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At what point does Cashmere get lost in the blend?

Blending Cashmere Fiber with three grades of Wool

Submitted to Olds College
Jayne Deardorff
March 2013
“A teacher affects eternity; He can never tell where his influence stops.”

Henry Brooks Adams
(1838 – 1918)

Cashmere fiber producing goats on the ME 2 FARM in Colville, Washington, USA
Cortney, Myself, Karey

Dedicated to my daughters, Karey & Cortney, who have inspired and encouraged me to go after my dream and finish this course.

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Abstract

The main objective of this report is to explore how cashmere fibers are lost when blended with three grades of wool and how that affects the finished yarns. This research was done to see if it is worth the time, money and fiber to blend cashmere fiber with wool, and if so is a blend of 25% cashmere worth the work.

I used one goat’s down with a micron count of 18.5 and blended it with a superfine Merino, a fine woolled Targhee, and medium fiber Montadale wool. I chose these fibers because they were easy for me to obtain, and I felt that by using these 4 fibers it kept some parameters on the project.

This research was both exciting to explore, and also very interesting to see the end results. An interesting thing I found out is that, when it comes to the blending of cashmere fiber, the opinions greatly varied, depending on who you talked to. I also discovered that there is not a lot of written information on cashmere fibers and blending.

At the start of doing the work on this report, I assumed that I would really love the Merino wool-cashmere fiber blend the best; however the blend that I enjoyed the most is the Montadale wool-cashmere 50/50 fiber blend. I think that this blend has the most varied uses. Before mounting the samples in the book, I had my husband lay out the labeled samples for me in a blind touch test. With my eyes closes, I let my fingers do the walking and still I picked put the Montadale-cashmere blend.

Being well informed about the history, and properties, of the cashmere fiber, I feel, is of great importance. As a breeder of cashmere fiber producing goats, it is my job to explain why this is a higher priced fiber. It is also important to show different percentage blends, to document this for others on how these fibers are complimentary to each other.
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Introduction

In my exploration of the blending of cashmere and wool fibers, it has been a wonderful journey, and I hope it shows that cashmere works well in a blended yarn without losing its desirable characteristics. In doing this research it was interesting to hear the different opinions that people have when it comes to blending cashmere. Some say it is almost a SINE to blend this wonderful fiber and others say you MUST blend it to have a yarn that is better and more affordable. It is important to remember that whatever your viewpoint you take spinning cashmere fibers, whether blended or pure, will be a joy in your hands!

Living on a farm where we raise our own cashmere fiber producing goats along with Registered Montadale sheep, I have access to many fibers. For this project I explored the blending of the fiber from one cashmere producing goat, with three different breeds of sheep, each having a different wool micron count. In the dyeing portion of this study I used the different percentage cashmere/wool yarns I created, to see if there was any affect on the handle, look, and dye absorption in the finished yarns.

The cashmere fiber used in this research project was harvested from a higher micron fiber count mature white colored goat in my herd. I could have used a fiber goat that produced a much finer fiber, but this is the only white goat that I could catch the day we were taking fiber samples. This cashmere sample from this doe’s shoulder fibers has a micron count of 18.5. By using the fiber from only one mature doe, there will be some limitations with the end results, but I feel that for this project, it is important to keep the cashmere fiber as a consistent factor, as I am looking into the way the cashmere fiber blends with three different wools. I feel that if different microns of cashmere fibers were used, this project could go on for a long time. I wanted to show a sample of what can be done and leave the door of opportunity open for others to explore.

In working doing this study I felt that by using the fiber from just one cashmere goat, it may change the parameters of the proposal but in the end it will give the people who wants to use my findings on this project, a more realistic view of how the cashmere
fiber can be effected by the blending of different percentages of wool with different micron count.

The three different wools that were used in this project were as follows: first Merino from a commercial preparation with a spinning count of 80 and a micron count of 18; second, Targhee fiber is from a friend’s band of sheep, and has a micron count of 19.1; and finally wool from my Montadale flock with a micron count of 26.8. I wanted to use wool fibers which I had on hand and which would be accessible to other spinners who might wish to duplicate my studies.

In reading this research project, I hope that spinners will understand more of the history and characteristics of this luxurious cashmere fiber, providing opportunities for the use and enjoyment of these wonderful cashmere-wool blends.
History of Cashmere

The origins of these high altitude goats, I found to be very interesting. The roots of this wonderful fiber can be traced back to part of the Tibetan Himalayas known as Kashmiri, from whence the English word ‘Cashmere’ derives.

This area where the cashmere fiber producing goats originated is bordered by India, Pakistan, China and Afghanistan (Black Drummond, 1993).

Starting in the 15th century the Tibetan tribal people began to comb and dehair the fibers. They spun the cleaned undercoat fibers into fabric to be used for very soft shawls and cloaks to be worn by the royalty. Later on this region became known as “Kashmir” after the goat’s fiber that started the main industry of the area. (Black Drummond, 1993)

Some of the area cashmere goats shed their fiber in the spring before they could be combed, as they were herded to summer pasture in the mountains. This shed fiber was collected off of the shrubbery by the native people (Crest Jewel, 2010).

Because they faced political unrest the nomads and their fiber producing goats were pushed to higher ground in the harsh Gobi Desert climate. The herds of goats were increasingly selected for improved undercoats with finer and finer fibers, as the goats with the finer fibers were able to keep from freezing to death (Black Drummond 1993).

Cashmere fibers first became popular in Europe by Napoleon Bonaparte’s wife Josephine Bonaparte. Josephine is said to have received the first cashmere shawl brought to Europe. Merchants from England and Portugal brought cashmere shawls to Europe in the 17th century and presented them to Josephine, who then became very fond of these special shawls. Her collection of cashmere shawls began a fashion trend that led to the exportation of these wonderful fibers to the world. Cashmere shawls were so fine that the entire light weight, durable, and very warm garment could easily be passed through a lady’s wedding ring (Black Drummond, 1993).
In 1850, Joseph Dawson and Alexander Johnston of Scotland revolutionized the cashmere fiber industry by independently developed the machinery needed to separate the guard hairs from the undercoat creating a “dehairing machine”. Before this new machine was developed, the fiber was separated by hand, a time consuming and labor intensive process (Forte Cashmere Co., 1997)

After World War II, the cashmere market started to move from Europe and Japan, to the United States and Canada, where fine luxury goods were in demand. The conflict in Korea helped to start the use of cashmere fibers other than white, as the importing of fine white cashmere from China was closed at that time. Continual political unrest in that part of world has helped to drive the production of cashmere fibers in North America (Black Drummond, 1993).

In 1939 the U.S. Wool Products Labeling Act defined cashmere fiber as being a maximum diameter of 19 or less microns. It also stated that no more than 3% by weight of the cashmere fibers can be over 30 microns (Cashmere and Camel Manufacturing Institute, 2001)

The development of the cashmere fiber industry in Australia and New Zealand began in the 19th century. Cashmere goats were not native to Australia, but were brought in by settlers as a source of fresh milk, meat and fiber. As many of the goats escaped and ran wild, they banded together and became the feral or ‘bush’ goats of today. Only the hardiest of the goats survived in the wild. In 1973, Dr. Ian Smith, From the University of Queensland, noticed their cashmere-like undercoat. Studies of the animals found that about 1 in 10 of these feral goats produced soft down. Some of the feral goats showed traits of the angora goats. Research on the fibers harvested from these goats found the fibers were non-medullated, meaning they do not have the honeycombed-like central core that is found in the coarse guard hairs, and therefore an Australian cashmere industry based on these goats developed (Feldman-Wood, 1985).
The cashmere industry monopoly held by Scotland continued until the early 1980’s. At this time, the breakup of the monopoly began with Deng Xiaoaping of China, as he had the Chinese government relax the state controls on this fiber just as the cashmere garment industry was growing in Italy.

Starting in 1980’s the herdsmen of Mongolia, which is a province that borders China, began to be allowed to sell part of their fiber clip on the open market. Control of the sales of cashmere fiber has not been well regulated, thus the results being a flood of mostly poor quality of cashmere on the market (Crest Jewel, 2010). The fiber from the region of Mongolia is known to be longer, slightly coarser and more lustrous when compared to cashmere produced in other parts of China. The luster and texture in the Mongolia fiber shows the influence of the Angora goat in its history.

Many of the cashmere producing goats in North America can be traced to the feral goats in Australia. Ann Dooling was very instrumental in 200 goats being brought to the United States in the 1980’s. This had a big impact on this new industry. In November 1988 a meeting was held in Longmont, Colorado and the North America Cashmere industry was born (Dooling, 1990).
Fiber Analysis

Cashmere fiber is the “fiber of kings” for good reasons. It is one of the warmest fibers available, eight times warmer than wool.

The garments made of this fiber have been found on mummies dating back more than 3000 years in China’s Tarim Basin. Another interesting idea that I came across is that this luxurious fiber may have even been used as a liner of the Arc of the Covenant of the Old Testament. I found this written in articles found on the internet, (All about Cashmere, 2010), and also in different books.

This fiber can be used for both men’s and women’s clothing such as, coats, jackets, blazers, skirts, hosiery, sweaters, gloves, shawls, scarves, blankets, mufflers, socks, caps and robes, to name a few (Cashmere and Camel Manufacturing Institute, 2001).

Fiber from a cashmere producing goat, whose scientific name is “Capra hircus,” consists of two main coats. The undercoat or down, is seasonally released from the animal, and produced from secondary follicles. The primary coat, known as guard hair, is important as it protects the animal and its fine down layer from severer cold winter weather. This outer or guard hair is not seasonally released and must be sheared from the animal (Cashmere and Camel Manufacturing Institute, 2001).

There are two other elements to the coats of the cashmere fiber. The first of these elements is a fiber sometimes called tertiary fiber. This tertiary fiber is also referred to as an intermediate or heterotype, and is a very fine guard hair. It is found in some fleeces, but is an undesirable fiber because it is almost impossible to mechanically remove. It will make the finished yarn have a ‘prickly’ feel, and will greatly lower the value of the fleece, (Forte Cashmere Co, 1997)
The second additional element in the coat of a cashmere goat is a kemp fiber. Kemp fibers have a hollow structure, white in color, and do not take up dyes. This fiber also has a stiffer structure and is difficult for the dehairing machine to remove, thus resulting in a ‘prickly’ finished yarn (Forte Cashmere Co. 1997).

The goats’ fleece grows from June 21, the summer solstice, to the winter solstice, December 21. After December, the weather will dictate when each animal will release the fiber and shed out. The release or molt of the undercoat fibers is triggered by the spring equinoxes with the longer daylight, the plasma prolactin in the individual fibers changes and down is released.

“There is no such thing as a cashmere goat” stated Liz Gipson in an article written for ‘Handwoven’ magazine (Gipson, 2009). In this article, Liz goes on to explain it is not the breed of the goat, but the ability of the animal to produce the down fiber that is referred to as ‘cashmere’. Through selective breeding over the centuries, some types of goats produce a much better cashmere fiber than others. Only those goats that produce this wonderful downy fiber can be referred to ‘cashmere goats’. Today the cashmere fibers are collected by hand combing or shearing once a year. Combing the down fibers from the goat must be done carefully. Over zealous combing will stretch and or break the fibers, resulting in poor quality fibers that will produce yarns with a tendency to pill or to be weak.

Both coats of fibers can be used when goats are shorn. The outer coat, or guard hair, is used for carpets and outerwear in Asia and woven into tent fabric by the nomads. This coarser outer coat is easily distinguished from the undercoat, and a difference of four times the diameter of the guard hair to the down is recommended so that it can be mechanical dehaired easier. The guard hair can be long or short, but should be long enough to protect the tips of the downy undercoat fibers (Meech, 1996).

The guard hair can be of the same or different color than the down, as both styles are acceptable in a judging competition. As a cashmere fiber producer and a fiber
processor, I prefer to have the two coats similar in color as this makes it easier to dehair. An example of this is a fleece that has black guard hair with white down, is not as nice to process as a fleece that has brown guard hair and beige down.

A questionnaire was sent out to several different people who are in the cashmere fiber industry. Some of the people taking part in the survey were animal owners, processors, spinners, weavers, mill owners and fiber instructors with the answers widely varied. Some of the information that was gathered is used throughout this report, including the following.

Cashmere producing goats can be found in many colors including, white, grey, brown, black, and also multicolor. The color of the outer coat, or guard hairs, does not always determine the color of the cashmere fiber. In general, cashmere falls into a limited number of color divisions. Diana Mullins stated on the questionnaire I sent out, “In North America there are 4 different main colors of down fibers recognized, with several variations in between," (Mullins, November 2009.)

The main classification for the different colors of cashmere fibers are as follows:

* WW – white cashmere with white guard hair, also called Super White.
* WC – White cashmere with a few scattered colored guard hairs, known as White/Colored
* GY – White/light colored cashmere with any colored guard hair, refers to Gray
* BR – Medium/dark colored cashmere with any color guard hair except white, or Brown
* MC – Mixed Colors

(Cashmere America Fleece Appraisal Form Key - found in CASHMIRROR magazine June 2003, pg 15)
Micron classification can vary in different parts of the world. In Australia the fiber diameter is classified as follow:

- Super fine – less than 15 microns
- Fine – 15 to 16 microns
- Medium – 16 to 18 microns
- Strong – 18 to 20 microns (Black Drummond, 1993)

This compares to classification used in the United States.

- Code 1 – less than 16.5 microns
- Code 2 – between 16.5 and 19 microns
- Code 3 – Over 19.0 microns
- Code 4 – No value (Black Drummond, 1993)

Using the above classification codes, anything over 19 microns is not considered to be cashmere but is classified as “cashgora”. The higher the number of the micron count, the courser the fiber (Black Drummond, 1993).

Figure 1: Illustration of fiber comparison. *Cashmere’s Story* by Forte Cashmere Co. - CASHMIRROR Magazine, March 1997
When examining at cashmere fiber, it is important to take note of a very important trait, which is **Character or Style**. Character is the type of crimpy structure of the fiber. Cashmere is crimpy, as compared to wavy, with a very soft handle, but is lacking in luster. The crimp or curvature in the fiber is very important and allows the finished garment to be warm without being heavy. In addition to producing warm but light garments, the crimp in cashmere fiber is very important, as without it the yarn will harden during fulling, rather than soften, and nap of the fabric will not brush evenly. According to Judith MacKenzie “The more crimp it has the finer it can be spun” (Mackenzie, 1999).

In cashmere, the correct crimp characteristic is, crimp that is as wide as the unextended fiber is tall, described as “deeply lobed crimp”. In a conversation with a cashmere producer, Diana Mullins, she stated the following, “character lets the cashmere hold its shape and makes the fibers springy, along with incredibly warm and lightweight as it allows air pockets to be held in the fibers. The unique character of the cashmere fiber comes from both the crimp and the fineness.”

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**Cashmere Fibre**

Fibre has a lot of crimp - 17 micron diameter.

**Cashgora Fibre**

Fibre has little or no crimp, but fine waves - 20 micron diameter, showing Mohair tendencies.

**Mohair Fibre**

Fibre has coarse waves - 24 micron diameter

Fine mohair, smoother fibre.

---

Figure 2: Illustration of fiber style. *Cashmere – A complete guide from fibre to fashion*, By Sue Meech
Although the cashmere fibers do have scales, the scales are very smooth and elongated. This makes for a velvety, light-absorbing, not lustrous surface that is harder to felt. Cashmere fiber can fade if left in the sun for longer periods of time. Something that I found out, by accident, is that this delicate fiber will fade even in natural light. The sample that I left in the sun was a darker shade of cashmere and it faded in an uneven pattern.

“China produces the best cashmere and thus sets the yardstick standard for all other cashmere fiber to be judged against” stated Angus McColl of YoCom-McColl fiber testing, in a phone call on March 15, 2011. Chinese also harvest the best white colored fiber having very little luster with a wonderful soft hand, as compared to other fiber that is produced in North America and Australia. The more luster displayed in the cashmere fibers produced in North America and Australia, shows an indication of the influence of the Angora goat. This Angora influence with the extra luster makes the cashmere fibers coarser. You can also find the Australia influence in the cashmere fiber in the guard hair, as it will be longer as well as very shiny and silky. This type of guard hair is very hard to remove and I found out from using my dehauling machine. By leaving in a bit of this fine guard hair does add a bit of shine to the yarn.

During the phone conversation with Angus McColl on March 15, 2011, he talked about how Mongolia does not produce a clean white color, but they blend the cashmere fiber with Yak fiber to improve the whiteness. He talked about how the blend is made as they comb their goats. The process that they use is to take two swipes with the comb from the cashmere goat, then one comb swipe from the Yak animal.

The staple length of good cashmere fibers should be at least 1 ½ to 2”. Any fiber that is shorter than 1 ¼” should be avoided, as it can be ruined in the combing or shearing process and is very difficult to spin either by hand or commercially. The shorter fibers are usually found around the neck or britch area and should be discarded. Staple length of the down fiber is usually not a consideration as long as it meets the minimum on length.
Quality cashmere should have an extremely soft feel and not be ‘silky’ or sticky. The fiber should be free of dandruff and have no visible debris. Inexpensive cashmere may be a lower grade or even the waste from the dehairing machine.

A high yield of cashmere from one pound of raw shorn fiber is 10 ounces of down fiber, with a diameter of less than 19 microns, as compared to the average fiber production 4 to 6 ounces of undercoat. A single fleece, after it is cleaned and processed, should yield no less than 4 ounces of spinning down. It takes the cashmere fiber producing goat four years to grow enough fiber to make one sweater (Angora Goats the Northern Way, 1993).

Factors that are important when looking at a cashmere fleece are:

1. Micron
2. Style or Character
3. Length
4. Yield

"Angora Goats the Northern Way by Susan Black Drummond, Pg 191"

Things to avoid are:

1. Matting or felted spots in the fleece. This condition is common in goats that are not shorn or combed before the start of the natural shedding.
2. Weathered tips, which are a result of exposure on unprotected down fiber tips to the sun and weather. Weathered tips will not accept dyestuff easily and may be brittle. This condition may also be known as ‘tippy’.
3. Weak or tender spots in the fiber structure. This is a concern as it can lead to breakage in the machinery processing and will affect the quality of the yarn produced.

Three things that have an effect on the quality of the fiber produced by the goat, are:

1. Age – the fibers get coarser as the animal ages, although genetics can make a difference in the cashmere fiber produced.
2. **Sex of the animal – males produce finer cashmere.** Whethers (neutered males) animals produce the best down as they do not have the changing of hormones as the does and buck experience, but in keeping a whether make sure that the animal has uniformity in its fleece.

3. **Nutrition – goats are a broad leaf browsing animal and are often overfed.** North American animals are too well fed and I like a quote from Angus at YoCom McColl fiber test station, were he shared his favorite saying, “Fat animals have fat fibers,” during a phone call on March 15, 2011.
Blending

The question that is asked is “why blend?” With such a wonderful fiber that will stand on its own merit, why would anyone want to blend cashmere?

Handspinners today have available an extensive array of fibers. The ability to be able to blend helps to make an expensive fiber like cashmere go further and opens up more avenues of end use. For this project I chose to blend wool and cashmere in hope that the desirable characteristics of both fibers would be enhanced. Softness and warmth will be the factors that are offered to this blend from cashmere fibers along with wool adding memory and loft, to this new blended yarn.

With the use of blending, the fiber artist can spin yarns that have superior quality and a very unique signature.

In doing the research for this project I chose to use just three grades of wool for the blending, and then show the end effect of the fibers when used at five different levels. It was interesting to see when the amount of the cashmere drops in the blends, so does the softness of the yarn along with the grist of the yarn going up. This part of the project was fun as I watched the cashmere disappear into some of the blends.

An important thing to remember when blending down fibers like cashmere is that these fibers need a lot of twist for strength and to prevent the yarn from slipping apart; however, when blending down fibers with fine crimpy wool, much less twist is needed for the yarn to retain the softness of the fine fibers, and stay together.

When blending, it is important to first look at the characteristics of each fiber and to define their strengths and weaknesses.

There are two different main ways that you can combine fibers. The first way is to blend the fibers by carding. This form of blending integrates the fibers and can be
done on hand cards, a drum card or commercially on a carding machine. The hand cards provide a way to work up a small batch for blending, but a motorized drum carder opens up more possibilities and is less labor intensive.

Technique in carding is important. When hand carding be careful not to put too much fiber on the hand cards, using only about one third of the cards face and also use care to let the teeth of the card barely touch, to avoid fiber damage. "When blending cashmere fibers, a medium or fine card, 104, 110 or more teeth per square inch cloth should be used with a fine or cotton cloth being the best choice," as suggested by the owner for Howard Brush Company, when I had a phone conversation with him in August 2009.

In May 2012, I interviewed Caroline Sommerfeld who is a gifted spinner, fiber artist and teacher. She stated that she prefers to use a hand card with 72 teeth per inch, as she finds it harder to use the finer cloth in teaching because her students are more likely to produce noils in the blends.

Paula Green, owner of the ‘Patrick Green Carders’ recommended using an exotic "fur" cloth on a drum carder. During our phone conversation, she recommended that a very fine and flexible wire teeth on a “fur” cloth with low density, for blending exotic fibers like cashmere works the best. The density of the cloth refers to the number of teeth on the carding cloth per square inch, also called TPI (teeth per inch). The standard TPI on carding cloth is 70 – 90 as compared to the TPI on fine carding cloth is 90 – 120.

As you card fine fibers on a drum carder, remember that the amount of fiber that can be fed into the carder depends not on the total weight, but on the number of fibers that you are working with in a batch. The finer the fiber you are using, the higher the number of fibers the carder will have to work with, and the finished batts will be of a lighter weight.
Some of the things, I have learned through owning a carding mill, are to keep in mind the diameter, length and the flexibility of the carding cloth teeth, as this can influence the outcome of blending. Another thing to do before you start blending is to make sure that your fibers are clean and not sticky as this will end in breakage and noils in your roving. Noils occur when the carding fibers are too long or dirty, as the fibers will then hang up or wrap around the carding cloth teeth thus putting extra stress on the fibers resulting in fiber breakage.

When carding, I weighed the different fibers as it is important to keep your percentages even throughout this process for consistency. I put the fiber through the small carder 3 to 5 times to get a homogenous blend. I only had to put the fiber through the commercial carder 2 times for a good blend. On the handcards I found that when I made batts that had been carded 2 times and then went back and after pulling the batts apart lengthwise, I mixed up the order of the two halves, recarded the mixed small batts two more times, and felt that the fibers were then well mixed. I personally preferred to have my fibers well blended. I did have to watch that I did not over process the fibers, might cause breakage.

One problem that arose when carding, especially fine fibers like cashmere is a buildup of static. To keep down the static that may arise is to very lightly spritz the fibers with water just before you start carding. Paula Green has a recommendation of using a teaspoon of fabric softener with 3 to 4 ounces of water to cut the buildup of static. I found that using, “Downy Wrinkle Releaser” works best for me.

Blending fibers when you ply is a second way to integrate the wool and cashmere fibers. When using this method of uniting the two fibers, it is important to make sure that the strength and length of the chosen fiber be considered but, the most important factor to look at is the elasticity and shrinkage of the blending fibers. A good quality of cashmere having elasticity matching that of fine wool will make for a good blend. If you blend, cashmere with wool that has little or no crimp, the yarn will have the appearance as a
novelty yarn, because the two different fibers may react to the water differently when fulled and one fiber may shrink differently than the other.

When taking a class from Caroline Sommerfeld at Olds College Fiber Week, she presented an interesting fact, “blending by plying, will yield less yardage as compared to carded blended yardage”. This occurs because there is less air in the cashmere ply, and that cashmere is not stretched as far as it is when card blended with wool.

The beautiful Orenburg shawl, made with fine cashmere yarns that are plied on the Russian spindles consist of one strand of fine cashmere along with one strand of silk.

I found that I liked the blending part of this project. After trying all of the different styles of carding the blends, I like the fibers best when blended on the commercial carder into rovings.
Spinning Cashmere and the New Blends

Because cashmere fiber is expensive, some people are nervous about spinning, but this fiber can be a true joy to spin if some basic principles are kept in mind. Cashmere is very similar to other fine fibers as these fibers are shorter and do not resist abrasion, they should be spun with a tight twist to produce a durable yarn.

As cashmere is a finer fiber than most wool, it will naturally want to be spun as a thinner yarn. If a thicker yarn is desired, it is better to ply using 2, 3, or 4 ply’s of fine singles rather than having heavier grist on the singles. The finished yarn produced by more plies of finer singles is better as compared to a yarn with thicker singles, because in the singles the twist is touching more individual fiber thus helping to keep those fibers from migrating out of the yarn, and it will still keep a soft handle on the finished yarn.

An interesting finding from my fiber processing career, is that if there is a big difference between the blended fibers in micron count, the finer fiber will want to migrate to the center of the yarns and push the lower, or courser fibers to the outside of the finished yarn, thus leaving a harsher yarn than you wanted. This is one reason it is very important to keep in mind of the fibers micron count when you are blending. In trying to find an answer to the reason that the fibers reacted this way when spun, I found that the answers were all over the place, depending on who you were talking to. My thought on this is because there is a difference in the fiber diameter, thus the finer fibers are drawn to the center of the yarns as it rotates in the spinning, leaving the coarse fiber to drift to the outside of the yarn.

When processing cashmere for spinning, the first step after the fleece is removed from the goat, is to sort the fibers in the following order; color, length, and fineness. The next step is to remove the guard hair. Dehaired of the fiber can be done by hand or it can be processed at a mill. I found through running my dehairing machine that, when the goat is combed the removal of the guard hair is much easier as most of the guard hair stays on the animal. When the animal is sheared, both coats are removed and so you
have 50% or more guard hair, thus making dehairing more time consuming. Once the
dehairing step is done, the cashmere that is combed as a rule, will return 80% as
compared to the sheared fleeces that will return about 20% - 40%.

The removal of the guard hair by hand is a very labor intense process. Removing
the guard hair starts with washing the raw fibers. Carol Spencer of Foxmoor Farm, a
cashmere breeder in Oregon, U.S.A, stated during a phone interview in August 2009, “the
fact that guard hair floats, you will be able to skim many of the guard hairs off the surface
of the bath water”.

I learned from my own experience that after the guard hairs are removed, it is
important to remember not to clutch or squash this fine fiber in your hand, but gently
cradle the cashmere when spinning as this down fiber can easily felt in your hand. This
rule applies whether you are spinning the cashmere in the cloud or the roving form. You
do not have to be quite as careful with the fiber if it is mixed in a blend and especially if
the blend is 25% cashmere and 75% wool.

Because cashmere is a very warm expensive fiber, it is best to spin a yarn that is
2-ply with 100 to 125 yards per ounce. This yarn will work up nicely on a US size #4 or
#5 knitting needle for a very lightweight, warm comfortable garment. As cashmere is
such a warm yarn, I found that this blended yarn works well for a more open or lacy
fabric. I did notice a difference in the knitting of the finished yarns in that, the more
cashmere in the blended yarn the more open I liked the fabric. I think that this is because
the property of the cashmere fiber being so warm. I did find that a 100% cashmere pair
of mittens can only be worn when it is VERY cold, as otherwise the mittens are just to
warm to wear. This is another good reason to blend the cashmere with wool as the wool
will help to wick away the moisture and still keep your hands warm.

To start the spinning process, make sure that the wheel you use is well oiled as
this will keep any drag on the bobbin and flyer to a minimum. Loosen or relax the tension
on the wheel, when using scotch tension, leaving just enough tension for the spun fibers
to be drawn in slowly. With the cashmere fiber being fairly short and a bit slippery, allow the twist to build up in the fibers a bit before letting the twist enter the new singles. The drawing-in speed needs to be slowed down and I like to use a whorl with a higher ratio, like a 12:1, as this will build up the high twist faster with less treadling. If you have a wheel that has the hooks of the flyer all on one top side, as opposed to hooks on the top and bottom of the flyer arm, you can do what is called lace the flyer. By doing this step you will change the ratio of the draw-in of the cashmere to a higher ratio. The higher spinning ratio is not as important as the percentage of the cashmere fibers in the blend goes down and the wool percentage goes up, this is because the wool does not need as much twist as the 100% cashmere fiber. For this project I did most of my spinning on a Schacht ladybug spinning wheel using a 12:1 ratio when spinning the fibers that were blended during the carding process.

Most commercially spun 100% cashmere fiber is spun semi-woolen as this will give the yarn a bit of air, but also a nice tight twist to hold this softer yarn together. The various styles in which you prepare and spin the cashmere fibers will give you different results. It is best to think of what you want your end product to be and then spin for that project. For a lace weight yarn a 2 ply will work beautifully, whereas spinning for something like socks or sweater, a 3 ply is better in order to stand up to the extra abrasion. If using 100% cashmere fiber I like a 2 ply and then use this finished yarn for a scarf, shawl or item that is not going to be suspect to abrasion. Whereas in a blend with wool, I would consider using a 2 ply yarn when making socks or a sweater as you have the wool added for durability and memory.

The fibers can be handspun using a worsted or woolen draw. The supported long draw will give you a smoother yarn that will be warmer than a yarn spun with a short draw. You can spin from a commercially prepared top, as it has already been dehaired and scoured, and so no more preparation is needed. Down fibers right off of the dehairing machine are in the ‘cloud’ form, and can be spun two ways. The first way is spinning a handful at a time, being sure to be gentle with the fiber as it rest in your hand, or by bending the fibers over your finger and spinning from the fold.
Something that I found interesting is that in talking to different spinners, some say that you can spin the cashmere from puni, while other spinners say no. While taking a class from Caroline Sommerfeld in April 2012, she stated, “spinning from a puni can be disastrous because the length of the cashmere fiber does not lend itself to this form of preparation. By putting it into a puni form, the cashmere fiber will tend to break as the high angle of the twist being added to the fiber and you will end up with a harsh yarn.”

If you are having a problem with the yarn being pulled onto the bobbin too fast, you can increase the size of the core of your bobbin. To increase this core size, either pad the core with a foam cover that is used to insulate water pipes or use a partially full bobbin. Using a thinner brake band can also reduce the drag on the bobbin.

In a class that I attended that was taught by Judith MacKenzie while in Eureka, Montana, U.S.A. in the summer of 2000, she shared what she found when working with cashmere fiber, “cashmere fiber works up wonderfully as a cable yarn and can be used for socks as it makes a strong yarn yet is still comfortable”.

Finishing of cashmere yarn is a very important step. This fiber really does a nice bloom during the fulling process. Using a sink plunger and the hottest water you can, add Dawn dishwashing soap and the new yarn, pound the yarn vigorously in the water. Remove the yarn and squeeze out the water, then put the yarn into ice-cold rinse water. Once again remove the yarn from the water and roll it in a towel to remove as much water as you can. Take the skein and with a hard smack, hit it on the edge of a table. By shocking the skein, it will develop a nice bloom also known as a halo. I really like this method of finishing the yarns that were made with a higher percentage of cashmere. As the amount of the cashmere fibers went down in a blend, I found that there was not as much ‘bloom’ and the ‘shock’ part of the fulling was a bit hard on the wool.

I found working with the three different grades of blended yarns, it did not make any difference which of the grades of the wool I used, as the amount of the cashmere
dropped, it was easier to spin the fibers and the amount of slippage when spinning was not as pronounced.
Dyeing the New Yarns

This part of the research was done to see if using the three different grades of wool, along with the different percentages of cashmere in the new blended yarns, would affect the end colors during the dying process. The yarns that I used were from the blending by carding as I felt this would give me more evenness of color, as opposed to the 2 ply yarns made using one strand of each fiber.

Using a 1% dye stock with a 3% Depth of Shade and made from Jacquard dyes. I used vinegar to set the dyes, and found that it worked well. I choose three colors:

* Aztec Gold for the Merino/Cashmere yarns,
* Brilliant Blue for the Targhee/Cashmere yarns
* Brilliant Kelly Green for the Montadale/Cashmere yarns.

All of the yarns took up the dyes well; however, I observed that the Brilliant Kelly Green left color in the dye water. I also found that when the yarns were laid out to dry, the green also left the most color on the paper. Little color was left over from the Blue and the Gold. I contacted Caroline Sommerfeld in May 2012, as she has more experience in dying than I have. Her response to my question on the use of the Kelly Green color was, “I did find that by using more acid in the dye bath with the Kelly Green color, and also by leaving the yarn in the dye pot overnight, more of the dye was exhausted”. In redoing this dying part of my report, the Kelly Green dye was taken up better when I did use more acid and left the yarns in the dye pot longer. I did notice that there was a slightly lighter shade of color on the 100% cashmere yarns over the percentage blends or even the 100% wool yarns.

One thing that I found interesting is doing the dyeing of the carded blended yarns was with the slight bit more luster in the Montadale blend as compared to the Merino blend. I attributed this to the fact that the Merino fiber has more scales and thus has less luster to begin with. Although the luster difference is not great, I do feel that the micron count does play a factor in the end of this dying exercise.
Questionnaire Results

In researching for this paper, I sent out a questionnaire to several different talented people in the cashmere industry. I felt that it was a great opportunity for me to tap into this pool of information. Surveys were sent to spinners, weavers, knitters, cashmere fiber producers, and a fiber testing station. I chose these people to ask for their opinion as they are very passionate in the fiber industry, and represent a good sampling from across the board in experiences.

I sent out 25 questionnaires and received back 7 on paper and 4 by phone calls. A fact that I found interesting was, the people that I thought would be sure to respond, did not acknowledge the questionnaire at all. It was however really interesting to see what the ones who did respond had to say.

The questions that I addressed in this questionnaire were to help guide me in my research in working with a cashmere and wool blend. By the responses that were returned, I found were varied on what the person was going to use the end yarn for. Some of the answers given were that some people are hard and fast in what they believe to be what the best use of the cashmere fibers is. I looked at all of the responses that I got back and used the different responses in writing this paper. The time that I spent putting together the questionnaire, mailing it out, doing follow up phone calls, was not the best use of my time. If I was to do this again, I think that I would not send out a questionnaire, but just do a phone interview to each person.

Everyone had their favorite percentage, but all agreed that they preferred a 50/50 fine wool-cashmere blend for the yarn with the least amount of cashmere used. In doing the work for this project, I found that even a cashmere-wool blend of 25% cashmere in the blend has a noticeable softer handle than 100% wool. A blend of only 25% cashmere in it, will not give you a super soft yarn if that is what you are striving for. The consensus was that a 50/50 blend works better for a jacket, coat, mittens or socks, whereas using a bit less wool in the blend is better for making scarves. Making a blend
with less than 20% wool in the cashmere blended yarn works well for baby items and was the answer most often given. One producer stated that they tried the 50/50 blend and it did not sell, so now they will only offer 100% cashmere.

All agreed that blending cashmere with wool makes a yarn that is more durable, and has more memory than a pure cashmere yarn. Both a 2 ply and a 3 ply yarn were recommended by respondents, with a 2 ply preferred for lacy gloves or baby items along with close to the skin garments, while a 3 ply works best used for outwear items, like hats, and sweaters. All agreed that a 100% cashmere yarn with more than 3 plies of this special fiber was not a wise choice. A pure cashmere yarn with more than 3 plies is costly and you compromise the lightness of cashmere with no added value.

The length of the cashmere most desirable for blending, was 1 ½ inches and up, with the shortest being 1 -1/4 inches. Most of the hand spinners surveyed liked a fiber length that is 2 - 2 ½ inches also with a higher micron count, for example, 18 compared to 13 as it is easier to spin and less likely to pill, as well as being more durable.

All the people that responded to my questions agreed that this fiber is a joy to spin, knit or weave. In the response from Debbie Radtke, a professional knitting pattern tester stated, “It is a touch of heaven to work with this wonderful fiber”.

If I was to do the research project again I do not think that I would do a questionnaire as the returns were not that much help and the answers were varied. I was disappointed that more people did not return the questionnaires as they were given a stamped self addressed envelope. It was fun to visit by phone with several of the people that I sent the questioners to as they all offered bits of wonderful information from personal experience.
Conclusion

Doing this study has been a wonderful journey, and I have learned a lot. It has been very interesting in seeing how the three different grades of wool blend with the cashmere fibers from one goat.

I was pleasantly surprised by the way the cashmere worked up with the Montadale wool. As we raise both of these fiber producing animals on our farm, Montadale sheep and cashmere fiber producing goats, the blending of these two different fibers is very enjoyable to spin. I do think that the Montadale wool, with its lower micron count than the other three wools, in a blend using 20% or 25% cashmere is the least amount of cashmere that should be used. My reason for this amount of cashmere fiber is, that this delicate fiber is just lost in the blend. I think that a 50%-50% blend of these two fibers is as far as I would go on this blend.

Most of the people that I interviewed for this study stated that they would only use the extra fine Merino wool for blending, and this is what I thought at first. After working with the Targhee and Montadale wool in the blends, I will not hesitate to use these wools on some projects in the future. I did find that the Merino blend did not feel all that good for me. I think it is because the Merino was commercially processed with more chemicals, where as the Targhee and the Montadale wools were processes more naturally.

The dyeing was very interesting and I was pleasantly surprised to see how nicely the fiber took up the dyes and made some colorful yarns.

One result that I found interesting is that when blending the fibers using 1 ply of cashmere and one ply of wool, the end yarns were not as pleasing to me. In future blending I would only use fine wool in this plying method. I did like how the cashmere
ply of this type of yarn shines out more in the knitted samples. I felt that the softness of the cashmere fiber was lost when blending this way. The wool, even when using a fine grade of wool, just overpowers the softness and delicate nature of the cashmere fibers.

When comparing the yarns that were blended through the carding process and the plying process, I found that I liked the card blended yarns much better. I feel that the card blended yarns had a more even grist and style. I also found that it is important to take the time to separate a cashmere fleece into sections if there is a color variation in the fleece. I did not do this and I see where the shade of white varies a bit throughout my spinning.

I chose to spin the samples with a short draw, worsted style spinning in an attempt to get a smoother yarn that will show off the stitches of the knitting. In the spinning I used the 12:1 ratio on the card blending yarns and the 8:1 ratio on the ply blending. I wanted to compare the different end yarns and discovered that I personally liked the 12:1 ratio better. Using the 12:1 ratio on the wheel, it was easier to get more twist in the yarn on a consistent basis.

When knitting up the blended yarns, I was able to try out different lace patterns. I enjoyed seeing how as the cashmere and wool fiber percentage changed in the blends, the grist and the handle of the yarns also changed. It was a good chance to see what wool I liked to blend with the cashmere and at what percentages. I enjoyed different percentages with the different wools. In the Merino and Targhee wool/cashmere blends I would not use less than 25% cashmere, where as the Montadale wool blend, I would not use less than 50% cashmere.

In doing this project, I personally feel that the cashmere will be lost in the wool if you are using any less that 25% cashmere fiber. One the same line of thinking I agree with several of the people that I interviewed, and that is that the most useful blend of wool and cashmere fibers is a 50/50.
In conclusion I feel that the point at which the cashmere fiber disappear into yarn when blended with wool, really changes with the micron count of the wool. When I did the blending and spinning, it was important to keep in mind what I thought might be best for my end product. Some of the blends I was really surprised with the end yarn, like the 50/50 Montadale blend, as I thought that this was going to have a very rough finish, but was pleasantly surprised with the softer handle. In whatever percentages of the fiber mixture you may choose to use, it seems really a waste of the wonderful cashmere if when you add it to the blend, you are not able to feel or see the wonderful properties of this great fiber.

I hope that in reading the information in this report that you will explore blending with different cashmere and wool fiber percentages, and that a new door will be opened on your blending fiber journey.
**Cashmere Questionnaire**

1. With a blending of Cashmere & Wool, is there a percentage blend that you like best? What project does this blend work best for?

2. With a blend of Cashmere & Wool, what type of wool do you like to use as your first choice?

3. When using a Cashmere & Wool fiber blend, how many plies do you like to have, 2, 3, or more?

4. Do you find that the length of the Cashmere fiber has an affect on the finished yarn? Please explain your point of view.

5. What characteristics are you looking for when you look at Cashmere fiber for a spinning, weaving or knitting project?

6. Do you notice any difference in the way that dyes are taken up by the fibers when using a blend of Cashmere & Wool as the percentages of the blend changes?

7. Please let me know any other thoughts that you would like to share about the use of a Cashmere, and/or Cashmere-Wool blend for a spinning, weaving, or knitting project.

8. Are you a Weaver, Spinner, Knitter, or producer of Cashmere fiber?

*Thank you for taking the time to help me with my Studies.*

** May I use your name in my report?**
Fiber Samples
Beginning Fiber Samples

Raw Cashmere Fibers
(Not dehaired)

Dehaired Cashmere

Commercial Merino

Montadale Wool

Targhee Wool
Knitting and Yarn Samples of Card Blending Fibers
Blending Cashmere & Merino during the Carding Process

Knitted Samples

100% Cashmere
- ply's - 2
- spin direction – ZZS
- TPI – 5
- WPI – 22
- length – 2 yards
- weight - .6 grams
- angle – 17'
- count – 5.4
- spun worsted
- spun from a cloud

75% Cashmere – 25% Merino
- ply's – 2
- spin direction – ZZS
- TPI – 5.5
- WPI – 17
- length – 2 yards
- weight - .8 grams
- angle – 21'
- count – 4
- spun worsted
- spun from roving

50% Cashmere - 50% Merino
- ply's – 2
- spin direction – ZZS
- TPI – 5
- WPI – 17
- length – 2 yards
- weight - .8 grams
- angle – 25'
- count – 4
- spun worsted
- spun from roving

Yarn Samples

Knitted pattern is ‘Open Lace Mock Rib Variation’ done on #4 (USA) knitting needles. Spun and plyed on a Schacht ladybug wheel with a 12:1 ratio.
Blending Cashmere & Merino during the Carding Process

Knitted Samples

25% Cashmere – 75% Merino

- ply's – 2
- spin direction – ZZS
- TPI – 5.5
- WPI – 22
- length – 2 yards
- weight – .6 grams
- angle – 21'
- count – 4
- spun worsted
- spun from roving

Yarn Samples

100% Merino

- ply’s – 2
- spin direction – ZZS
- TPI – 5.5
- WPI – 19
- length – 2 yards
- weight – .7 grams
- angle – 22'
- count – 2.9
- spun worsted
- spun from roving
**Blending Cashmere & Targhee during the Carding Process**

**Knitted Samples**

<table>
<thead>
<tr>
<th>100% Cashmere</th>
<th>Yarn Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>ply’s – 2</td>
<td></td>
</tr>
<tr>
<td>spin direction – ZZS</td>
<td></td>
</tr>
<tr>
<td>TPI – 5</td>
<td></td>
</tr>
<tr>
<td>WPI – 22</td>
<td></td>
</tr>
<tr>
<td>length – 2 yards</td>
<td></td>
</tr>
<tr>
<td>weight - .6 grams</td>
<td></td>
</tr>
<tr>
<td>angle – 20’</td>
<td></td>
</tr>
<tr>
<td>count – 5.4</td>
<td></td>
</tr>
<tr>
<td>spun worsted</td>
<td></td>
</tr>
<tr>
<td>spun from a cloud</td>
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<table>
<thead>
<tr>
<th>75% Cashmere - 25% Targhee</th>
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<tbody>
<tr>
<td>ply’s – 2</td>
</tr>
<tr>
<td>spin direction – ZZS</td>
</tr>
<tr>
<td>TPI – 3.5</td>
</tr>
<tr>
<td>WPI – 16</td>
</tr>
<tr>
<td>length – 2 yards</td>
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<tr>
<td>weight - .7 grams</td>
</tr>
<tr>
<td>angle – 18’</td>
</tr>
<tr>
<td>count – 4.6</td>
</tr>
<tr>
<td>spun worsted</td>
</tr>
<tr>
<td>spun from roving</td>
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</table>

<table>
<thead>
<tr>
<th>50% Cashmere – 50% Targhee</th>
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</thead>
<tbody>
<tr>
<td>ply’s – 2</td>
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<td>spin direction – ZZS</td>
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<tr>
<td>TPI – 3.5</td>
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<tr>
<td>WPI – 17</td>
</tr>
<tr>
<td>length – 2 yards</td>
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<tr>
<td>weight - .8 grams</td>
</tr>
<tr>
<td>angle – 25’</td>
</tr>
<tr>
<td>count – 4</td>
</tr>
<tr>
<td>spun worsted</td>
</tr>
<tr>
<td>spun from roving</td>
</tr>
</tbody>
</table>

Knitted pattern is ‘Bias Openwork’ done on #4 (USA) knitting needles. Spun and plyed on a Schacht ladybug wheel with a 12:1 ratio.
Blending Cashmere & Targhee during the Carding Process

Knitted Samples

25% Cashmere – 75% Targhee
ply’s – 2
spin direction – ZZS
TPI – 5
WPI – 22
length – 2 yards
weight – .6 grams
angle – 19’
count – 3.3
spun worsted
spun from a roving

100% Targhee
ply’s – 2
spin direction – ZZS
TPI – 3.5
WPI – 13
length – 2 yards
weight – .9 grams
angle – 20’
count – 3.6
spun worsted
spun from roving
Blending Cashmere & Montadale during the Carding Process

### Knitted Samples

<table>
<thead>
<tr>
<th>Blend</th>
<th>Ply’s</th>
<th>Spin Direction</th>
<th>TPI</th>
<th>WPI</th>
<th>Length</th>
<th>Weight</th>
<th>Angle</th>
<th>Count</th>
<th>Spinning Method</th>
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<tbody>
<tr>
<td>100% Cashmere</td>
<td>2</td>
<td>ZZS</td>
<td>5</td>
<td>22</td>
<td>2 yards</td>
<td>.6 grams</td>
<td>18'</td>
<td>5.4</td>
<td>spun worsted</td>
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<tr>
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<td>spun from a cloud</td>
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<tr>
<td>75% Cashmere - 25% Montadale</td>
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<td>ZZS</td>
<td>3.75</td>
<td>19</td>
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<td>.5 grams</td>
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<td>spun worsted</td>
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<td></td>
<td></td>
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<td>spun from roving</td>
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<tr>
<td>50% Cashmere - 50% Montadale</td>
<td>2</td>
<td>ZZS</td>
<td>3</td>
<td>16</td>
<td>2 yards</td>
<td>.7 grams</td>
<td>19'</td>
<td>4.6</td>
<td>spun worsted</td>
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<td></td>
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<td>spun from roving</td>
</tr>
</tbody>
</table>

Knitted pattern is ‘Horizontal Lace’ done on #4 (USA) knitting needles.
Spun and plyed on a Schacht ladybug wheel with a 12:1 ratio.
Blending Cashmere & Montadale during the Carding Process

Knitted Samples

25% Cashmere – 75% Montadale
- ply’s – 2
- spin direction – ZZS
- TPI – 4
- WPI – 16
- length – 2 yards
- weight - .8 grams
- angle – 20'
- count – 4
- spun worsted
- spun from roving

Yarn Samples

100% Montadale
- ply’s – 2
- spin direction – ZZS
- TPI – 3.5
- WPI – 12
- length – 2 yards
- weight - 1.1 grams
- angle – 20’
- count – 2.9
- spun worsted
- spun from roving
Knitting and Yarn Samples of Ply Blended fibers
Blending Cashmere & Merino Wool using 1 ply of each Fiber

### Knitted Samples

<table>
<thead>
<tr>
<th>Fiber Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>100% Cashmere</strong></td>
<td>2 ply&lt;br&gt;spun ZZS&lt;br&gt;6 TPI&lt;br&gt;21 WPI&lt;br&gt;length - 2 yards&lt;br&gt;weight - .6 grams&lt;br&gt;angle - 22&lt;br&gt;count - 5.4&lt;br&gt;spun worsted&lt;br&gt;spun from a cloud</td>
</tr>
<tr>
<td><strong>100% Merino</strong></td>
<td>2 ply&lt;br&gt;spin direction - ZZS&lt;br&gt;7 TPI&lt;br&gt;25 WPI&lt;br&gt;length - 2 yards&lt;br&gt;weight - .4 grams&lt;br&gt;angle - 25&lt;br&gt;count - 8.1&lt;br&gt;spun worsted&lt;br&gt;spun from roving</td>
</tr>
<tr>
<td><strong>50%/50% Cashmere-Merino</strong></td>
<td>ply's - 2&lt;br&gt;spin direction - ZZS&lt;br&gt;6 TPI&lt;br&gt;23 WPI&lt;br&gt;length - 2 yards&lt;br&gt;weight - .4 grams&lt;br&gt;angle - 20’&lt;br&gt;count - 8.1&lt;br&gt;spun worsted&lt;br&gt;spun from roving</td>
</tr>
</tbody>
</table>

### Yarn Samples

Funnel Neck Lace Pattern done on size 3.25(USA) knitting needles. Spun and plyed on a Schacht Ladybug Wheel with a 8:1 ratio.
Blending Cashmere & Targhee Wool using 1 ply of each Fiber

Knitted Samples

100% Cashmere
2 ply
spun ZZS
6 TPI
21 WPI
length - 2 yards
weight - .6 grams
angle - 22
count - 5.4
spun worsted
spun from a cloud

100% Targhee
2 ply
spin direction - ZZS
4 TPI
12 WPI
length - 2 yards
weight - 1 grams
angle - 20
count - 3.2
spun worsted
spun from roving

%50% Cashmere-Targhee
2 ply's
spin direction - ZZS
4 TPI
13 WPI
length - 2 yards
weight - .8 grams
angle - 25'
count - 4
spun worsted
spun from roving

Yarn Samples

Miniature Leaf Pattern done on size 3.25(USA) knitting needles.
Spun and plyed on a Schacht Ladybug Wheel with a 8:1 ratio
Blending Cashmere & Montadale Wool using 1 ply each Fiber

Knitted Samples

100% Cashmere
2 ply
spun ZZS
6 TPI
21 WPI
length - 2 yards
weight -.6 grams
angle - 20'
count - 5.4
spun worsted
spun from a cloud

100% Montadale
2 ply
spin direction - ZZS
6 TPI
19 WPI
length - 2 yards
weight -.5 grams
angle - 23'
count - 6.5
spun worsted
spun from roving

% Cashmere-Cashmere
2 ply’s
spin direction - ZZS
4 TPI
21 WPI
length - 2 yards
weight -.6 grams
angle -
count - 5.4
spun worsted
spun from roving

Yarn Samples

Victorian Pattern done on size 3.25(USA) knitting needles.
Spun and plyed on a Schacht Ladybug Wheel with a 8:1 ratio
Dyed Yarn Samples of Card Blended fibers
Directions used for dyeing the Cashmere blended yarns.

The yarns used for this part of the blending project, are from the blends that were carded together. I put the fibers through the carder 3 times to get a good blending.

For the dyeing part of this project I used dyes by 'Jacquard'. I like these dyes because of the nice colors that they produce.

The yarns were first soaked in water where a few drops of Synthropol had been added, for 20 minutes, removed from the water, and added to the dye pot. The temperature of the dye pot was turned up till there was a good amount of steam. A lid was placed on the Crockpot, turned off, and allowed to sit overnight to cool down so to give the fibers time to absorb the dye.

The next morning I took the dyed yarns out of the pot, rinsed in slightly warm water till the rinse water was clear. I hung the yarns to dry and then placed in skeins.

The same process was used when dying all the different colors.
Cashmere/Merino blended yarn dye

results – *Aztec Gold*

In doing this dye batch I used a 1% dye stock solution, and a 3% depth of shade. The total beginning dry weight of the 5 skeins of 10 yards each is 17.6 grams.

The amount of liquids used was 1590 ml of water to 53 ml of dye stock solution. I added 3.5 grams of glauber salt to the solution along with 10 ml of vinegar.
Cashmere/Targhee blended yarn dye

results — Brilliant Blue

For this dye batch I used a 1% stock solution with a 3% depth of shade. The combined dry weight of the 5 skeins of 10 yards each was 21.5 grams.

1935 ml of water was used along with 64.5 ml of dye stock solution. To this solution I added 4.3 grams of glauber salts and 1 ml of vinegar.
Cashmere/Montadale blended yarn dye results – *Brilliant Kelly Green*

A dye batch made up using a 1% stock solution with a 3% depth of shade. Dry weight of the combined 5 skeins of 10 yards each was 20.8 grams. 62 ml of dye stock was added to 1860 ml of water. 11 ml of vinegar was mixed with 4 grams of glauber salt and added to the Crockpot of water mixture.

**2 ply carded blend yarns**

100% Cashmere  75% Cashmere  50% Cashmere  25% Cashmere  100% Montadale  
25% Montadale  50% Montadale  75% Montadale
Micron Test Reports
Optical Fiber Diameter Analyser (OFDA 100)
Micron Test Report

ME2 Custom Fiber Processing Farm/Jane Deardoff
986 Artman-Gibson Road
Colville WA 99114 USA

Date: 03/15/11
Test No: 399523

Animal and Sample Description

Animal Name: Yellow 6
Animal ID: Yellow 6
Breed: Cashmere (Cut off at 30µ)
Sample Location: XXXXX
Sex: XXXXX
Sample Date: XX/XX/XX
Color: XXXXX
Age: XXXXX

Laboratory Data

Mean Fiber Diameter: 19.6 microns
Fibers Greater Than 30 microns: 0.0 %
Standard Deviation: 3.9 microns
Comfort Factor: 100.0 %
Coefficient of Variation: 20.1 %
Mean Curvature: 42.8 deg/mm
Spin Fineness: 18.9 microns
SD Curvature: 29.0 deg/mm

This Test Performed According to I.W.T.O Method 47
Optical Fiber Diameter Analyser (OFDA100)
Micron Test Report

ME2 Custom Fiber Processing Farm/Jane Deardoff
986 Artman-Gibson Road
Colville WA 99114 USA

Test No: 399525

Animal and Sample Description

Animal Name: Targhee
Breed: Targhee
Sex: XXXXX
Color: XXXXX
Animal ID: Targhee
Sample Location: XXXXX
Sample Date: XX/XX/XX
Age: XXXXX

Laboratory Data

Mean Fiber Diameter: 20.3 microns
Standard Deviation: 3.5 microns
Coefficient of Variation: 17.0 %
Fibers Greater Than 30 microns: 0.3 %
Spin Fineness: 19.1 microns
Mean Curvature (deg/mm): 103.4
SD Curvature (deg/mm): 62.3
Comfort Factor: 99.7 %

This Test Performed According to I.W.T.O Method 47
Optical Fiber Diameter Analyser (OFDA100)
Micron Test Report

ME2 Custom Fiber Processing Farm/Jane Deardoff
986 Artman-Gibson Road
Colville WA 99114 USA

Test No: 399524

Animal Name: Fam MT
Breed: Montadale
Sex: XXXXX
Color: XXXXX

Laboratory Data

Mean Fiber Diameter: 27.7 microns
Standard Deviation: 5.7 microns
Coefficient of Variation: 20.4 %
Fibers Greater Than 30 microns: 30.2 %
Mean Curvature (deg/mm): 80.5
SD Curvature (deg/mm): 52.1
Comfort Factor: 69.8 %

This Test Performed According to I.W.T.O Method 47
Bibliography
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retrieved December 3, 2011

Cashmere and Camel Hair Manufactures Institute (n.d.) "Definition of Cashmere"
Survey replies were received from:

Angus - YoCom-McColl testing Laboratories, Inc. - Denver, CO. USA
Fiber Testing Site

Carol Spencer - Foxmoor Farm - Silverton, OR. USA
Cashmere fiber goat producer, spinner, knitter.

Debbie Radtke - Fiber Trends Knitter - Yakima, WA. USA
Master knitter

Diana Mullin - NW Cashmere Association – Twisp, WA. USA
Cashmere fiber judge, former goat producer, weaver

Jeff Newman – Monta Bella Ranch – Sherwood, OR. – USA
Cashmere fiber producer

Linda Fox & Paul Johnson - Goat Knoll Farm - Dallas, OR. USA
Cashmere fiber producer, Editor for CASHMIRROR magazine, knitter, spinner, weaver

Mickey Nielsen – Liberty Farm Cashmere – Yakima, WA. USA
Cashmere fiber producer, cashmere fiber judge, spinner

The mailing on the questionnaires was sent out in November 2010 and the last response came back in June 2011.

I sent out 25 questionnaires and received back 7 written responses and 4 phone calls.
Phone Interviews:

Caroline Sommerfeld - Calgary, Alberta. Canada

Judith MacKenzie – Augusta, Montana. USA

Sue Meech – Napanee, Ontario. Canada

Angus McColl – Denver, Colorado. USA