not all being realised at farm level.

WHAT IS CASHMERE/ PASHMINA? (FARMER TRAINING MATERIAL)

Types of fibre on goats

Goatskin consists of three layers: epidermis, corium and tissues under the cuticle. **Epidermis** or primary cuticle is the outer thin layer of a skin. Corium or derma is where follicles of fat and perspiration glands, muscles and blood vessels are located. The skin has follicles, which are a small skin cavity from which hair (fibre) grows. Fibre follicles start to evolve from the embryo stage before birth (<http://www.infovets.com/books/smrm/A/A286.htm>).

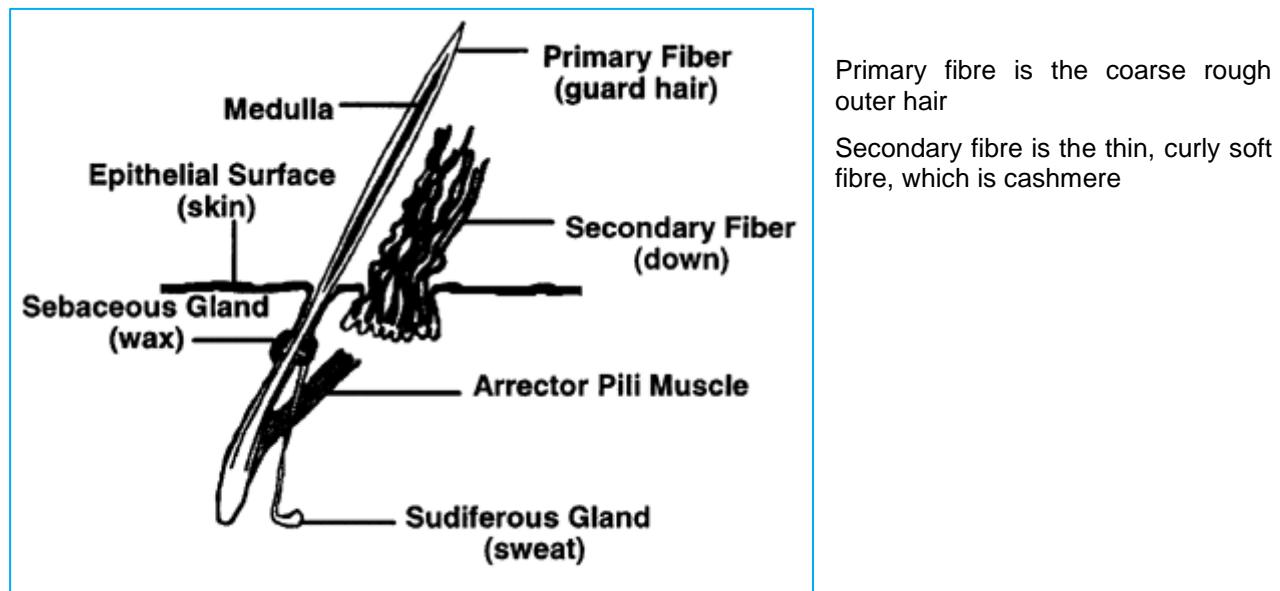
There are two types of follicles on skin: primary and secondary. They each produce a different type of fibre. **Primary follicles** are located deep in the skin. **Secondary follicles** are not located as deep as primary follicles and only fat glands are located close to these follicles. See Figure 1.

Cashmere Fibre Biology: The anatomical structure that produces fibre is the skin follicle. The primary follicle produces a coarse, medullated guard hair with diameters ranging from 50 to 150 **microns**. The secondary follicles are non-medullated and produce the down (cashmere fibre) with a mean diameter of 11-18 microns. The secondary to primary follicle ratio (S:P) and follicle density (number per unit area of skin) influence the potential production of the animal.

Medullated Fibres: Fibres possessing a medulla or core of air filled cells. Under the microscope, this structure appears spongy. When the medulla is coarse, the fibres are hairy, harsh in handle, and possess irregular dyeing properties. Good quality cashmere should contain less medullated fibres.

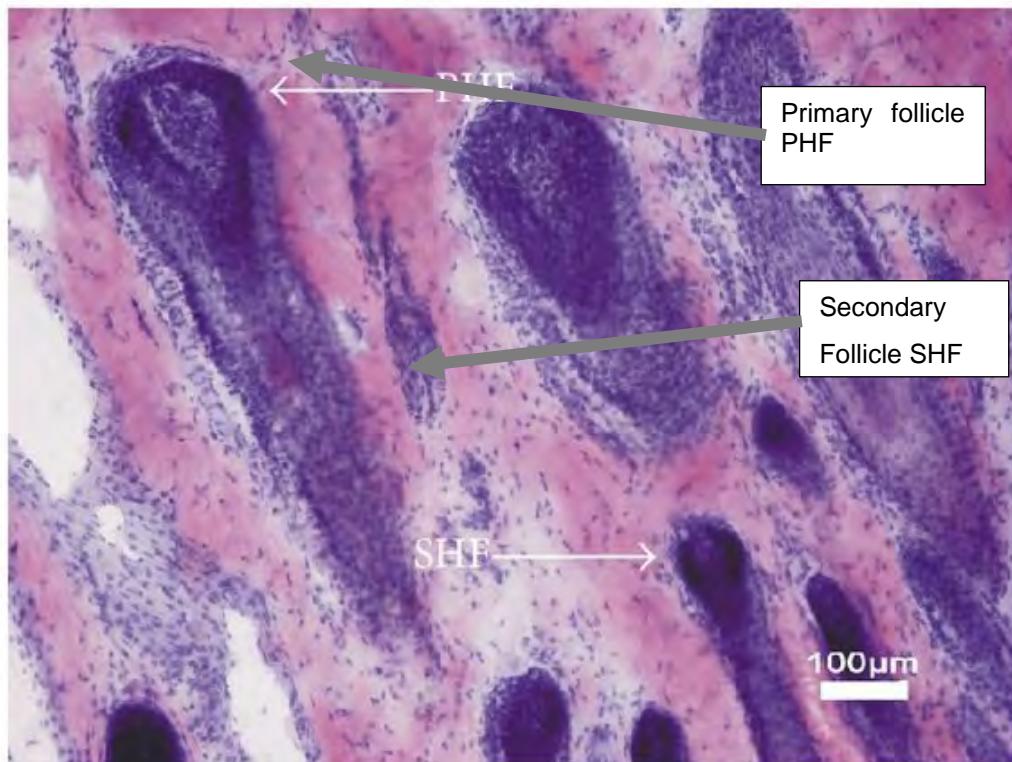
Micron: Diameter of wool fibre in units of millionth of a metre or one-thousandth of a millimetre. It is a shorten word for micrometre. Symbol for micron is μ .

Figure 1: Primary and secondary skin follicles on cashmere goats



Source Photo: <http://www.infovets.com/books/smrm/A/A286.htm>.

Figure 2: Frozen sections of cashmere goat skin stained by haematoxylin. White arrows indicate the primary hair follicles (PHFs) and secondary hair follicles (SHFs) in the sample



Source Photo: Teng et al.2013

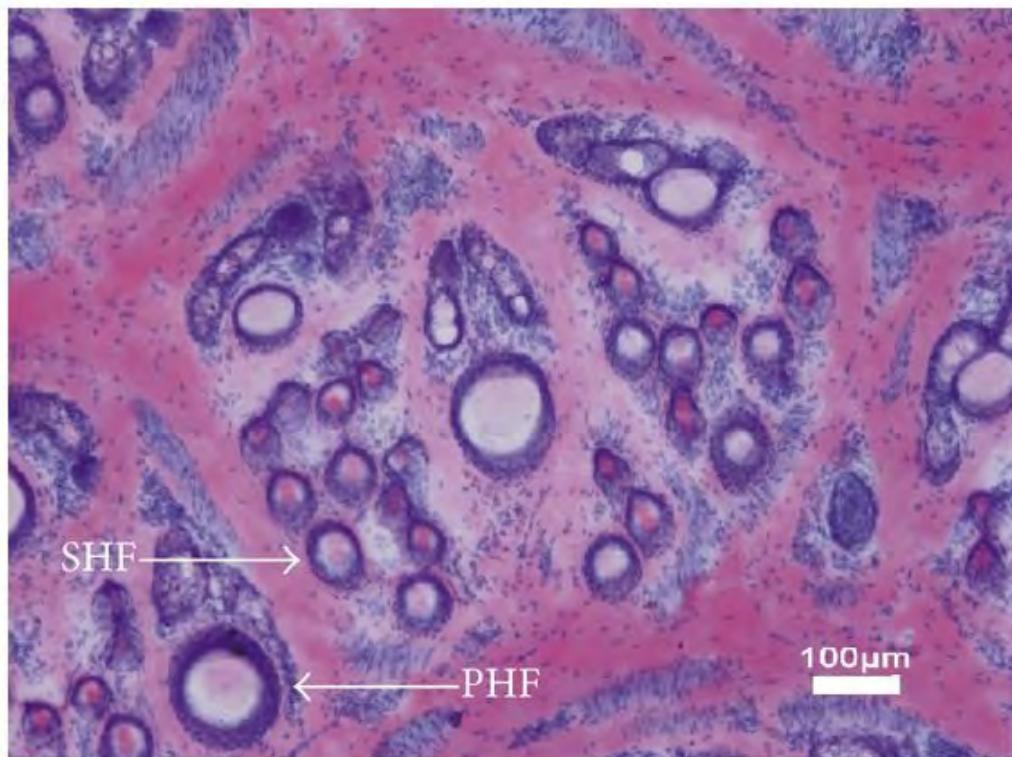


Figure 3: Combing the cashmere down undercoat away from the guard hair coarse coat, Kazakhstan



How is cashmere defined?

There are several definitions defined by national governments to determine trade, import and export labelling. From Cashmere and Camel Hair Manufacturers Institute (CCMI) website <https://www.cashmere.org/definition-cashmere-wool.php>

1. The U.S. Wool Products Labeling Act of 1939, as amended, (U.S.C. 15 Section 68b(a)(6)) defines cashmere as:
 - (A) the fine (dehaired) undercoat fibres produced by a cashmere goat (*Capra hircus laniger*);
 - (B) the average diameter of the fibre of such wool product not exceeding 19 microns; and
 - (C) containing not more than 3 percent (by weight) of cashmere fibres with average diameters that exceed 30 microns.

The average fibre diameter may be subject to a coefficient of variation around the mean that shall not exceed 24 percent.
2. Regulation (EU) N. 1007/2011 of 27 September 2011 in the European Union, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02011R1007-20180215>
Note: This document does not separately define cashmere, but refers to animal wool and fibres.
3. Household Goods Quality Labelling Law on Labelling of Textile Goods in Japan
4. FZ/T 01053 Standard, Textiles - Identification of FibreContent in China (available in English by payment). See also: <http://www.asianlii.org/cn/legis/cen/laws/cotgootscotcopamc912/>

The most valuable cashmere characteristics for commercial processors

Cashmere Fibre Diameter: Cashmere has a mean fibre diameter between 11 and 18 microns with no down fibre above 28 microns. Processors prefer the 15 to 16 micron cashmere fibre, and this range attracts a

premium price. Fibre that averages above 18.5 microns is technically not cashmere, although some processors have shown interest in it. <http://www.infovets.com/books/smrm/A/A286.htm>. The lower the thickness, the softer the yarn will be. (www.lucafaloni.com). See “**How Cashmere is defined**” above.



Length: Cashmere fibre lengths range from 30 to 70 millimetres (mm) for the **woollen system** (knitwear) and above 70 mm for the **worsted system**. The length of the down fibre can be affected by ultraviolet rays, which can damage the exposed tips, causing brittleness. Guard hair length should exceed the maximum down length to protect the down.

The longer the fibres, the more resistant and durable the final material will be, and it will also generate less pilling. Longer fibres are usually found on the neck and underbelly and are much more expensive.

Source : Greasy cashmere length of approximately 40 mm (4 cm) on a man's hand, Inner Mongolia, China - **Photo:** Carol Kerven

Cashmere Yield: Cashmere yield is the proportion of down in the total fleece. The yield is expressed as a percentage. Superior animals have yields up to 45 percent cashmere. Cashmere yield is determined using special machinery – dehairing - that separates down from guard hair. Processors claim to separate cashmere (down) from guard hair to a level of 99 percent purity. The amount of yield in greasy cashmere is a major factor for profit by processors



Combed cashmere poor quality sample, showing high proportion of guard hair to down (cashmere). Even though this is white, which processors prefer, they will offer a lower price because the yield is lower.

Combed cashmere, good quality sample, less guard hair and high proportion of down (cashmere)



Important Cashmere Qualities: Cashmere has an extremely soft **handle** and no **crimp**. These physical properties combine to produce an extremely fine, smooth **yarn** which produces a garment with very desirable wearing qualities.

Handle: Using the sense of touch to determine certain qualities of a fibre.

Cashmere Colour: Down is produced in a range of colours including white, light grey, dark grey, and brown. White is most desirable colour and gives the widest range of alternatives at the dyeing stage. Cashmere colour often contrasts with the colour of the guard hair. For example, a goat with dark grey outer coat can produce cashmere with light colours. Different natural colours of cashmere yarn.



Source Photo: Lang Yarns <https://www.langyarns.com/?l=en>

Cashmere goats in the world

Both wild goat species and domestic goats (raised by people) produce cashmere in cold winter climates. There are many indigenous (local, not scientifically bred) breeds of cashmere goats in the world. Most cashmere goats raised by people are dual-purpose breeds that produce cashmere, meat, and milk. The genetic resources of cashmere goats are very rich throughout the world and are mainly distributed in the cold winter plains, plateaus and mountains of Asia, including China, Mongolia, Iran, Afghanistan, India, Kazakhstan, Kyrgyzstan, and Tajikistan (Wang et al. 2021). See Figure 3. In Iran for example, there were an estimated 5 million cashmere goats in 2004, of local breeds Raeini, Nadoushan, Birjandi, Abadeh and Abasabadi (Ansari-Renani et al. 2013). Small numbers of cashmere goats are kept by farmers in USA, Australia, New Zealand, Italy, UK and some other countries.

In China, there are more than 20 native cashmere goat breeds that yield 75% of the cashmere produced worldwide (Du 2011). A small goat population in the cold southern upland regions of south America also produce cashmere (Lanari et al. 2020). Not all of these breeds have been studied in detail on their cashmere characteristics which could be commercially valuable. For example, there are many millions of domestic cashmere goats raised by people in Afghanistan, Kazakhstan, Turkmenistan, Pakistan and other countries which have not been scientifically assessed in terms of their precise cashmere qualities.



Source : Alashan specially bred cashmere goats on farm, Inner Mongolia, China.- **Photo:** Carol Kerven

Cashmere goats have the broadest altitudinal range of all herbivores in mainland China, as it is continuously distributed from sea level (e.g., Liaoning cashmere goat) to the Tibetan Plateau (e.g., Tibetan cashmere goat). Northern China has a relatively cold and dry climate, north and west of approximately the 0 °C January isotherm and 800 mm isohyet. Goats in northern China, the main breeding area for cashmere goats, have an extraordinarily dense coat of hair and a more compact body conformation (Cai et al. 2020).



Source : Cashmere goats kept by nomads in Iran - **Photo:** Ansari-Renani et al. 2013.



Source : Local cashmere goats, Pamir mountains, Tajikistan - **Photo:** Carol Kerven.



Source : Local cashmere goats, Kazakhstan desert - **Photo:** Carol Kerven.



Source : Native criollo cashmere goat from Neuquen, Argentina. <https://digital.fontagro.org/en/successful-cases-2015/case-3-native-criollo-goats/>



"Pashm, lena as it is known in the Ladakhi language, comes from the fine winter undercoat or down of a particular variety of domestic goat, which is known as 'Pashmina goat' or Changra (literally "Northern goat") and also shawl goat. The growth of pashmina is stimulated by the intense winter cold of windswept plateaus, situated at high altitudes, such as Changthang. Typically, pashm is combed out of the goats in the months of June and July, with a male goat yielding between 300 to 500 grams of fibre and a female 200 to 250 grams". (Monisha Ahmed)

Source : Changra cashmere goats, Jammu and Kashmir, Ladakh, India. **Photo:** Looms of Ladakh - <https://kashmirloom.com/blogs/news/pashmina-nomadic-livelihoods-trade-and-craftsmanship>

Improving cashmere production and quality

Genetic selection

Some countries have performed genetic breeding research on cashmere goats since the 1980s, in particular by scientists in Mongolia and China, which has helped improve cashmere production and the commercial quality of fibre (Wang et al. 2019). The main breeding efforts have been directed at increasing the yield of cashmere (weight of down obtained per goat); decreasing the fibre diameter (fineness in micron), and increasing the live body weight, which all have economic implications for goat owners and the cashmere industry. Newer breeds with commercial qualities have been selected by scientists over several decades, in China, Mongolia, Australia, Iran and Kyrgyzstan.

"Cashmere goats are only found in specific areas of Asia. However, this resource is rich in China with more than ten different breeds developed after long-term natural and human selection (Qi 2004). Among them, the Liaoning and Inner Mongolian (including three types of Alashan, Erlangshan and Wuzhumuqin) cashmere goats are well known worldwide for their high cashmere yield and cashmere fineness respectively. In the past three decades, cashmere yield has been the primary breeding objective. Genetic admixture among some breeds and inbreeding within the breeds/types is possible. This may have led to the loss of genetic structure and diversity in some of these breeds/ types" (Di et al. 2011).

Nutrition and cashmere goats

Decades of controlled on-station and on-farm research has been carried out by scientists on the relationships between cashmere production and nutrition for goats. One of the world's experts is Bruce McGregor, author of numerous scientific papers on this question (see for example in References on McGregor 2016, 2017 and 2018). Unquestionably, nutrition will affect overall goat production, including liveweights, growth, reproduction, kidding, general health, morbidity, mortality and also fibre production. Some earlier findings are reviewed in McGregor (1998), below.

"Goat fibre production is affected by genetic and environmental influences. Environmental influencesinclude bio-geophysical factors (photoperiod, climate–herbage system and soil–plant trace nutrient composition), nutrition factors and management factors. Nutrition and management influences ...include rate of stocking, supplementary feeding of energy and protein, liveweight change, parturition and management during shearing. The nutritional variation within and among years is the most important climatic factor influencing ...cashmere production and quality. Cashmere production of young, low producing goats does not appear to be affected by energy supplementation, but large responses to energy supplementation have been measured in more productive cashmere goat strains. ... Estimates of the energy requirements for the maintenance of fibre goats and the effect of pregnancy and lactation on ...cashmere growth are summarised. The effects and importance of management and hygiene during fibre harvesting (shearing) in producing quality fibre is emphasised. ...it is important to assess the results of scientific experiments for the total environmental content within which they were conducted....In ...annual temperate environments, seasonal changes in liveweight are large and influence both quality and production of mohair and cashmere. ...cashmere producers can manipulate liveweight by supplementary feeding energy during dry seasons to minimise liveweight loss, but the economics of such feeding needs to be carefully examined. Strategic benefits can be obtained by enhancing the growth of young does prior to mating and for higher producing cashmere goats." (McGregor 1998).

According to a livestock nutritionist at a commercial feed supplier preparing winter feed supplement for a research flock of cashmere goats in Kyrgyzstan, a suitable premix of minerals and vitamins is required because "*we are primarily interested in increasing the ratio and density of the secondary skin follicles, which produce the mohair (from angora breeds) and cashmere from cashmere breeds*" (Tobias Gerber, Kyrgyzstan 2018, personal communication). Starting about 30-50 days after conception (early autumn), the females should be getting a vitamin+mineral supplement and high lucerne/barley amounts, and after kidding, they should get as much feed and supplement as they want (*ad libitum*). That will result in kids with lower mean fibre diameter of their cashmere, and it will also have good effects on kid early weights, which may improve their survival to weaning.

While better nutrition benefits overall goat production and cashmere growth in particular, there are always real costs to improving livestock nutrition. Whether many Chyangra goat farmers in Nepal can afford to feed their goats better, and will also realise higher cashmere yields, is an open question at present.

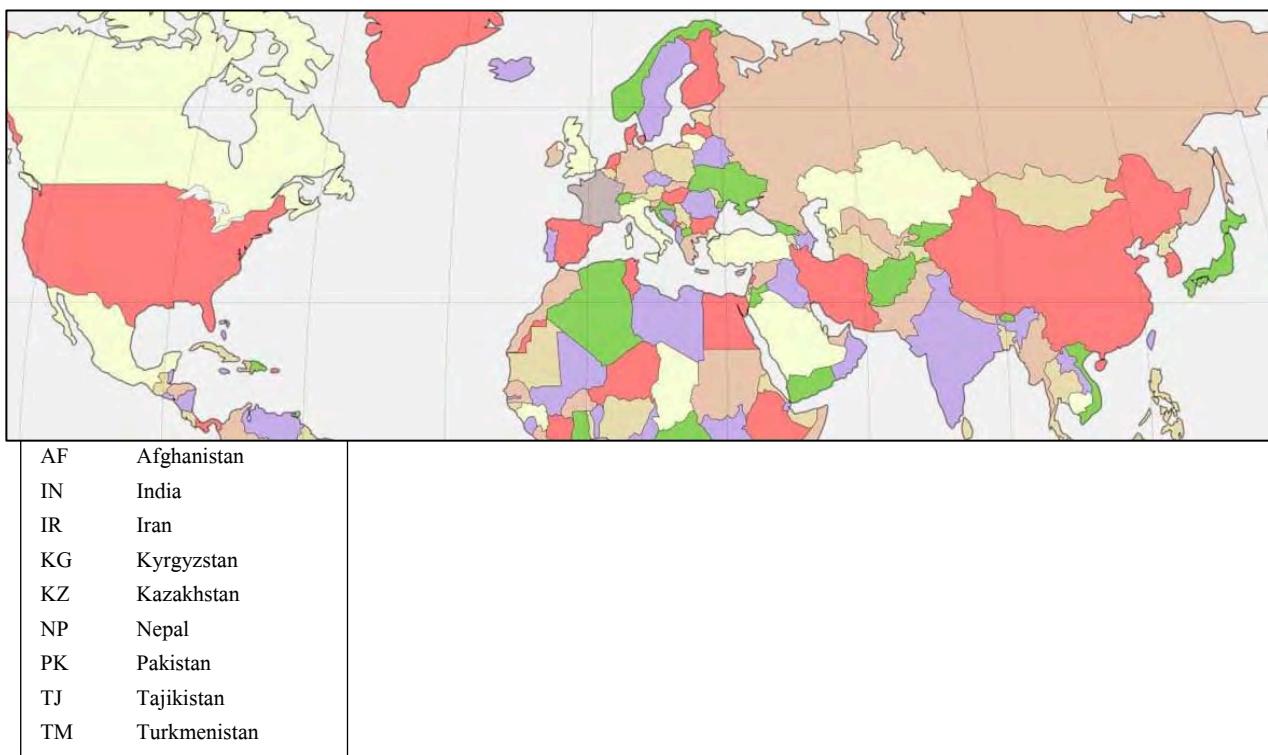
World production of cashmere for the market

China is the largest cashmere goat-producing country in the world. In 2018 the total cashmere produced in China was 15,438 tons, accounting for more than 2/3 of the world's total output. The export volume of dehaired cashmere reached 3,212 tons (Wang et al. 2021). In 2019, cashmere production in China was reduced about 13.5% compared to 2018 (Schneider.com). Data for 2020 is not readily available. Ten years' previously, in 2009, China exported 1,363 tons of dehaired cashmere (www.gschneiders.com), with the top importing countries being Italy (70%), UK (16%), then South Korea, Japan and others, including Nepal (2,043 kg). See Figure 3.

Mongolia may account for 40% of the world production. In 2020, dehaired cashmere export reached only 215 tons compared to 392 tons in 2019, meaning 45% less than 2019. Most of the cashmere was washed in Mongolia and then exported to China. In 2019 the total number of cashmere goats reached 29 million, equivalent to about 9.800 tons of greasy cashmere. In 2020, according to the Mongolian statistical office, goat populations continued to increase, arriving at 30 million goats, with a total production of greasy cashmere arrived at 10.000-12.000 million kg (Schneiders Market report 2020). The main markets for dehaired cashmere are Italy, Great Britain and South Korea. India and Nepal also import partly finished cashmere from China and Mongolia. In 2018, China exported 112,466 kg dehaired (yarn and slivers) total, to:

- Italy 68,995 kg
- UK 22,121 kg
- Korea 18,900 kg
- India 1,015 kg
- Nepal 650 kg
- Taiwan 258 kg.

Figure 4: Countries producing cashmere and supplying to China and elsewhere



Prices and grading for cashmere¹

The prices for raw greasy and early-stage processed (dehaired) cashmere vary from year to year. These changes are caused by many factors. Changes in the global economy, especially in highly developed nations, alters peoples demand for cashmere clothing; development of new cashmere processing facilities follows economic growth, for example China's rapid development in the 1990s (Waldon et al. 2014). Sharp weather events like droughts or snow disasters in cashmere-producing rangelands of Asia causes mass death of goats, which reduces cashmere supply and increases prices. Rising incomes with economic development pushes consumers' demand for luxury goods, including cashmere clothing. Due to COVID 19 and lock downs, in Mongolia there was a price reduction from USD 38 per kilo greasy in 2019 to USD 24-27/kg in 2020 paid to Mongolian goat herders.

All these unrelated changes affect the annual prices for raw cashmere bought from farms.

Cashmere prices soared in the last months of 2021, reflecting a rebound in demand from the low level in retail sales in 2020. Sustainable cashmere is also rapidly emerging on the global market. Our report offers an overall picture of short-term and long-term trends of the cashmere market, including China's exports of fiber and yarns, with volume, value, and unit prices. Italy's cashmere imports from China are also displayed. Historical data covering the last two years (China) and five years (Italy) are available for download.

Cashmere fiber prices continued to rise in the last months of 2021, over a rebound in demand.

Export prices of Chinese cashmere climbed from 95US\$ per kilo in June to 115.3US\$ in November.

Prices surged 55% in November from a year earlier.

Import prices of Chinese cashmere in Italy jumped from 81 euros per kilo in June to 88.6 euros in September and 101.8 euros in November, according to the latest available customs data.

In euro terms, cashmere prices rose 13.7% in three months and 67.4% in a single year.

Demand is stronger in the current period, compared with a year earlier when the pandemic was depressing retail sales in Western countries.

China's cashmere exports jumped by 66.4% in volume terms in November from a year earlier, even rising 164% in dollar terms.

China accounts for about 60% of the global production of cashmere fibers, with Mongolia at 20%, and other countries, like Iran or Afghanistan 20%.

The victory of the Taliban in Afghanistan may depress the production of cashmere in this country.

Sustainable cashmere production is rapidly rising year after year, as luxury brands are committed to delivering these kinds of fibers to their customers.

A series of certification programs and initiatives have been launched in the past years, especially in Mongolia.

According to Textile Exchange, sustainable output surged from nearly nothing to 7% of the total in 2020.

Figure 5: Italy's Cashmere Fibre Import Prices

¹ Source for price information: emergingtextiles.com

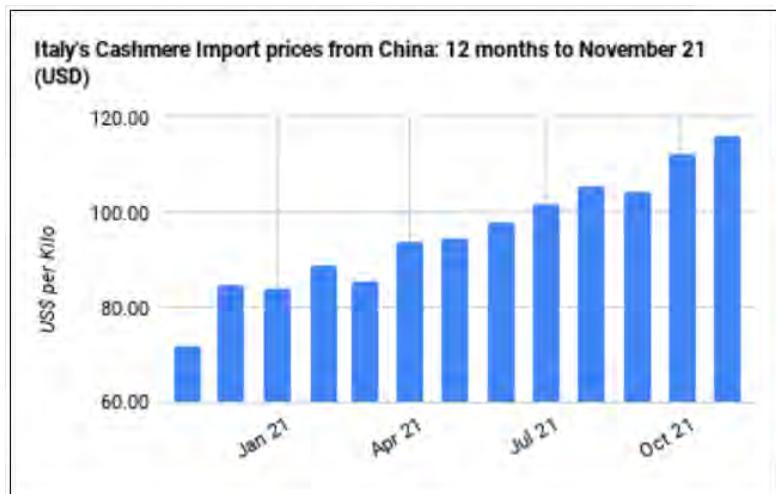


Figure 6: Cashmere prices in the last 5 years (Italy's Imports)

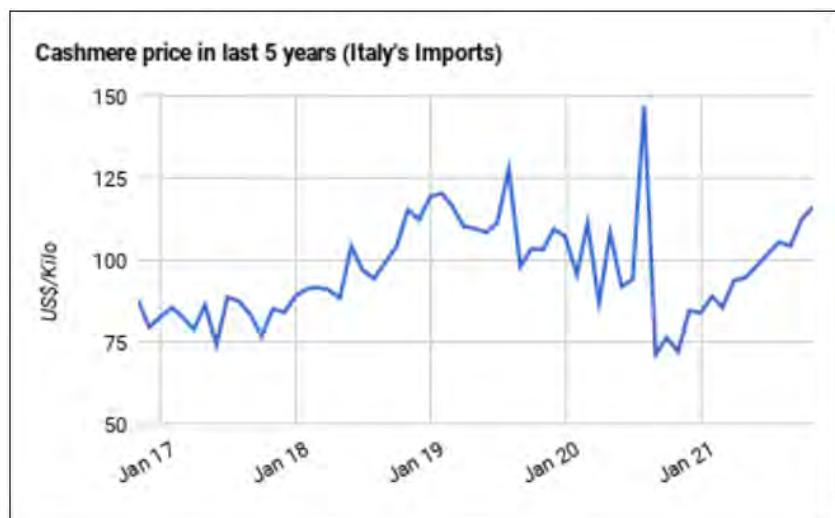
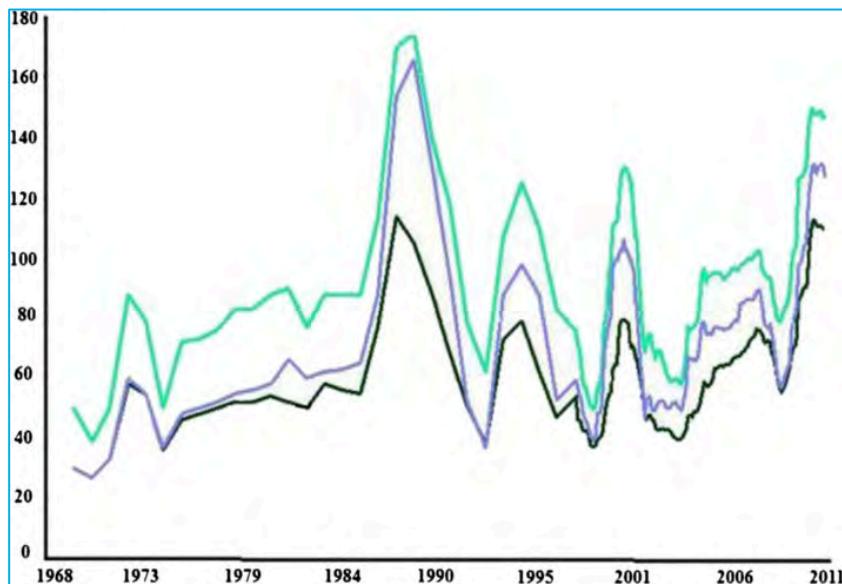


Figure 7: Cashmere dehaired price (in US dollars) in China, Mongolia and Iran 1968-2011

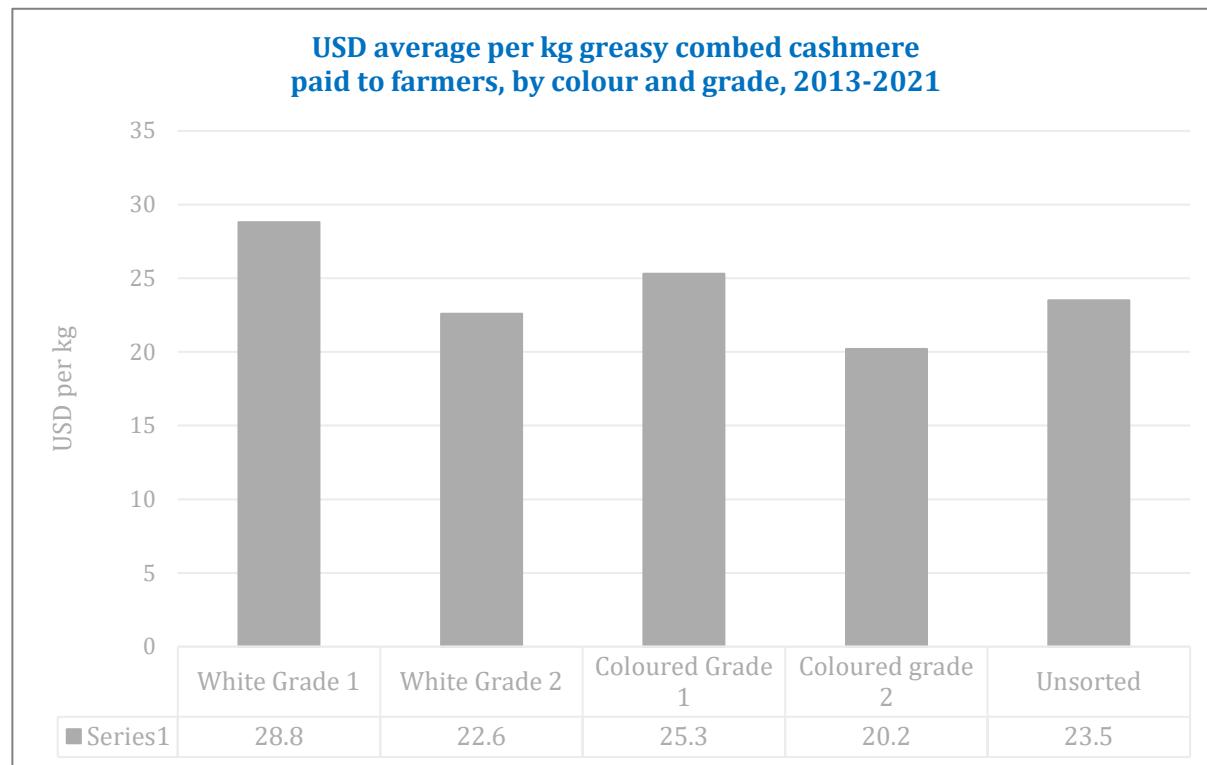


Source : China (green line), Mongolia (blue line) and Iran (black line) 1968-2011 (Schneider 2012). From Ansari-Renani et al. 2013.

In Kyrgyzstan until 2013, almost all greasy cashmere bought from farmers was bought as sheared fleece, containing both outer coarse guard hair and inner cashmere down. Combing goats was not commonly practiced except in certain regions producing a coarse non-cashmere goat fibre. Middlemen in the main cities bought fleeces and then exported the fibre to China for hand-dehairing, before the next process of scouring. By 2013, a USA company started training goat farmers to comb their goats and paying farmers a premium price for combed cashmere.

About 10 years ago, a foreign company started up in southern Kyrgyzstan and sought to buy combed cashmere. At the same time, an international donor project started training goat farmers on how to comb their goats and when to comb them. Trainers and the new company explained to the goat farmers that selling combed cashmere would bring them more income, compared to selling sheared fleeces to the existing local traders for onward export to China. As the foreign commercial company expanded over time and purchased from more areas, an increasing number of farmers were learning how to comb and also receiving combs from the company as well as the international donor organisation. A few years later, a large-scale European luxury firm began investing in training the Kyrgyz farmers to comb and sell higher quality cashmere, for which the farmers received better prices compared to their previous sales to the local traders who were exporting to large Chinese companies. This development process had begun earlier in 2003, when donor and research projects started to investigate the economic and commercial value of cashmere goats in the country.

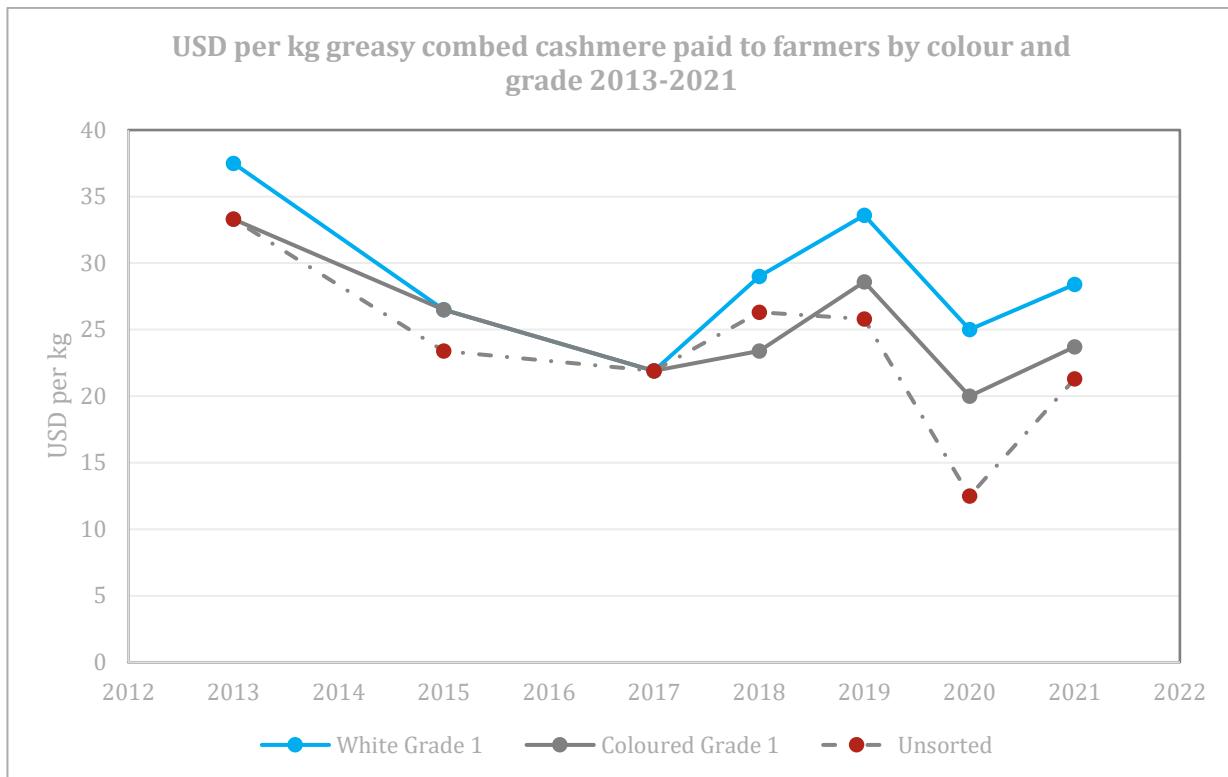
Figure 8: Average prices received by farmers in Kyrgyzstan for combed greasy cashmere, 2013-2021.



Note : Graded greasy bought by USA+Kyrgyzstan company for export to Europe. Unsorted was bought by traders in Kyrgyzstan city for export to China.

Source : Tuvet Cashmere NGO, Kyrgyzstan (S. Toigonbaev and C. Kerven).

Figure 9: Differential prices by quality grades over 8 years in southern Kyrgyzstan



Source : Tuvet Cashmere NGO, Kyrgyzstan (S. Toigonbaev and C. Kerven).

The USA+Kyrgyz company informs goat farmers in advance by phone that they will pay differently per kg offered, according to the colour (white versus non—white) and the estimated yield (proportion of cashmere down versus coarse hair and foreign matters such as vegetation, dung, scurf etc.). Thus White Grade 1 is priced highest, being white with least amount of coarse hair or foreign matter. As yield is also important for processors' profitability, even Coloured Grade 1 will attract a higher price than White Grade 2, as shown in Figure 5 above. Despite these price differentials promoted by the USA+Kyrgyz company, local wholesalers buying on commission or speculation for onward reselling to Chinese factories, often still offer farmers prices for unsorted combed cashmere comparable to the graded prices offered by the USA company. One reason is that these local wholesalers may receive more capital backing from the Chinese firms; this may allow the local wholesalers to effectively outbid the USA-backed company, which is viewed by established local buyers as a competitor for the scarce and valuable cashmere.

CASHMERE PROCESSING FROM THE GOAT TO FINAL PRODUCT PURCHASED BY CONSUMERS

Harvesting cashmere

Combing



Processors prefer to buy combed cashmere because it is easier and cheaper to dehair – mechanically remove the coarse outer hairs from the inner fine down, which is cashmere. Shearing (using scissors to cut all the hair and down off in one piece) produces less valuable cashmere as the fibre length is shorter and processors pay less for sheared fibre. Shearing goats in spring is also a potential great risk, as the goats lose their protection from unpredictable cold or rainy weather, and they can become sick, lose their unborn kids, and even die. Farmers who do not already know how to comb their goats need to be taught how and when to do this, by training and demonstrations. Farmers who do not have need to obtain them easily and cheaply.

Goat farmers in high altitude mountains of Kyrgyzstan (2,000 + metres high) have been trained how to comb their goats over the past ten years. They have received combs on loan or for free from international commercial companies wanting to purchase combed cashmere

Source : Shearing off tips of outer coarse hair before combing cashmere, Kazakhstan **Photo:** Carol Kerven



Combing should be carried out when the cashmere down starts to separate from the goat's skin and is lying in the guard hair. This happens as winter ends, the days become longer (more daylight) and the weather becomes warmer. The process, called moult or shedding, is biological and cashmere goats will always moult (shed) their winter down in springtime, which will start to grow back again as the weather gets colder in autumn.

Source : Cashmere goat shedding cashmere from undercoat in spring **Photo:** www.cashmerepeopleyarns.com





The disadvantages of shearing are explained according to the highly developed processing traditions in Jammu and Kashmir, India: “*No type of mechanical shearing can be done as this action would break the very fine fibre and make it impossible to spin. After the combing, the fibre arrives into the Kashmir valley in untidy bundles, which are then handed over to the highly skilled women with centuries of expertise behind them. It is first sorted out and the coarse outer hair of the fleece removed. The carded soft Cashmere is then made into loose little fluffy balls in preparation for spinning.*” (kashmirloom.com).

Selling cashmere by farmers to buyers

Farmers who harvest their cashmere goats can sell the cashmere to buyers, who can be local people working on commission for large-scale buyers in towns. In this case, the local buyers receive advance money from their employers to pay farmers for their cashmere in the farming villages. These buyers may be paid according to the amount and quality of the cashmere they collect from farmers and pass onto buyers in the towns. Their payment is a commission.

Sometimes the first buyers are self-employed and must raise their own funds to pay the farmers for their cashmere. Later these self-employed buyers bulk up and sell to bigger scale buyers in towns and cities. These buyers will sell the cashmere to bigger buyers at a higher cost than was paid to the farmer, as the buyers have to cover their transport costs, which can be high when goat farms are in difficult and remote areas to reach. The self-employed buyers also need to earn an income from their work, which takes place over a short season of just two or three months in spring.



official permits.

Goat farmers generally expect to be paid immediately in cash when they sell their harvested cashmere to the first stage of buyers. Some farmers can get informal credit in cash as an advance payment from some buyers, before harvesting their cashmere. This happens if the farmer needs money urgently, for example in late winter if the farmer needs to get feed for their livestock or food for their family. This can also happen if a particular buyer wants to ensure that farmers will sell to that buyer and not to another buyer. Some buyers will travel from towns to the farming area with foodstuffs like flour, cooking oil and potatoes, and barter the food for greasy cashmere.

There is competition between buyers to get cashmere at the lowest price. The best cashmere will receive a higher price when the buyer sells onto a bigger buyer.

The chain of buying greasy cashmere from farmers and sending it for first stage processing in factories is a long sequence in distance and time. The greasy cashmere can travel thousands of kilometres over several months, as well as crossing international borders, with or without official permits.

Source : Buyer from town inspecting combed cashmere from a Kyrgyz goat farmer - **Photo:** Sabyr Toigonbaev



Sorting by grade quality

Goat owners become motivated to sort their own combed cashmere into grades, when they become aware that buyers are willing to pay higher prices for the higher grades of cashmere.





"The time of the year when the members of the Looms of Ladakh women cooperative source the raw material from their own members. Sorting the colours and grades of the wool. Bargaining the prices, it's wonderful how the members are slowly starting to earn not only from selling the raw material, but also by adding value to it in its own cooperative"

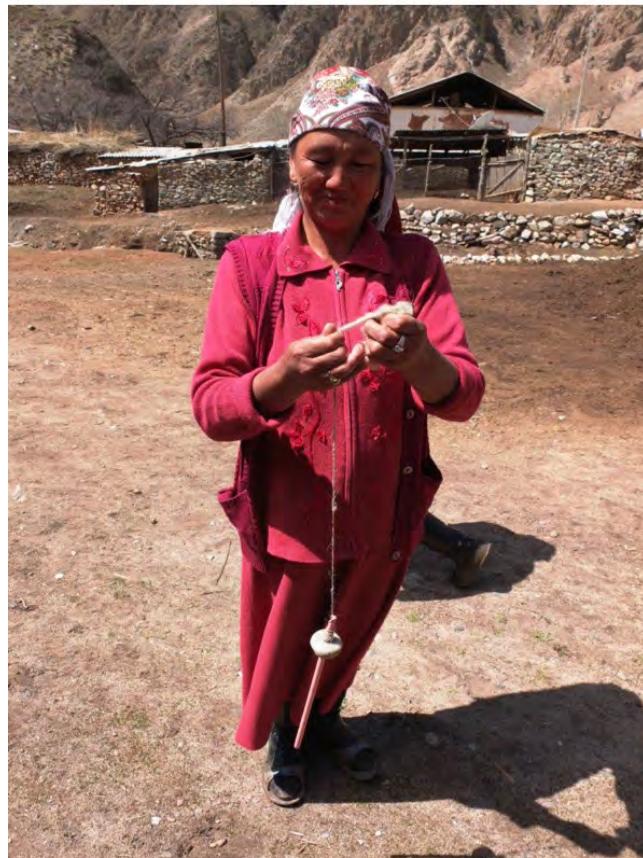
<https://www.facebook.com/LoomsOfLadakh/photos/4187021091376394>

Source : Ladakh pashmina cooperative. - **Photo:** Looms of Ladakh

Home processing of cashmere



<https://www.facebook.com/LoomsOfLadakh/photos/4306281382783697>



Industrial mechanical processing

Scouring

After greasy cashmere is purchased from farmers, sorted into different grades and bulked up by wholesalers, the first mechanical stage of processing is scouring;



The cashmere goat collects dust, dirt, and debris as it grazes through the wild. That waste along with the natural oils the animal accrues throughout the season must be carefully removed prior to further processing. The scouring process provides the critical initial wash of the fibre. Scouring conditions of the finer cashmere requires greater controls than normal wool. Care must be taken not to impair the lustre of the cashmere through strict controls of water rates, temperature, pH and the proper type and quantity of detergent. Errors in the scouring process may degrade the fibre's quality and ability to hold dyes. Every stage in the scouring process and subsequent drying is controlled to ensure no residues are left behind and the proper amount of natural grease remains with the fibre. Approximately 15-20% of the original mass is removed in this process". <http://www.awcashmere.com/the-process>

6,500. - Photo: Alibaba.com

Source : Small scouring machine made in China; USD 1,500 to



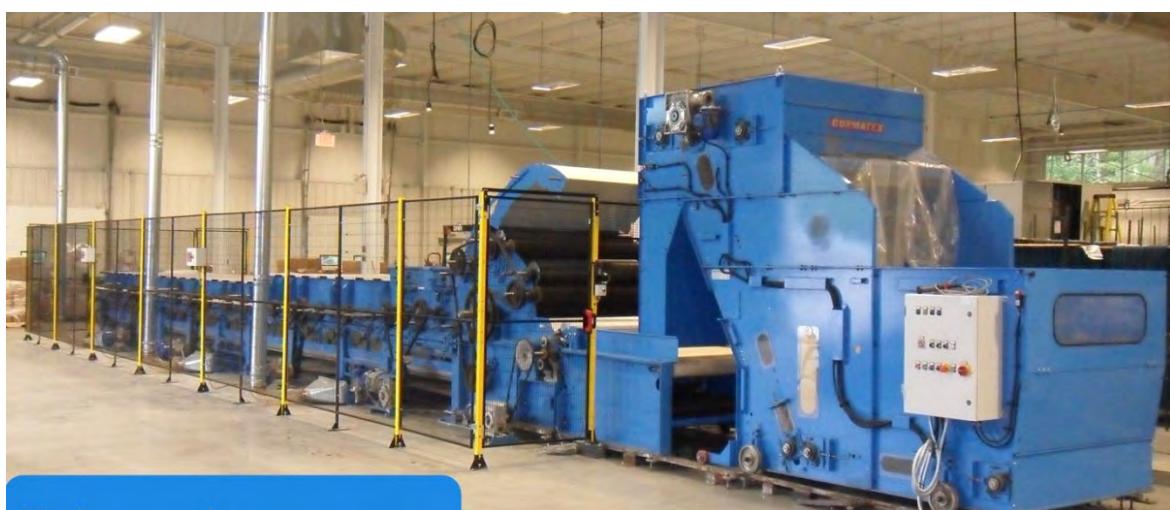
Dehairing

"Dehairing- The process by which machinery separates the coarse guard from the fine down fibres is called dehairing. Mechanical combing procedures utilize the difference in friction between these fibres to separate the two. In addition to separating the fibres, this process further removes any impurities that may remain in the cashmere. The end result of this process is extremely soft and fluffy pure cashmere. Approximately 35-40% of the original input remains at the end of this process."

<http://www.awcashmere.com/the-process>



<https://www.gschneider.com>



<http://www.cormatec.it/>



www.rosiesugden.com

Testing dehaired cashmere

There are significant price variations on cashmere according to its quality – usually defined by mean (average) fibre diameter in micro; mean fibre length in mm., and colour. There are other factors that make a difference in price, such as the sheen (lustre) or shininess of the fibre. Therefore, before agreeing to the

price of a consignment of cashmere from a wholesaler, processing companies often independently check the quality of the cashmere they intend to buy. This checking is carried out in animal fibre testing laboratories, which should operate to strict international standards, to maintain their reliability. Some large manufacturers use their own laboratories in-house.

"To ensure the high quality and value of cashmere, the fibres need to be measured in terms of scale density and thickness, pigmentation, diameter and other characteristics". [by] two commercially viable methods of cashmere microscope testing and measurement currently available: scanning electron microscope (SEM) and optical microscope. www.sgs.co.uk



Source Photo: www.gobicashmere.com

The Cashmere and Camel Hair manufacturing institute (Boston, USA) has identified a number of accredited laboratories for testing animal fibres including cashmere. These laboratories are located in China, Japan, Hong Kong, Italy, USA, South Korea, and UK.

<https://www.cashmere.org/fine-animal-hair-testing-labs-microscopy.php>



Laboratory testing for quality can be done on greasy or dehaired samples of about 5-10 g. Costs for testing greasy will be higher. The samples need to be collected in a systematic method, at the right season, at the right location on the goat's body, and accurately labelled.

Source : Testing drawn length of cashmere in a laboratory, a skilled job - **Photo:** Sustainable Fibre Alliance <https://sustainablefibre.org>

Dyeing

There are four different, but equally effective, ways to fibre: in its natural state, when it has been spun into yarn or woven into cloth and where smaller quantities are needed, hank dying (www.johnstonsofelin.com)



Like natural human hair, the chemical dyeing process can leave the raw fibres in a felted and matted state. To open the fibres and prepare them for carding they are teased out over a series of spiked rollers and sprayed with a light coating of oil to protect them in subsequent processes

Using vegetable dyes on pashmina hand spun in Ladakh, India.

<https://www.facebook.com/LoomsOfLadakh/photos/4158534640891706>

Source Photo: Looms of Ladakh, <https://www.facebook.com/LoomsOfLadakh/photos/4158534640891706>



Source : Machine dyeing with chemical dyes. - Photo: www.rosiesugden.com

Carding

Carding is a mechanical process that disentangles, cleans and intermixes fibres to produce a continuous web of fibre/yarn suitable for subsequent processing and spinning. The main aim is to further blend and align the fibres. It is achieved by passing the cashmere fibres between differentially moving surfaces covered with card cloth (this is sort of like sandpaper and is serrated so it can break down and blend the fibres). It breaks clumps of fibre and then aligns the individual fibres to be parallel with each other creating a "web" which you will see in the images below. www.rosiesugden.com <https://www.rosiesugden.com/2018/04/18/the-making-of-cashmere-yarn-part-5/>



After the fibre is blended into a colour or a mix of fibres, it is fed into a carding machine that works like a giant comb to straighten the fibres in preparation for spinning. Carding converts a continuous web of fibres into individual ribbons known as slivers or rovings.



Source : Carding. - **Photo:** www.johnstonsofelgin.com

Source : Roving. - **Photo:** FearnFarmFibres, Etsy.com

A sliver is a long bundle of fibre that is generally used to spin yarn. A sliver is created by carding or combing the fibre, which is then drawn into long strips where the fibre is parallel. When sliver is drawn further and given a slight twist, it becomes roving.

Worsted textiles differ from woollen textiles in that, after carding, they are subjected to gilling, a process to make sure the sliver has a more uniform linear weight and add lubricants. (Wikipedia.org)

Spinning

The rovings are then spun to transform them into yarn. Spinning twists the fibres together to give them strength and prepare them for weaving. The thickness of the yarn is determined at this stage by drawing the rovings out to a pre-determined degree.

Knitting



Woollen System: A method of yarn production from wool fibres that have been carded, but not combed or gilled. The fibres in the yarn do not lie parallel to each other

Worsted System: A system of yarn production from wool fibres that have been carded or prepared and either gilled or combed (sometimes both). The fibres in the yarn lie parallel.

Yarn: Fibres spun into a thread which can be used for knitting or weaving.

Source : Cashmere knitting machine. - **Photo:** www.alibaba.com



Source : Yarn cones for machine knitting or weaving - **Photo:** <http://www.cashmere-yarn.com>

Source : Knitted cashmere

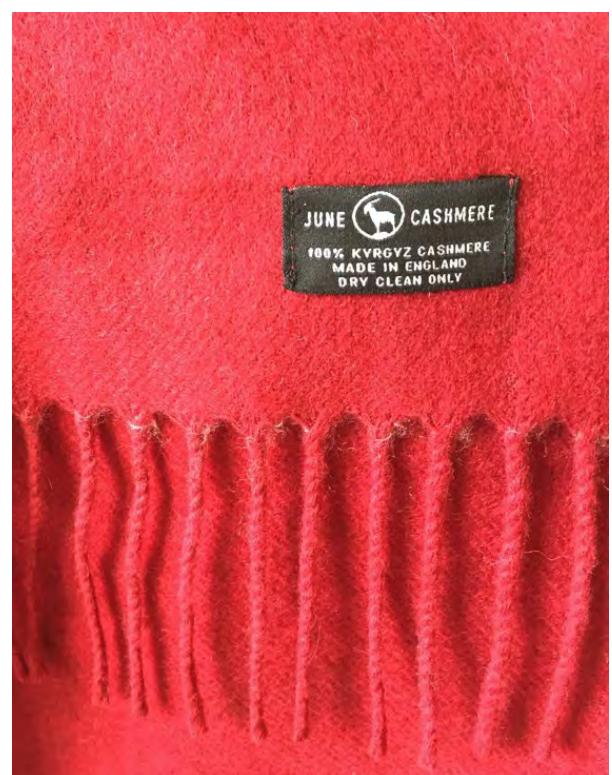


Weaving



Source : Scarf by June Cashmere. Photo: Carol Kerven

<https://www.junecashmere.com/collections/woven-scarf>





Source : Embroidering fine spun woven cashmere in Kashmir **Photo:** kashmirloom.com

ANNEX I FEEDBACK ON “GOOD PRACTICE GUIDE FOR IMPROVING THE QUALITY OF PASHMINA FIBRE” AND OTHER RELEVANT DOCUMENTS

This document was prepared in 2021 by the Ministry of Agriculture and Livestock Development (MoALD) in consultation with Nepal Pashmina Industries Association (NPIA). The guideline or protocol follows 10 standard good manufacturing practices principals and refers to existing animal welfare guidelines, Australian Industry Welfare Standards and Guidelines for Goats, and Good Cashmere Standard. These are all reviewed below, excluding Section 2.10 Health Management of the Good Practice Guide.

The following technical comments might need to be taken into consideration:

- Traceability from goat to manufacturing is impossible, unless very expensive high tech is applied.
- Practices for rearing goats and harvesting cannot be “mandatory” in Upper Mustang, given the potential costs and logistics that would be necessary for monitoring and enforcement.
- Different kinds of buyers have different requirements and standards. If aiming at the luxury international market, cashmere requirements will be more stringent than the “buyers’ recommended quality requirement of 17.5 micron and length of fibre within the range of 28 to 60 mm”. Luxury cashmere buyers typically require mean fibre diameter of 16.5 micron or less, and 36-40 mm length.
- Chyangra goat are not a separate species, but a local landrace (breed) of domesticated goat *Capra hircus*.
- Combing goats is not painful if done correctly by farmers who have been properly trained. There has been some propaganda by activist international organisations e.g. PETA, that goats are hurt by combing, but there is no evidence of this in the scientific literature.
- There is no scientifically-verified evidence that Chyangra goats are environmentally unsustainable, due to their role in climate change - “grazes by eating the roots of the grass and its hoofs desertify the land”. Intensive detailed studies in the largest cashmere goat- keeping countries of China and Mongolia find evidence that overstocking goats without seasonal movement to graze different pastures leads to changes in soil and vegetation. However, these are long-term complex effects connected to weather patterns, topography, markets, and government policies towards the environment and livestock-keepers.
- On the Nepali pashmina industry producing pashmina to meet the requirements of animal welfare, environment and sustainable production, international organisations with much funding have been trying to do this for years in Mongolia, which has 20+ million cashmere goats. Some progress made in Mongolia and western China, (e.g. the Good Cashmere Standard produced Aid by Trade Foundation (AbTF)). For Nepal, this is unlikely to happen quickly as the cashmere goat-producing peoples are remote, inaccessible, and have little practical contact with development agencies.
- Government of Nepal regulations on officially importing or exporting “raw” (i.e. greasy) pashmina will need to take account of phytosanitary prohibitions by many countries on importing or exporting greasy cashmere, i.e. that has not undergone scouring and possibly also chemical and/or physical disinfection.
- On pashmina farm registration and animal identification, e.g. “condition of Chyangra in the herd can be analysed and improved including performance recording, animal breeding improvement, disease surveillance, prevention and control, feeds balancing – microchips, ear tags, breeding records, insurance, etc. ”.
- Most of the proposals are very unlikely to be implementable in the isolated rural remote regions of pashmina goat production in the Nepal Himalayas. Perhaps a very few big scale goat producers can achieve a few of these goals. But even this would require having local-based, well-trained professional personnel to advise, monitor and support the registered farmers, along with appropriate new technology, and close support over a number of years. These kinds of activities are typically done on intensively-managed farms and research institutes with access to inputs and sufficient income, not in remote mountain individual farms in developing countries. These are not quick, cheap and easy processes to set up.
- Raw cashmere sources from individual goats cannot be traced. Only a partly or completely processed consignment of collected cashmere might be traced, but only with investment in expensive technology, which is being done by some European and Chinese firms.
- On food management and grazing: It will not be possible for Chyangra farmers to keep these kinds of records on goat grazing locations, periods and seasons. The goats are grazed on communal pastures for much of the year. Chyangra goat owners already know and practice most of the recommendations on seasonal movement to different pastures. It will not be feasible or cost-effective to calculate the stocking rate per pasture areas grazing. These recommendations are only relevant

for high-input commercial livestock farms in high income countries, with privately-demarcated fenced pastures.

- On management of weeds: Many of the plants named in the report are not grasses (scientific family of Poaceae or Gramineae) but forbs (herbaceous) or woody shrubs, which are generally preferred as browse by goats. This could be a translation issue.
- Access to grazing areas: This is very important for sustainable environmental management and continued production of high value cashmere. Some of these initiatives are being undertaken by micro projects under the NLSIP programme.
- Fibre collection and processing: These recommendations seem mostly relevant and are similar to successful practices of combing cashmere from goats in the major cashmere producing countries of China and Mongolia. The emphasis should be on training goat owners on how to comb their Chyangra goats calmly and effectively without hurting or frightening the animals. It is, however, infeasible to expect farmers to separately comb and sort cashmere from different parts of the goats' bodies.
- Mechanical dehairing and scouring of greasy cashmere is not being done on any scale at present in Nepal. Some manual dehairing is being done on a small scale by some companies in Kathmandu valley.
- Washing greasy cashmere is never recommended to be done on-farm by farmers, as this a specialised task requiring technical knowledge, chemicals and equipment.
- Record management: All this is only relevant to a research farm with trained technicians and funds for infrastructure and technical equipment. A farmer in Mustang, even a big one, is not going to do this, as it would serve the farmer little purpose. For 10 years in Kyrgyzstan for a small research flock of about 60 cashmere goats, with two scientists in charge part-time, it was very difficult to keep these records properly. Only in the last 3 years we have succeeded, with many external inputs, training, funding, and learning from our mistakes.
- Only three references are provided, and they are from highly developed countries with long experience of commercial cashmere goat management (China and Australia), with significant government support and inputs at farm level.

international cashmere goat standards and their relevance for Nepal

Good Cashmere Standard

FROM website: <https://thegoodcashmerestandard.org>

The Good Cashmere Standard® (GCS) is an initiative of the Aid by Trade Foundation (AbTF). The objectives of GCS are to promote animal welfare in cashmere production, encourage social responsibility in farms of all sizes, protect the environment and support biodiversity in Inner Mongolia, Peoples Republic of China. GCS makes the textile value chain transparent to all

Stakeholders: brands, retailers and consumers. International retailers and brands that join GCS buy

Sustainably produced cashmere at world market prices. In return, they receive support to smoothly integrate the raw material into their value chains. GCS-certified cashmere is processed in all the major textile production markets. At the end of the textile chain, partner companies pay a nominal license fee to the Foundation that is then reinvested to benefit the farmers and their animals in Inner Mongolia.

Inner Mongolia has a population of around 25 million inhabitants, millions of cashmere goats and a total area of 1.18 million square kilometres. The region is China's leading producer of cashmere, accounting for around 6,600 tonnes of global cashmere in 2018, representing 26% of the world's cashmere production.

Comment: This commercial scheme operates in Inner Mongolia, China, the mostly highly state-controlled and regulated cashmere producing region in the world. Regular checks are performed by independent auditors, e.g. Pur Projet in France, in order to monitor compliance with these criteria. Cashmere processors have to pay to join the scheme, which is internationally certified. The scale of cashmere production in Inner Mongolia is vast by comparison with Upper Mustang and neighbouring cashmere-producing Himalayan regions of Nepal. It would therefore be very costly to institute the level of monitoring required to join the Good Cashmere Standard scheme for the relatively very small level of cashmere production in Nepal at the present time. It is unlikely to be applicable to Upper Mustang in the near future, given the informal and unregulated nature of cashmere production in that region.

Australian Wool Industry Welfare Standard

FROM website: www.animalwelfarestandards.net.au

Fibre harvesting/shearing

G5.29 Care should be taken when shearing and crutching to minimise cuts, and severe cuts

Should be treated at the first reasonable opportunity.

G5.30 When harvesting fibre, consider:

- Stopping if cold, wet and windy weather is experienced or predicted and adequate shelter is not available
- Releasing newly shorn goats into adequate shelter or allowing goats to remain in the shed until the weather risk has passed
- Ensuring there is adequate feed and water available for newly shorn goats.
- Taking extra precautions in the first six weeks post-shearing, depending on body condition, pregnancy status and seasonal weather conditions.

Comment: Similarly, *the Australian Industry Welfare Standards and Guidelines – Goats*, by Animal Health Australia (AHA) 2020 is not relevant to Upper Mustang. These standards may be applicable to Australian angora and cashgora (crossbred angora and cashmere) goats, as the standards refer only to **shearing** goats, not combing, because Australian fibre goats are crossed between cashmere and angora breeds, producing a lower-quality fibre known as “cashgora”, which is generally sheared off their whole coat, rather than only the inner layer combed. Goats which are shorn are left with very little protective fibre, which means they are at risk of getting ill if they get wet and cold in rainy windy weather. This is not a risk for goats which are combed, as they only lose their inner down layer, which is already moulting, but retain the outer guard hair fibre, which continues to protect them against cold. The standards are therefore not relevant for value addition to Chyangra goats, since the Australian standards referred to shearing of goats, while combing is recommended for harvesting good quality cashmere from goats such as Chyangra.

So Good to Wear company (SGTW)

The Good to Wear foundation works with a model farm in Nepal on breeding as well as fibre value addition. Their website refers to importing goats from Australia to crossbreed with Nepalese goats “better suited for the local climate”, aimed to “kick-start the production of quality cashmere in Nepal and bring it back to its [sic] origins”. No further information on the type of imported and local goats was shown on the website. Developing a new breed takes from 5 to 10 years.

Document review based on minutes received from Mr. Sichan Shresthra, of a Zoom meeting on 18 December 2020, with Mr Bharat Dahal, SGTW and Mr Shambhu Pandey, Technical Advisor, SGTW.

- The company plans to create a new breed of goat for high pashmina fibre production in the tropical and sub-tropical zones of Nepal. No parameters for type of fibre were mentioned. They began by importing a new breed of goat from Australia (no specific breed or production parameters were mentioned) and cross-breeding with the local Khari breed of goat. Their aim is to produce a white crossbreed pashmina goat breed in a 10 year period, up to 2029.
- The company has a central farm and some satellite farms and uses stall-feeding with mineral supplementation for their crossbred goats, as they believe that quality of fibre will deteriorate due to rainwater if the “goats are fed in open grazing land” [Comment: there is no scientific evidence of this].
- The company has produced a package for goat rearing starting from 10 goats and up to 400 goats for commercial scale. In the package, three basic components (breeding, nutrition/feeding and health care) are addressed. There is a training package developed which also includes vaccination, de-worming, etc.; for developing health goats in Nepal.

Comment: It is not clear whether pashmina cross-bred goats can thrive or produce cashmere in the tropical and sub-tropical lower altitudes of Nepal. Goats which produce commercially valuable cashmere are mainly found in regions which have very cold winters. There, land race goats (both wild and domestic) have evolved to seasonally produce a layer of downy undercoat from their secondary skin follicles. Such goats are known as double-coated and can thrive in high altitudes or plains with cold winters.

ANNEX II ADDITIONAL INFORMATION ON CHYANGRA GOAT BREED AND FARMERS

The Chyangra breed of goat in Nepal

From Bhattacharai et al. 2019.

"The Chyangra goat is one of four indigenous breeds kept in Nepal and are the dominant breed across northern trans-Himalayan regions from an altitude of 2500–5000 masl from east to west. Nepalese goat animal genetic resources (AnGR) were not documented of the evidence of its potential and, therefore, Nepal failed effective marketing of its genetic materials. As a consequence, the population of the indigenous AnGR is diminishing drastically."

"Chyangra goats are the mountain goat originating from Tibet reared in trans-Himalayan region. They are suitable for meat and pack and are popular for high value as well as fine quality called Chyangra fibre known as Pashmina. Their population is declining and hence needs attention. They have been characterized at phenotypic and mitochondrial levels. Chyangra fibre has high market potentials, as they have unique blend and qualities and hence are popular within and outside the country. Chyangra population is estimated to be around 1% of the total goat population, i.e., 0.11 million heads in Nepal. Body colour varies from pure white to pure black with mixed patch of different colours. Its compact body weighs around 30 kg with body length of 62 cm and chest girth of 71 cm. Wither height is 62 cm. Body weight varies from 29 to 32 kg for females and 35–40 kg for males". "...the breed has not been understood completely in the sense of their quantitative and qualitative attributes. Limited information [is] available on morphological characteristics and growth traits. The breed is not fully utilized for its Chyangra cashmere production, and this is an area of importance where focus is required".

This detailed information about the Chyangra indigenous goat breed is extracted from a comprehensive review by Nepali scientists from the Department of Animal Breeding and Biotechnology in the Faculty of Animal Science, Veterinary Science and Fisheries, Rampur Chitwan; the Agriculture and Forestry University, Rampur Chitwan; and the Animal Breeding Division, Nepal Agricultural Research Council, Khumaltar, Lalitpur. However, some of the information about the cashmere production of this breed reveals that cashmere indices are not well-understood; for example, the article states that "Chyangra goats produce up to 2–3 kg pashmina fibre annually" (p.10). This must refer to the whole sheared fleece of a goat which includes the coarse heavy outer hair, rather than only the combed inner light weight fibre of cashmere, which generally does not exceed much more than 100g per goat/year in cashmere goats which have not been specifically bred to produce higher amounts of cashmere per year, as for example, some Chinese cashmere goat breeds (Waldron et al.2014). Likewise, in the discussion on "selection for pashmina fibre quality the article states a length to be selected: "length (4 inches minimum)"p. 11, which would be about 10 cm and far too long for any commercial cashmere length, which is generally between 3.2-4 cm (32-40 mm) length.

From Shrestha Sandesh 2019:

"The Upper Mustang region is inhabited by the Lhoba (or Lho-pa) people - Lhoba refers to "southerners" or "the people of the south" in Tibet (Figure 3.14). They are culturally, linguistically, and ethnically similar to those of neighbouring Tibet region (Fürer-Haimendorf, 1975; Jackson, 1984; Bista & Heide, 1997; Dhungel, 2002; Tulachan, 2003). People speak Tibetan dialects, practice Tibetan Buddhism, and often times identify themselves as "Historically Tibetan, but politically Nepali" (Shackley, 1996). The Lhoba people are traditionally traders, merchants who controlled the trade route along the Kaligandaki valley which was once a major trade route between Tibet, Nepal, and India, especially for salt (Shackley, 1994; Dhungel, 2002). The trade route operated until China's annexation of Tibet in 1959 (Dhungel, 2002; Tulachan, 2003)."

Lhoba people in the Upper Mustang region are socially stratified into three groups: Kutak, Showa, and Righin. The highest-ranked "Kutak" sometimes referred to as "Bista" as their surname are noble class. They constitute the Royal family and are mainly concentrated around the town of Lo-Manthang with very few populations. The second group is "Showa" who belong to the commoner class and are referred to as Gurung. They constitute the majority of the population in Upper Mustang. The third group called "Righin" are the lowest in social status. They use Bishwokarma or Bika as their surnames.

Study of Yara , a small village located in the eastern part of the Upper Mustang region situated at 29°5'43.23" N latitude and 83°59'58.43" E longitude at an elevation of 3650 m a.s.l. The village previously belonged to Surkhang village development committee (VDC)but now it belongs to Dalome rural municipality under a new administrative system of Nepal.

Sheep/goats are a great source of income generation for households; generally, based on the records from fieldwork the herd numbers range from 10 to 220 depending on how well-off the households are. Usually, a small number is kept by poor households whereas well-off households keep a large herd of sheep/goats for trading purposes.

The following quote is by a male respondent (30 – 40 years old) in possession of a large herd of goats. According to him, goats are bought from a local merchant in Tibet during the transborder trade fair which takes place in September – October. He further said that those goats are sold to merchants in southern cities of Nepal once they are fully grown up. (Household interview, 06/16/2018)

"Additionally, I have also kept goats. They are 150 in total now. I also have 2 horses. Goats have been brought from Tibet. We buy from the local merchant. Mostly we bring offspring of goats in September-October. We feed them well and they become ready to be sold in 4-5 years. We sell them in the market in southern cities (Beni, Pokhara). That is how we make money for our living, (Translation, 06/23/2019)"

"Rangelands have totally dried out nowadays. There is no grass for our goats, horses, and cows. If we get a good amount of rain and snow, then grass grows well in the pasture. And in the growing season, we take our livestock for grazing. But, now the grass is scarce. We have to feed our livestock by bringing grass for Tsarang village (nearby village from Yara). We have to transport a huge amount of grass on a tractor every year. (Translation, 06/23/2019)"

"we have to buy foods such as corn, wheat from the market to feed our sheep and goats. If we keep 100-150 goats/sheep then, they require approximately 50 ruck sack size of corn every year. (Translation, 06/23/2019)"

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Figure 4.16. Locals extracting goat hair in Yara (Date: June 2018, Source: Author)

Acharya et al. 2017

"The migratory Transhumant system of movement of animals to the alpine meadows and temperate pasture in summer and to the lower altitude pastoral, forest and cropped areas around villages is the common animal production system in Trans-Himalayan region of Nepal. The herds of Yak, Nak, Chauries, Chyangra goat and Bhyanglung sheep are taken to the alpine meadows and temperate pasture for four months from June to September by keeping them in different pastoral areas depending on the feed availability and climatic condition. With the onset of cold weather as the winter approaches, the herds are brought down close to the village forest, pastoral land, crops residues in harvested cropped land. During the snow falls, these animals are fed with hays and crop by products like straws and chopped fodder root crops mixed with water and salt".

From Koirala, A. and Shrestha, K.B., 2017

"Mustang District is situated in the rain shadow area and receives an average rainfall of less than 260 millimetres (mm). The mean minimum monthly air temperature falls to -2.7°C in winter, while the maximum monthly air temperature reaches 23.1°C in summer (NTNC 2008). Mustang District has a total land area of 3,573 square kilometres (NTNC 2008). The classification of land use shows an unusually skewed distribution: 39.1 percent of grassland, 28.08 percent of forest land, and 6.19 percent of agricultural land".

From Aryal et al. 2013

Mustang district, located in the High Mountain zone in central Nepal, where rangelands extend northward onto the Tibetan plateau. The district is sparsely populated, with the lowest population density (4.1/km²) in the country. Historically, agriculture and animal husbandry are the two major economic activities of the traditional people in Mustang district (NBS 2002). However, the district is characterized by low agricultural productivity because of low annual rainfall, lack of proper irrigation facilities, low temperature, and a single growing season (Chetri and Gurung 2004). Due to environmental constraints and the limited amount of land suitable for cultivation in this zone (2500 km²), animal husbandry is the primary source of income for people in the region (Aryal et al 2012a, 2012b). A long tradition of goat and sheep trading from Mustang to China reflects the social-cultural value of animal husbandry in the district (Chetri and Gurung 2004; Pokharel et al 2006; Aryal et al 2012a, 2012b).

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