

NEW ZEALAND
CASHMERE

FEEL THE POTENTIAL



BREEDING CASHMERE GOATS

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Welcome Message

This is an introductory guide to assist farmers who have already committed to farming goats intended to help you develop your own plan for your own flock.

You know the basics of farming already - your fencing is in good shape, you have your foundation breeding livestock ready to bring onto farm and you largely know how you see goats integrating into your farm system.

This guide will cover the basics of breeding and genetics for cashmere-producing goats to help you refine your strategies to achieve animals that remain robust and produce fibre the market needs and pays a premium for.

The objective of this booklet is to help provide some background and principles to help influence your breeding and selection choices. There are many technical science and research papers about aspects of breeding cashmere goats. They provide greater depth on aspects of breeding and selection.

Every farm and every farmer is different. Take from this guide what you need to inform your breeding strategy and practice. It contains some example case studies, questions for your buck provider, and breeding strategy tools to help you get started. It is written from 40 years of experience breeding goats for their fibre, numerous hours of reading academic research and seeing the other benefits goats bring to our farm system in South Otago. There is a mystique and prestige around producing cashmere fibre. It is a special high value fibre that demands care in producing it. Your breeding strategy will help you breed for these ultra-high end markets and the brands that use our fibre.

Hēpara Cashmere is proud to be at the forefront of the renaissance of the sector alongside NZ Cashmere and we are happy to support members of the Foundation Flock with any questions on buck selection and on breeding for fibre.

David Shaw – Hēpara Cashmere

* This Breeding Cashmere Goats Guide has been able to be developed through the support of the Ministry for Primary Industries' Sustainable Food & Fibre Fund.

Breeding for Cashmere Farming

Breeding is the most important part of Cashmere farming and producing cashmere fibre.

Fibre production and quality is set by genetic traits. Research carried out in Australia in the 1990s has shown cashmere production is mostly independent of nutrition compared to other animal fibres like wool. This makes breeding decisions critical for growers looking to develop their cashmere fibre production and quality.

Understanding market value helps inform breeding strategy

For farmers producing raw materials for sale, it is essential to understand the users and markets for your products. This information helps define specifications for what we select and emphasise in our breeding programs.

For cashmere, the critical trait is to select medium fibre diameter (MFD) which is measured in microns, as it influences the pricing value steps - as you can see in the table. Combined with down weight per goat judgements will be made on how to produce the best return from your goats and ultimately your farm business. In cashmere we have a market seeking supply for certain specification of fibre, which differs to many other products where we produce a commodity and then look for a market. It is also a stable market compared to other low-value fibres, with returns showing little variation over the past decade.

Cashmere international standard – <18.5 um less than 2% residual hair following dehairing of fibres under 30 um.

BREEDING CASHMERE GOATS

| | |
|----------|---------------|
| Cashmere | 12-18 microns |
| Cashgora | 19-23 microns |
| Mohair | 25-40 microns |

| Grade | Micron | Value |
|-------|------------|-------|
| 00 | <14.5 | \$180 |
| 0 | 14.5-15.3 | \$150 |
| 1 | 15.3 -16.7 | \$125 |
| 2 | 16.7-18.5 | \$110 |

*Market value based on market at the time of publication



Starting out

Developing your Breeding Strategy

How do I influence my returns?

Animal production is the key. This is influenced by the farm environment and genetics (genomic potential). Cashmere production is more influenced by breeding than nutrition. Breeding excellence is the key.

Questions that will help inform your breeding strategy:

What have I to gain from Genetic improvement?

- More cashmere to sell
- More returns from high-quality fine fibre
- More kids born and available to enter and replace lower producers in the flock
- More surplus animals to sell
- More resilient low intervention animals.

What do I want from my goats?

- Income, productive Cashmere, meat, surplus sales, build asset
- Easy care, healthy, low input, temperament. Adaptability to variable climate and regions
- Survivability - robust feet, resilient, parasite-tolerance, lots of kids
- Control my weeds and improve pastures for existing stock
- Look nice - sound, fluffy and white



Genetic Plan – the process:

- Determine your breeding goals based on the traits you wish to improve.
- Select a buck source with genetic information for these traits to address the goals for your genetic gain.
- Select bucks with genetic merit that will influence the combination of traits you want.



Set a specific plan for your flock:

1. Personal & farming values and medium to long term goals
2. Define a breeding objective for the goat flock
3. Define the key traits that contribute to the objective
4. Put value on the traits
5. Choose the selection criteria
6. Measure and record
7. Use the information

Genetic Traits and Their Heritability

Any genotype trait superiority passed from a parent to its offspring is called heritability (h^2).

The key genetic trait parameters for cashmere selection have very high heritability relative to many other livestock traits.

Just as every trait has its own heritability, these traits are often linked. These links are called genetic correlation. With most flocks we seek and select for improvement in more than one trait. Some selections work in tandem and are positive, but some work against the other.

For example, increasing Down Weight (DW) is correlated with increasing micron diameter, but this works against grade value (\$ per kg).

Research from the 1980's and subsequent studies showed the heritability (h^2) of the main production traits - Fibre Diameter (FD) and Cashmere Downweight (DW) are high. When initial studies were published many critics suggested these were too high to be correct. The few flocks that continued to select and breed cashmere from those periods proved the validity of the initial research conclusions and subsequent international studies in the USA, China and Australia support this too.

The consequence for commercial growers is that this speed of improvement enables them to make faster production gains.

Goats and Cashmere Fibre Trait Heritability (h^2)

| Trait | Genetic gain | h^2 | h^2 |
|--------------------------------------|-------------------|--------------|-------|
| | | NZ estimates | China |
| Down Diameter (FD) | High to Very High | .60 | .45 |
| Down Weight (TDW) | Very High to High | .45 | .42 |
| Down Length | Very High to High | .70 | .39 |
| Down Yield (%) | High | .52 | - |
| Ratio of guard hair to cashmere down | | | |
| Fleece Weight (TFW) | Medium | .25 | - |
| Liveweight | Medium | .25 | .35 |
| Birth Weight | Medium | .22 | .35 |

Genetic Correlations

Yield, down length, and denser fleeces are positive and beneficial traits. However, in most circumstances, stronger fibre is considered negative due to its decreased value. The breeding objective may prioritise certain traits over others.

For example: If we select for Down Weight, then the following traits are also influenced:

| | |
|--|--------------|
| Down Yield is also selected for and improves | $h^2 = 0.74$ |
| Cashmere gets longer | $h^2 = 0.52$ |
| Diameter gets stronger | $h^2 = 0.51$ |
| Fleeces get denser | $h^2 = 0.53$ |



Genetic Traits and Their Heritability

Today, top cashmere goats can produce more than 500 grams of cashmere at fine and stable microns, show great cover, longer fibre and higher cashmere yield (ratio of cashmere down to guard hair components of the fleece), reduced guard hair length.

The genetic gain in these few flocks has been cumulative. That means that people starting breeding today are starting at a very different point and potential.

They also have the advantage that most bucks are homozygous white (white coat colour being genetically dominant). Most kids born come out of does white, even from coloured does.

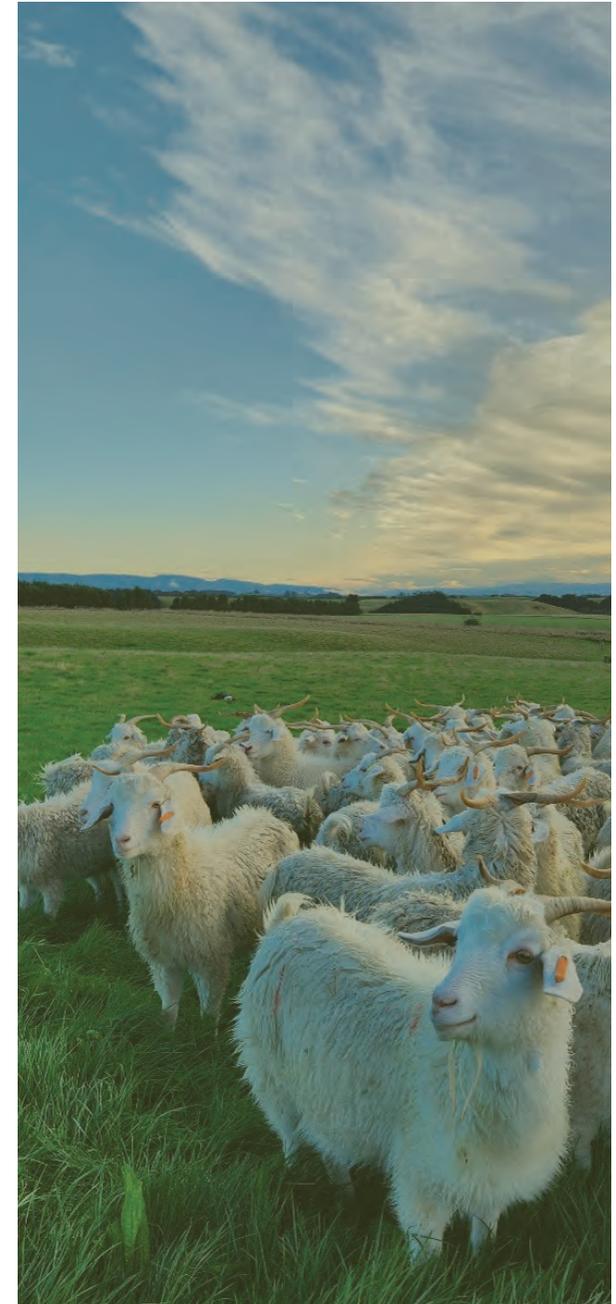
Modern improved genetics are a step up and enable rapid breeding progress even when starting with foundation does. With superior cashmere goats, they can be a leading farm enterprise.

Phenotype = Genotype + Environment

Phenotype – How genes are expressed under the influence of their environment

An animal may perform on one farm but not another due to the influence of the farm environment and system management. Therefore Phenotype - is how the genes influence goat performance in each environment and under unique management.

This is important to understand when breeding as it can help inform discussions with your genetics provider around buck selection. It can also help inform your culling decisions for stock that may look good on paper – but don't adapt to your farming environment. This is why genetics providers assess new buck genetics they may introduce into their stud flocks over time and test their progeny for performance to understand how those genetic traits are expressed over time.



Informing your Breeding Plan with Science

Genetic Gain and Variation

Genetic progress can be measured to help you understand flock performance over time.

Most commercial flocks, and those starting out can't justify measuring their annual genetic progress through rigorous testing, recording and analysis. Buck breeders, like Hēpara Cashmere, will measure for several reasons – the most important being to understand how to evaluate sire buck performance, so the best genetic material can be passed on to commercial growers. This can help you to inform the future performance of your flock and track performance of your stock.

When we select superior sires the average performance of the offspring should move up. This movement is called genetic gain. Genetic gains are cumulative but can also work in reverse if poor breeding selections are made. Speed of genetic gain is controlled by Heritability, Selection Differential and Generation Interval.



$$\text{Genetic Progress Annually} = \frac{\text{Heritability} \times \text{Selection Differential}}{\text{Generation Interval}}$$

h^2 = Heritability (see earlier table).

h^2 is fixed for a trait and doesn't change much. Some populations of animals may be slightly different due to historical selection histories.

SD = Selection Differential - the difference or range in the flock between the best and the worst. How much better the selected parents (Averaged males+females) are than the average of the flock they came from.

GI = Generation Internal - the average age of parents when kids are born. Short GI means more rapid progress i.e. faster turnover of generations.

Selection Differential is influenced by how much, how accurate and how soon credible production data can be obtained. Many key traits can be confidently assessed by year 1, but year 2 data can be a better indication of lifetime performance due to stabilising factors.

The bigger the population to choose from is an advantage. The larger the group of animals the more opportunity exists for “outlier” individuals to show up.

Buck/sire choice, price, availability may restrict the ideal individual for your flock, so we may need to make compromises.

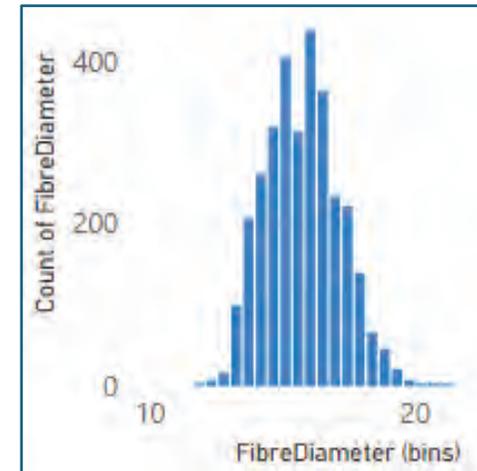
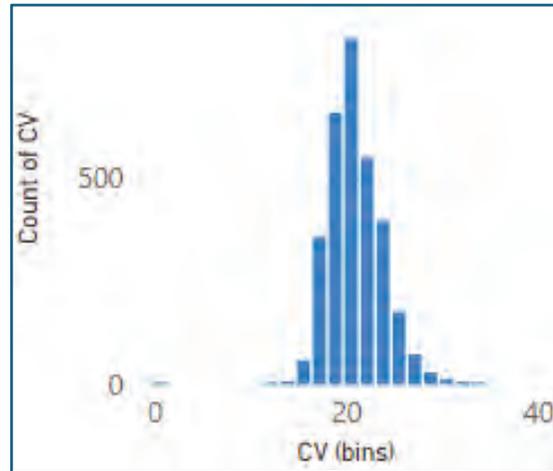
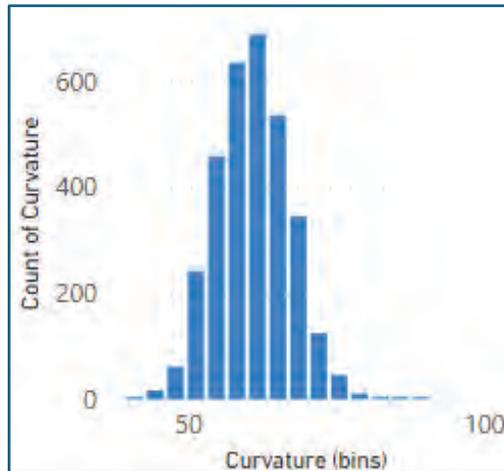
Speed of improvement matters especially for new flocks starting their cashmere journey. Productive animals make a difference to motivation and confidence to reinvest in the flock and enterprise. The quicker you reach high performance, the greater the income and profit.



Variation

Within a population or flock of animals there is always variation of performance across each of the traits you may be working to build in your flock.

The three graphs below are histograms for the Hēpara flock on specific traits - Curvature, CV (Coefficient of Variation) and Fibre Diameter. They are a good representation of the variation in range of performance within the flock.



An aim of a cashmere fibre producer is to tighten the range within a flock toward the desired traits that maximise fibre returns. For example at Hēpara Cashmere across our flock we are looking to hold our fibre at a stable micron in a certain range, while increasing down weight.

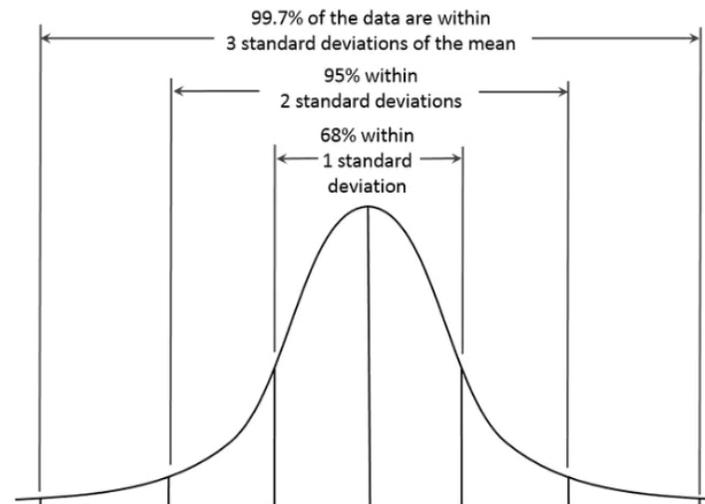
Standard Deviation (SD)

A standard deviation is a measure of how dispersed the data is in relation to the mean. Low, or small, standard deviation indicates data are clustered tightly around the mean, and high, or large, standard deviation indicates data are more spread out.

We use SD in relation to fibre testing and SD is the measure in microns of tested fibres that falls within 1 SD of the mean.

You will see this on a range of fibre test reports (like the sample report and charts that follow).

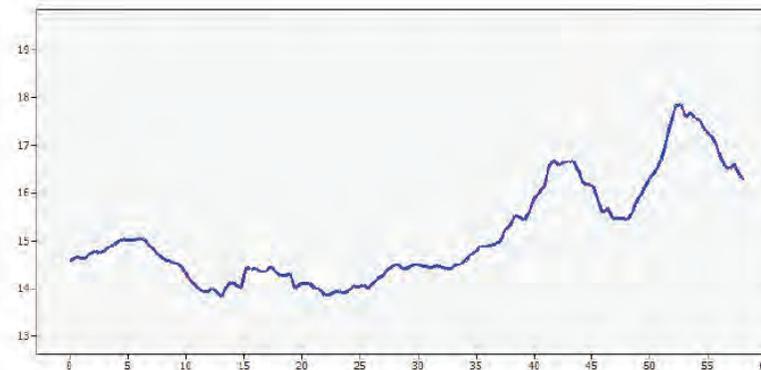
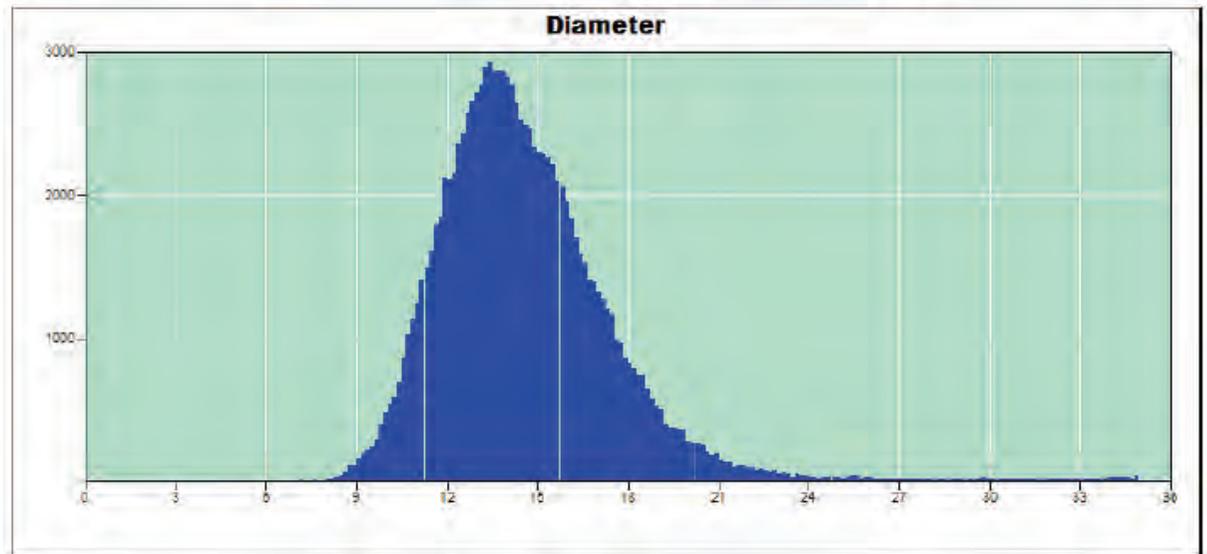
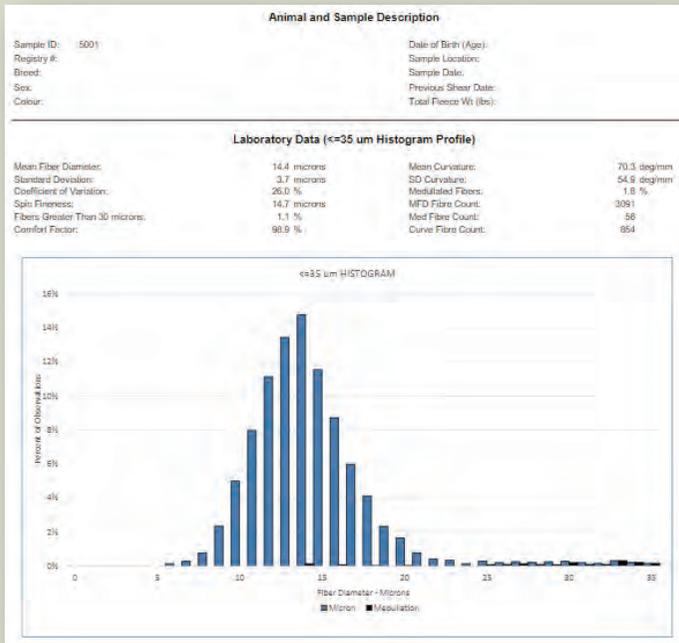
This indicator is useful for assessing the variation of any measure within your flock, from the micron range in an individual fleece to understanding the overall variation across your entire flock.



Fibre Testing Results

Fibre Sample Test Result 4675

| | | | |
|----------------------------------|-----------------|---------------------|-------------|
| Species / Breed: | Goat / Cashmere | Tag/Name: | 4675 |
| Age: | | Medulation %: | 0.0 |
| Mean: | 14.4 | SD: | 2.7 |
| CV: | 18.6 | Coarse Edge: | 0.57 |
| Mean Curve (Å ² /mm): | 71.1 | Staple Length (mm): | 58 |
| Comfort Factor: | 100.0 | SD Along: | 2.1 |
| Client: | D Shaw | Test Date: | 19 Jun 2020 |

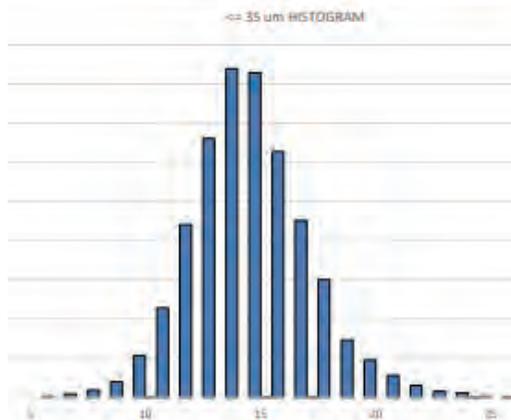


Variation in um along the length of a 60mm cashmere staple. This shows there is variation in fibre as it grows through a year.

Just because someone has classified a goat f1 to f5 or more, does not mean it is good or better. Only fleece assessment and breeding background will verify their quality.

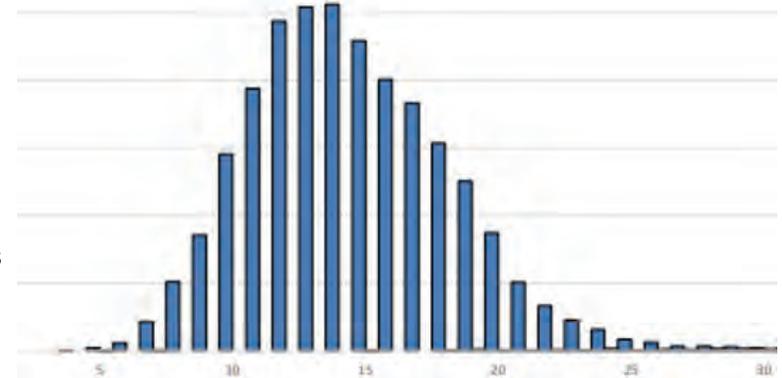


These two graphs show the difference between two fleeces. Both producing nice 14um cashmere but at the extremes of variability in range of fibres within the fleece. The graphs show that without measuring, this variability is hard to see visually and even harder to quantify.



Mean Fibre Diameter: 14.9 microns
 Standard Deviation: 2.8 microns
 Coefficient of Variation: 19.0%

Mean Fibre Diameter: 14.7 microns
 Standard Deviation: 4.0 microns
 Coefficient of Variation: 27.5%



Animal Assessment

Learning about what good fibre is helps growers to set flock objectives and genetic progress. It may also enable you to class your own fibre in the future. Test results are a guide so don't get hung up on the last decimal place. Animals will fluctuate a little over their lifetime.

At a commercial level much can be visually assessed once you know what to look for and do.

Testing of fleeces can be expensive and cost prohibitive on large numbers of commercial animals, or when you're starting out, making it hard to justify testing every fleece.

Testing a few nice does or your buck fleeces will give you a reference and increase your knowledge and calibrate your eye.

It is important to be aligned with your buck supplier and have confidence they are identifying the superior animals to drive genetic progress in the traits important to your flock. Seek advice from those that are measuring and testing to help you decide what you need to measure and when. This will help you to pick the right test for the right information.

- Fleece test sample preparation is critical for consistency of results.
- There is always some seasonal variance and error in subjective assessments.
- You never test the same fibres each time so expect variance between tests and the same goats.

And remember - any measurement method visual or tested has errors. There must be a balance between accuracy and cost, in \$ and time. Ask the key question - what will make a difference to your flock?

So what genetic traits do I select for?

The two principle commercial traits are micron (FD – fibre diameter) and total down weight (TDW) as they have the largest influence on your fibre returns.

Principle – the fewer the traits you select for the faster the genetic gain.

Traits to consider

- **Colour** – WW (white guard hair GH, white cashmere down), WC (light ginger GH, white cashmere down), GY (coloured GH, light coloured down), BR (black / dark brown GH, brown cashmere down).
- **Yield** – ratio of guard hair to Cashmere down, cover, density
- **Guard hair fibre attributes** – length, mane, britch, differentiation, intermediate fibres, medullated fibres, shiners
- **Micron stability** – how much does the fleece average micron increase over the animal's lifetime
- **Down length** – density, cover, curvature, variance (SD & CV)
- **Number of kids weaned** – the more kids produced means more replacements are available to grow the flock. Replace lower producing does.
- **Disease and parasite resistance** – feet, worm tolerance
- **Size** – bigger or growth rates related to more kids, better reared kids, more resilience, goats have overcome environmental constraints.
- **Structure and conformation** – feet, mouths, udders

Sometimes selection is eliminating the outliers or extremes. If “bad” in one major area it can eliminate the animal for consideration in all others.



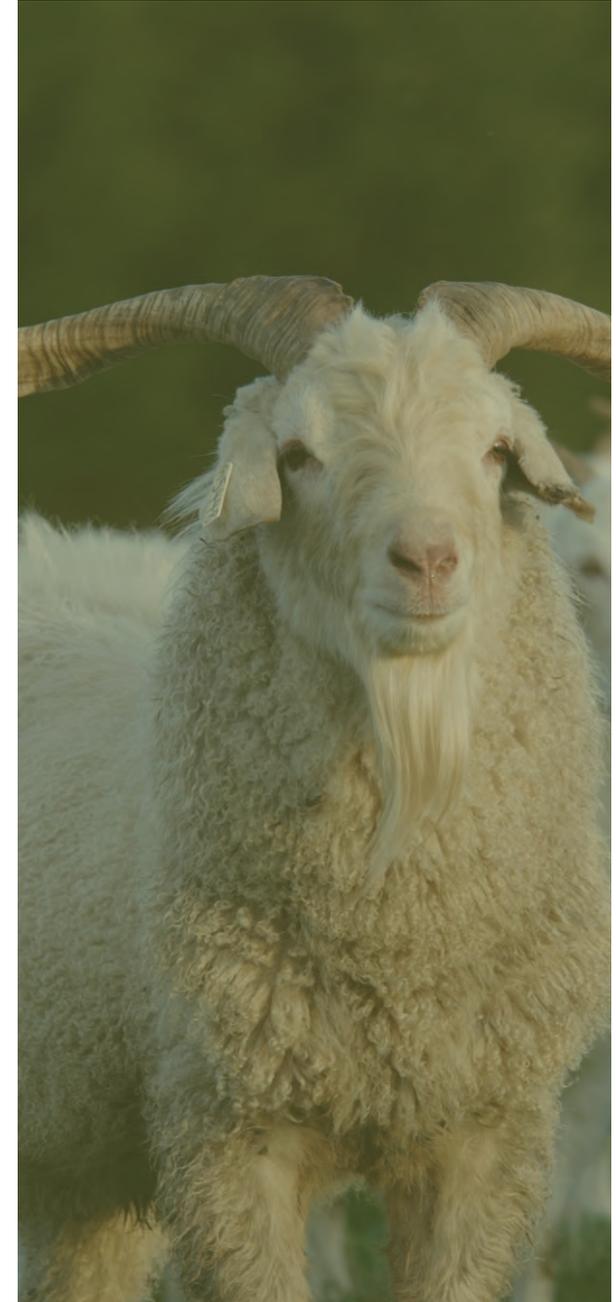
Putting it all Together

Buck selection

A basic general principle is that choosing the flock (or family line) where the bucks come from is more important than the individual buck, as over time you follow the source flock's genetic performance.

How many generations does it take to influence change or copy performance of your breeder? - Here's what it looks like:

| | | |
|--|---|--|
| 1st generation or cross f^1 – 1st filial | Your Does x Buck $\frac{1}{2}$ progeny 50% genetic likeness to buck's source flock | Variation seen in progeny. Progeny throw to be like mum or dad  |
| 2nd generation or cross f^2 – 2nd filial | Your 50% Does x Buck $\frac{3}{4}$ progeny 75% of Buck source | |
| 3rd generation or cross f^3 – 3rd filial | Your 75% Does x Buck $\frac{7}{8}$ progeny 87.5% of Buck source | Most progeny follows a few generations behind the buck source flock  |
| 4th generation f^4 | Your 87.5% Does x Buck $\frac{15}{16}$ Progeny 93.7% of Buck source | |
| 5th generation f^5 | Does essentially like Buck source flock. $\frac{31}{32}$ Progeny 96.9% of Buck source | You follow the breeder. Are they going in the direction you want? |



Questions to ask your buck supplier or breeder

1. What is that flock's objective? Does it align with mine?
2. What is their flocks' performance?
3. What do they select for?
4. Are their animals recorded and what testing takes place?
5. Is the measure accurate and does it have integrity?
6. Can the flock provide evidence of production progress?
7. Are animals selected in an environment that transfers to mine?
8. Is the flock big enough to enable meaningful selections and genetic momentum?

Remember - there are always compromises – there's no perfect breeder or animal, and your environment and management (See: Phenotype) will influence how your flock develops

Selecting Your Does

Most flocks likely fall into one of three categories

1. Extensively run with low intervention
2. Semi managed - Mobbed and rotationally grazed
3. Semi managed or intensive - tagged & recorded.

The amount of activity between the farmer and flock will influence how and when selection choices are made. Farmer interest and motivation varies, so design a management plan that matches. Costs are a critical part of profitability. So, costs are an important consideration.

When to select and assess your does

When making selections for culling poor cashmere producing-stock it needs to be done when they are in full fleece. Cashmere is the winter coat, so it is at maximum from about May to shearing around August.

How many that are retained, selected and sold depends on your ultimate flock size. If increasing numbers, most does will be retained, but if static numbers you should have higher genetic younger does available to enter the flock.

The simplest way to ID candidates for next season's culling period, which usually follows weaning, is to pick out "plainer" does (those with visually poorer fibre quality and volume) and identify them with an appropriate tag before they are shorn.

This separates the ID from shearing, simplifying the in shed activity.

If the mob is tagged with ID numbers, you may be able to record fleeces in more detail. Once you learn to make visual fleece assessments these can be recorded and aid future selection and culling decisions.

BREEDING CASHMERE GOATS



How to measure and Track Your Progress

01

From classer and processor

- Total clip weight divided by number of goats shorn
 - ▶ TFW grams / goat.
- Processed weight of recovered dehaired Cashmere down or processed lot divided by goats shorn
 - ▶ Yield % and TDW grams / goat
- Yield % - ratio of guard hair / cashmere down
 - ▶ Can be assessed visual estimate, bale cores or weights recovered from dehairing.
(There is a difference and not the same as wool yield, which is a washed sample with grease or suint removed)

02

Simple shearing shed assessment

- Total Fleece Weight x Yield = Total Down Weight / goat.
 - ▶ Can calculate on batch basis or fleece basis. Visual assessment vs test.
- Micron - visual estimate (hard to be accurate and margin of error)
 - ▶ Studies suggest by eye can be several microns out and inconsistent. Micron is not the only selection criteria so don't get consumed by a number. Diameter does move around little for the same animal over its lifetime.
 - ▶ Best to start and categorize micron by - Fine / Medium / Coarse.
 - ▶ Kid fibre is usually 1-2 microns finer than adults. Assessing kid fibre separately from adult helps consistency in observations.
 - ▶ Testing improves accuracy but costs.

- Down Colour - WW, WC, GY, BR. For classing.
- Classing can take place in the shed or at the warehouse. Warehouse classing comes with experience and accountability. If you make a mistake in grading your fibre, it could easily drop a grade and value.
- A good ambition is to learn enough about the fibre to class your own fibre.

03

Paddock or yards

- Kid Colour - Super White, White, Cream, Gold, Ginger, Blue, Brown, Dark Brown, Black. Kids are born with a birth Coat which gets replaced at about 3 months of age. Colour in a kid usually remains in the Guard Hair for its lifetime
- Weights
- Reproduction – mothering ability, kids weaned

Recording shearing information requires keeping each does fleece separate and identified to tags, fleeces weighed and then being able to make accurate assessments. This can be done very cheaply by eye for screening of animals. People can vary from being very accurate to being a waste of time. So be realistic and take the time to learn, or work with someone who has experience.

It is difficult to do accurately weigh, record ID’s, class and sample at the same time as shearing. It is a busy activity so segment and focus on the core pieces and do that well.

You can keep track of your stock performance with a simple spreadsheet of the measures that matter to you, like in this example:

| Number ID | TFW | Yield % | TDW (calculated) | Colour | Grade | \$ per kg | \$ per head | Comment |
|-----------|------|---------|---------------------|--------|-------|-----------|-------------|---------------------------|
| 6047 | 540g | 55 | 297g | WW | “1” | 125 | \$37.15 | Nice Fleece Good Yield |

How we track our fibre performance at Hēpara Cashmere

The following table gives a selection of the Hēpara best does fleeces by each micron and comes from actual fibre tests of our 2021 shearing. These are indicators of where some elite animals' production sits within this flock. Our recording system is today giving us the ability to track families which have strengths in specific traits. There is a range of options where to place breeding emphasis and we are exploring further developing different lines to maximise genetic gain in defined traits.

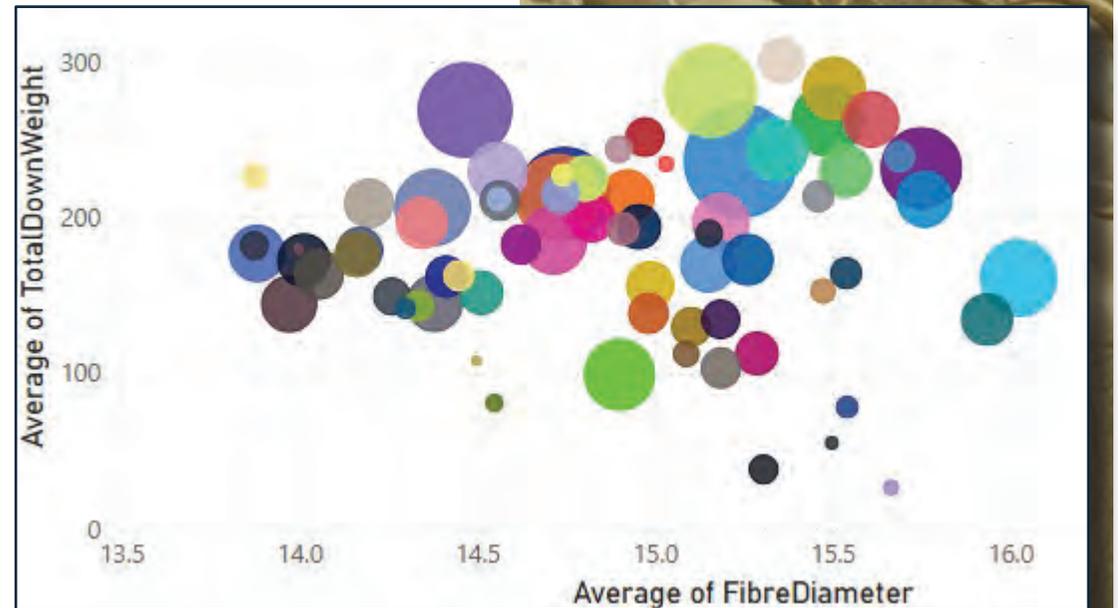
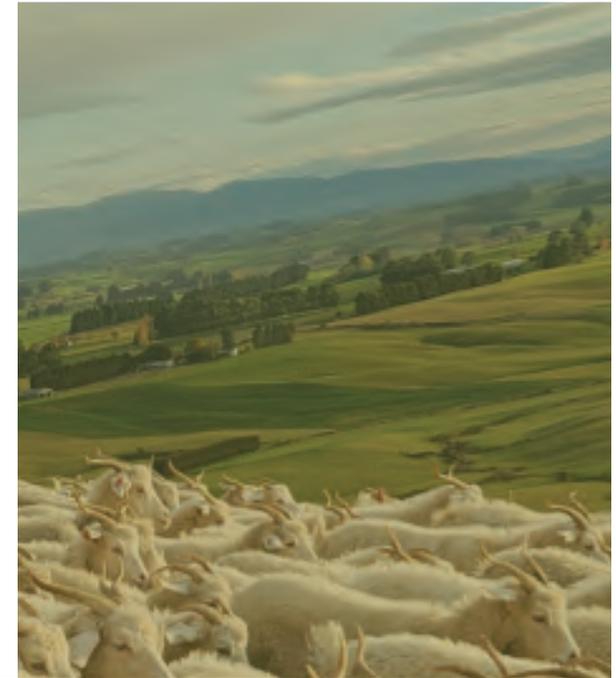
It informs the decisions around genetics available to growers via our bucks.

Some key points:

- The weight of fleeces increases as microns increase, but finer fibre is worth more.
- Kid/hoggets fleeces are generally 1 to 3 microns finer than adult fleeces.
- Our flock's aim for our does to average around 16 um mark.

DIAGRAM: Each dot represents the progeny groups of each buck used in the flock. This includes all daughters and sons shorn in 2020, 2021, 2022, 2023 and their average 10 month fleece performance at their first shearing. 2375 kids were born in these years.

The spread demonstrates the range in bucks breeding performance. For micron the finest group is over 2 microns finer. The best sire groups have produced 3 times the weight of cashmere.



BREEDING CASHMERE GOATS

Hēpara best does fleeces

| | Doe Tag | Total Down Weight | Micron | Yield | Curvature | CV | SD | |
|----|---------|-------------------|--------|-------|-----------|------|-----|---|
| 12 | 5334 | 391 | 12.8 | 85 | 66.9 | 22 | 2.8 | Very good cover and style, plainer back |
| 13 | 5724 | 352 | 13.9 | 80 | 62.5 | 20.8 | 2.9 | Exceptional cover and style, woolly, A++ |
| 14 | 5240 | 442 | 14.4 | 76 | 60.2 | 22.7 | 3.3 | Exquisite cover and style, woolly, A++ |
| 15 | 5343 | 539 | 15.2 | 79 | 61.6 | 22 | 3.3 | Exceptional cover and style, woolly, A++ |
| | 5448 | 507 | 15 | 84 | 63.6 | 23.3 | 3.5 | Very woolly, long, A+ |
| | 5246 | 537 | 15.4 | 78 | 58.8 | 18.9 | 2.9 | Exceptional cover, very woolly, very long, A++ |
| 16 | 4925 | 544 | 16.3 | 72 | 57.4 | 16.6 | 2.7 | Exceptional cover and style |
| | 5054 | 569 | 16.3 | 73 | 58.7 | 19.4 | 3.2 | Woolly, excellent cover and style |
| | 5469 | 665 | 16.4 | 74 | 56.9 | 23.9 | 3.9 | Exceptional cover and style, long woolly, Instagram |
| | 4523 | 950 | 16.9 | 80 | 52.3 | 21.5 | 3.6 | Great cover, long, big, woolly |
| 17 | 4113 | 511 | 17.5 | 68 | 54.5 | 19.4 | 3.4 | Exceptional cover and style |
| | | 572 | 17.7 | 76 | 58.3 | 19.3 | 3.4 | Exceptional cover, long |

- **Left column Micron** – average diameter of fibres <35um in the sample
- **Yield** – percentage of cashmere in the total shorn fleece. Ratio of guard hair to cashmere down
- **Curvature** – the mean curvature, waviness, crimp or curl of all fibres in the staple expressed as degrees/mm
- **SD** – Standard deviation is a measure (in micron) of the dispersion of fibre diameters either side of the average fibre diameter, where 66% of the fibre diameters lie
- **CV** – Coefficient of variation is the Standard Deviation expressed as a percentage of average fibre diameter

Case Study: Flock Makeup Feral Foundation Does



RESILIENT FOUNDATION FERALS

F1 kids

F1's as 3 year olds

- ▶ Ferals crossed to Hēpara's Cashmere Bucks
- 95 to 100% white kids born
- Hogget (10 month) shearing
- Produced approx 150g Down @ 15 microns (10 month fleece)

HĒPARA CASHMERE

Starting from a Foundation Flock

Most growers will find their best entry into Cashmere production is by starting with a foundation flock of does and proven high genetic merit bucks

Foundation does can be any breed. Most goats naturally produce down fibres as part of their winter coat. Different breeds or strains of goats offer different advantages and consequences for progeny.

Foundation types will be used for a limited number of breeding seasons unless the enterprise model is just producing 'first x' kids for sale. The aim is to produce sufficient first and next generation kids to satisfy the flock size objectives. Once this is achieved does can be sold. Farm managed does may still have breeding life and can be sold to new start farms or be culled for meat.

Types of Foundation does:



Ferals and Feral X's.

Ferals are readily available and make ideal foundation does. These entry level does can be sourced at a modest cost or by capture. They are resilient and naturally adapted to their local environment where they have survived with little intervention for generations. They are tough, medium sized and produce lots of kids if well-managed.

They are recognized by their mixed colours, which is mainly the guard hair component of their fleece. Cashmere down colour is either white, cream, grey or brown. Feral genetic background can be very diverse, and with quite variable volume in coat components. Natural amounts of cashmere vary greatly. They range from not being worth shearing (<50 grams/head) to a few exceptional animals being over 150g gram/head. The quality of their cashmere can also be quite mixed in

cashmere yield, length of cashmere and guard hair, micron and style of cashmere down.

Some feral populations may have had cashgora/angora influence somewhere in their past, so just because they look fluffy don't assume all the fluff is Cashmere. Feral Cashmere usually has lower curvature, higher CV and can be variable length.

In the wild most ferals get pregnant on their first cycle. This influences their lifetime size, with managed progeny often showing good increases in stature, fully grown as 4 tooth's (3 years old).

Feet are generally very good. Ferals are very strong bonded mothers with neat compact udders.



Meat X's (Boers, Kikonui)

Both strains of goats produce varying amounts of base cashmere and can be used as foundation animals. They were developed and selected for size, growth rate and kidding rate. However this selection has taken place in very different environment and management

systems. Boers coming from a dry climate with supplementary feeding verses Kikonui from a NZ feral with some dairy infusion. They will consequently require and respond to different management. Over a few generations their genetics will be diluted in favour of cashmere.



Dairy Crosses (Saanan, Toggenburg, Nubian)

Dairy breeds produce fast growing kids thanks to their large milk volumes and stature. Milking farms generally have many more kids than what they require as replacements. This offers an opportunity to supply specialty breed Cashmere kids to establishing Cashmere flocks. These does produce lots of kids but dairy breeds bring other issues. Udder conformation, big or long hanging tits can be a problem

for extensively kidded does. They also tend to have short haired coats. This gives them less protection when extensively grazed and they feel the cold more than feral X types. The hair on progeny can be short like mum resulting in higher culling required. They are less hardy animals and need care, so if you are in challenging environmental conditions factor this into your decision-making.



Angora, Angora X's, Cashgora types to avoid as a foundation flock

Parallel to the Cashmere industry in the 1980's goat boom, large upgrading breeding programs for Mohair production took place. Many flocks started from ferals and progressed from "G4 ► G1" being top mated to Angora bucks. Cross-bred animals threw three types of fibre - cashmere, mohair and guard hair in varying quantities. Some first cross kid fibres were fine enough to grade cashmere and attempts were made to stabilize the fine edge.

The crossbred fibre was branded and sold as "Cashgora" but was essentially a strong down fibre more aligned to Iranian microns of

the period. Some breeders tried to stabilize this fibre, but Cashgora ultimately failed with no market for this fibre today.

The Angora influence introduced luster and intermediate micron or "shiner" fibres (fine mohair types) into the Cashmere which were difficult to remove at dehairing and add a serious fault in yarns. The dry climate Angora crossbred animals were also softer to parasites and had weaker feet. They didn't adjust well to New Zealand extensive farming systems.

The following three case studies are examples of starting-point scenarios for your flock, breeding priorities, buck selection emphasis and the time-frames to achieve you breeding goals. Use these as templates to help guide your approach. There is also a section for you to add your own notes when discussing options with your livestock supplier, buck breeder and, farm advisors.

| | |
|---|--|
| <p>Resilient Foundation Feral Does</p> | |
| <p>Flock breeding priorities</p> <ul style="list-style-type: none"> • Shearable cashmere on progeny • White kids • Maximum number kids weaned | <p>Select bucks for</p> <ul style="list-style-type: none"> • Homozygous white • High cashmere down weight • Medium to long down length • Coverage • < 18 microns |
| <p>Graphic/picture</p> <p>Refer to page 28 graphic</p> | <p>Time Frame</p> <p>1 to 3 generations/drops of kids – 2 to 4 years</p> <ul style="list-style-type: none"> • Utilize goats grazing behavior for weed control and pasture improvement • Build numbers and grow asset • Build flock genetic base and goat knowledge |



First or Second Crosses or 2nd Generation Does

| Flock Makeup | First or Second Crosses or Generation Does |
|--|---|
| <p>Flock breeding priorities</p> <ul style="list-style-type: none"> • Reduce variance in flock • Get as many kids on ground and weaned as possible to enable flock growth and doe selection • Cull faults and low producers. | <p>Select bucks for:</p> <ul style="list-style-type: none"> • Come from a recorded flock • Recorded and tested • Emphasize Down weight • Medium Micron 15-17mm • Sound. |
| <p>Picture</p>  | <p>Time Frame</p> <ul style="list-style-type: none"> • Similar to foundation does • Select does on production • Progeny should be superior genetically to parents. |



Established Cashmere Flock

| Flock Makeup | Established Cashmere Flock - f ² ▶ |
|--|---|
| <p>Flock breeding priorities</p> <ul style="list-style-type: none"> • Follow your defined breeding objective • Good bucks make the most influence in the flock • Fluffy white, high yielding doe flock • Down weight, fibre quality, cover, reproduction, resilience. | <p>Select bucks for:</p> <ul style="list-style-type: none"> • Come from a recorded flock • Recorded and tested • Emphasize Down weight • Medium Micron 15-17mm • Sound. |
| <p>Picture (Good examples)</p>  | <p>Time Frame</p> <p>At this point you are following your breeder, looking for incremental gain. Timeframes are dependent on your objectives and where you place your breeding emphasis (e.g. incr. TDW)</p> |

Cashmere Fibre Returns

What expectations should I have for fibre revenue?

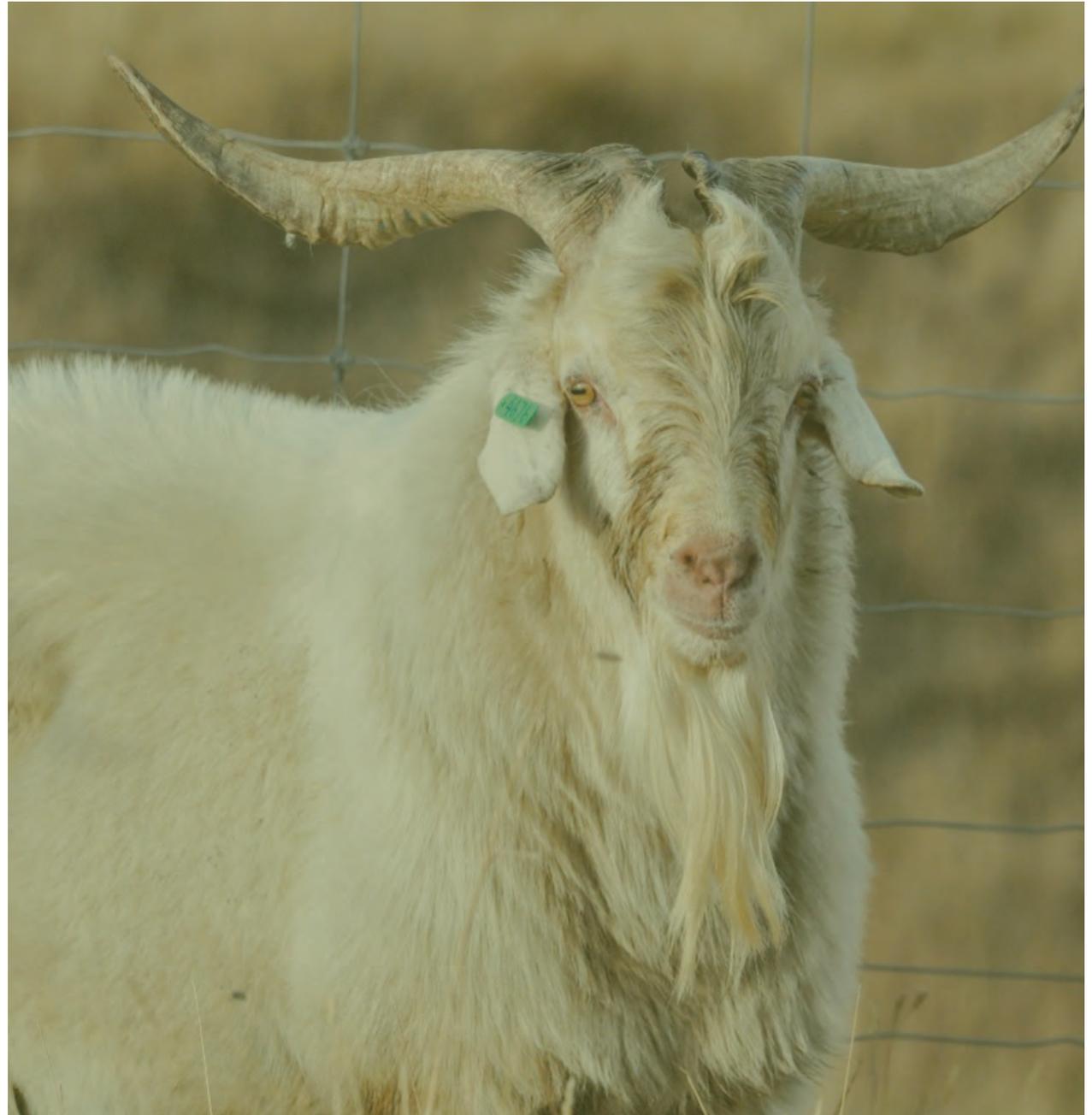
| CASHMERE FIBRE RETURNS | | | | | | |
|---|-------|-----------------|----------------|----------------|----------------|----------------|
| These prices and weights can fluctuate depending on markets, husbandry and genetics. Treat this as a guide. | | | | | | |
| DOES | | FOUNDATION DOES | F ¹ | F ² | F ³ | F ⁴ |
| | | FERAL/MEAT/MILK | 1/2 | 3/4 | 7/8 | 15/16 |
| | | 0 TO 120G | 100 TO 200G | 120 TO 220G | 150 TO 300G | 175 TO 400G |
| EXPECTED RANGE OF GRAMS/HEAD | | 80 | 150 | 175 | 200 | 250 |
| UM | \$/KG | | | | | |
| 17 | \$110 | \$8.80 | \$16.50 | \$19.25 | \$22.00 | \$27.50 |
| 16 | \$125 | \$10.00 | \$18.75 | \$21.88 | \$25.00 | \$31.25 |
| 15 | \$150 | | \$22.50 | \$26.25 | \$30.00 | \$37.50 |
| 14 | \$180 | | \$27.00 | \$31.50 | \$36.00 | \$45.00 |
| | | Note 1. | Note 2. | | | Note 3. |

Notes:

Note 1. Foundation does have mixed cashmere ranging from very good to not being worth shearing. They are ideal for producing f¹ kids. Feral does have mixed cashmere length, quality, micron, and many have coloured fleece which is discounted but still valued. Their cashmere can also be mixed quality depending on heritage (Cashgora/Angora influences).

Note 2. First cross does produce very nice cashmere, but with greater variability. Depending on the doe background and colours and sire background a large portion of kids will be white. The better the bucks, the faster the genetic gains. The cashmere traits heritabilities are very good- Down weight (.4 to .6); Fine micron (.5 to .9); Down yield (.3); Down length (.6 to .7)

Note 3. There is a negative correlation between micron and down weight. The average down weight per micron could be -20g to 40g less depending on phenotype. A doe flock aim may be slightly stronger micron average but higher down weight at a slightly lower price, and more higher value fibre coming off hoggets.



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NEW ZEALAND
CASHMERE

FEEL THE POTENTIAL

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This booklet is a collaboration between New Zealand Cashmere and Hēpara Cashmere.



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