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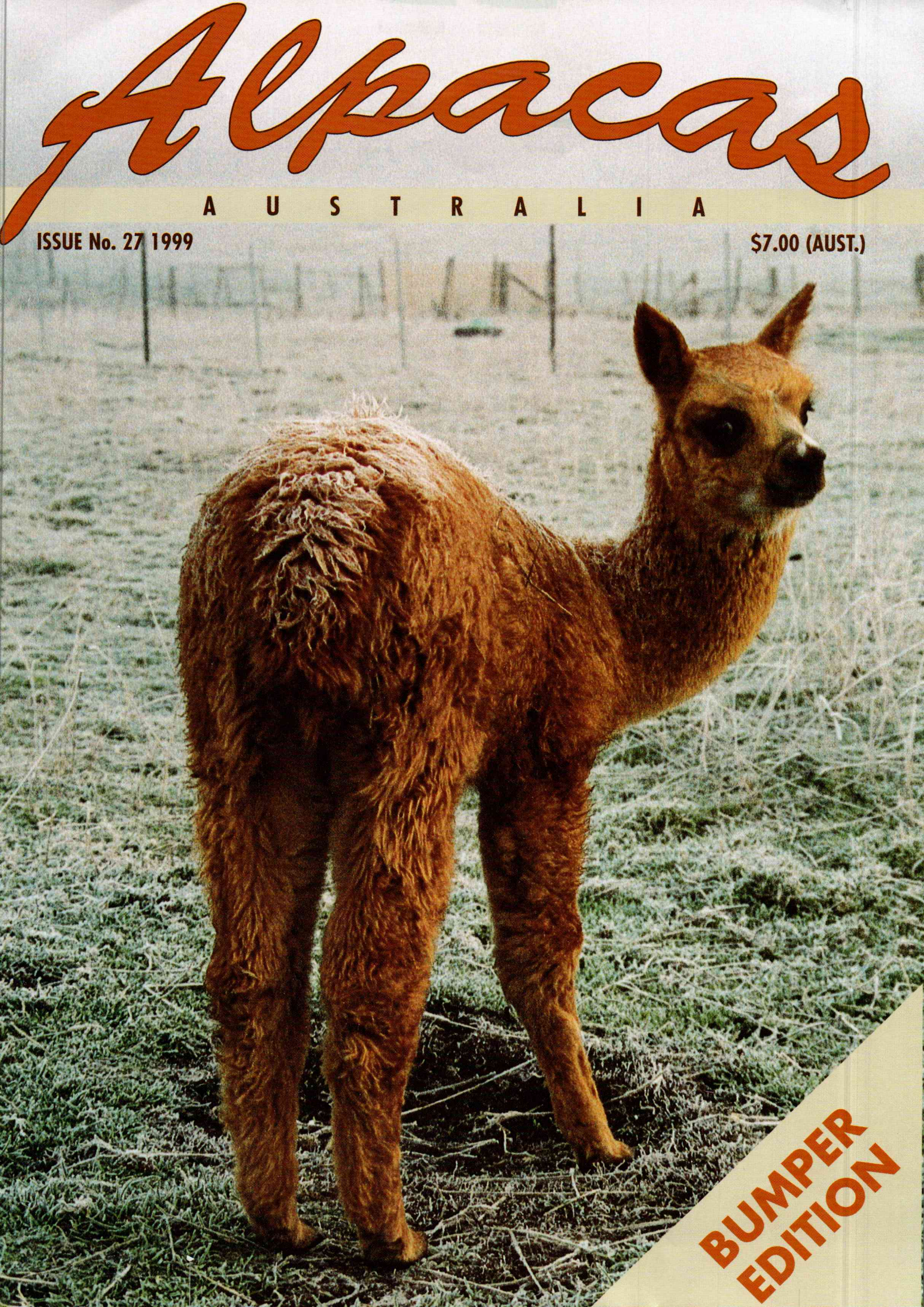

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A.S. TRADERS FORTUNES CHOICE

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First in Class: National Classic 1996
Placed first in every class/every show entered
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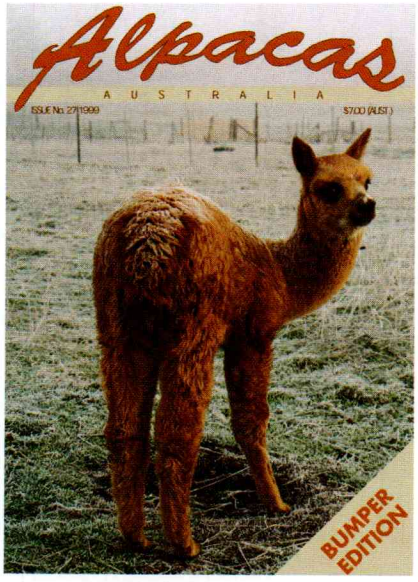

Cover: R and M Grubits, Intrepid Alpacas

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A message from the President

I am often asked what I see as the future of the alpaca industry, where it is going and how it is going to get there. What a question!

While I have my own ideas and a personal vision as to what structure the industry may take, there are some fundamental processes that must be in place before we can become anywhere near definitive in planning for the future. Of three things I am sure:

- the future belongs to those who plan for it;
- we need to achieve and set in place a common consensus of what we believe in; and
- we have a collective commitment to achieve results.

The Australian alpaca industry is rapidly approaching the next stage of its evolution into a primary industry of some significance. Having learned, like a child, to crawl and master the first stages of industry development, it is now taking its first tentative steps toward commercialisation. It is moving from an era of stud animal build-up to a phase where clear (and sometimes not so clear) lines will be drawn between true stud and commercial operations.

I believe that current stud operations (and operators) will settle into several distinct stratums that will form the basis of the alpaca industry in the next ten years. There may be a small number of 'parent' studs characterised by large numbers of breeding animals and access to superior genetics that will probably be infused into the national herd through artificial insemination and embryo transplants. These studs will provide primarily top quality stud males.

The second stratum will be the 'daughter' studs, probably aligned with specific parent stud bloodlines and producing quality commercial males and foundation stud females.

The third stratum, commercial breeders, will source their males mainly from the daughter studs, breed their own replacement female lines and farm quality fibre-producing wethers.

Whether this, or another industry structure emerges, we will need to manage it, *if* we are to be controllers of our own destiny. Unplanned growth will result in limited control and an uncertain future for the industry.

Right now, we should be asking ourselves some important questions. What is my alpaca business today? Have I reviewed my aims and ambitions lately? Have I taken a long, hard look at the reasons why I first entered the industry? Have I decided whether they are still valid? How will increasing commercialisation affect my business? Where will I be in 2005 and 2010?

The Association has a responsibility to assist in the development of the total alpaca industry for the benefit of everyone. Equally, Association members have an obligation to contribute, recognising the value of goodwill and collective input that produces effective, confident planning.

The challenge of industry structure, definition and future development will not go away. It must be addressed in a pro-active and positive way and not be allowed to creep up on us so that our only possible course of action is *reaction.*

We need to be ready to listen and open to new ideas. The alternative is to bury ourselves in the past, close our minds to new ideas and concepts and become irretrievably introspective.

The Association must plot a course through largely uncharted waters. It is a voyage of discovery that will provide both thrills and spills. It will never be boring and it will evoke passion and argument. But we will forge ahead, regardless.

We need you to participate in this voyage: to contribute your ideas, fears, dreams and your commitment. Above all, we need you to step out of the square of everyday business and look to the future with us.

Ian Watt

Alpacas AUSTRALIA

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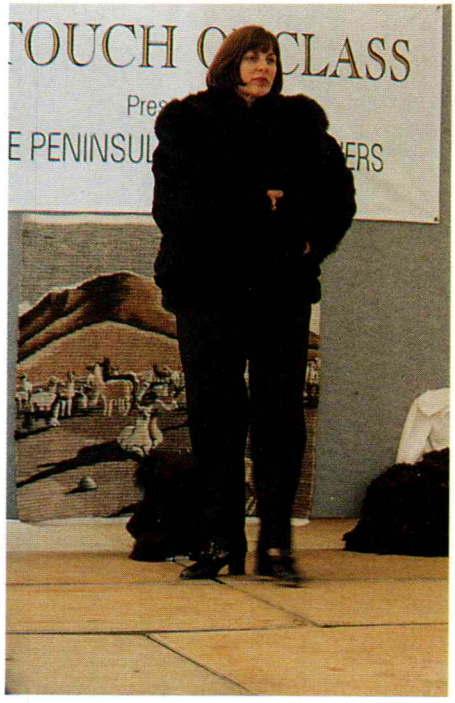
South Australian breeders go country



Alpacas were the featured breed at the inaugural Kapunda Agricultural Trade Fair. Right in the middle of sheep country, Kapunda was an ideal venue for alpaca breeders to reach the farming community, according to alpaca convenor, Bill Sims.

South Australian alpaca breeders joined some 20,000 exhibitors and visitors at Australia's oldest mining town on Friday April 30 and Saturday May 1 in ideal autumn weather.

The centrepiece of the alpaca pavilion was the fleece show, coordinated by Lorraine Kalleske, who commented, 'The 42 fleeces entered in the show have a full range of colours and represent the best fleeces currently being produced in South Australia.' They had been judged by Cameron Holt on April 17 who said, as part of his general comments on the exhibits, '...those fleeces, on the whole, that were entered for this show were of good quality and reflect the gains breeders are making with their breeding program.'

Ever an advocate of fleece exhibiting, Cameron's characteristic message was given in true rhyming couplet style,

Remember, you will never know
if you don't have a go
So get in and support your local show.

The public who attended the Kapunda '99 event were treated to two fashion parades daily presented by the Cleve Alpaca Group and co-ordinated by Gloria Parker.

There was 'standing room only' at each of the parades – and even that was crowded!

These Eyre Peninsula breeders staged their fashion parade (after their great success at the Cleve Field Days) with professional aplomb, showing off an extensive range of quality clothing, including some attractive and individually styled S.A. made garments. It was great to see the range of ages of the models, from young ladies to middle-aged women and grey haired farmers, all poised and smiling – obviously enjoying themselves. In all, there were ten models, working with two alpacas which behaved very well and which, as usual, charmed the audience.

The shearing demonstrations held each day attracted capacity crowds and lots of interest. Presented with excellent commentary, the shearing was carried out by Andrew Chapman. Much much discussion ensued when farmers' hands encountered freshly shorn alpaca fleece – probably for the first time!

Andrew Chapman shows how it's done...

Well-known studs, Akhira and Ambersun were represented with a range of garments produced from imported and Australian fibre. Mid North Alpaca Breeders, Timbertop and Barachel complemented their animals with displays of fibre: some part-processed and some as finished garments including handknits and felts.

For the suri breeders, Adsail Alpacas made sure everyone knew about the unique characteristics of suri fibre.

The suris were well represented.

Alpaca exhibits attracted plenty of attention.

Other breeders, present with penned animals, were also kept busy answering questions from a seemingly endless flow of visitors.

The information stand of the South Australian Region of the Australian Alpaca Association passed out information on animals and breeders, as well as selling raffle tickets for an alpaca continental quilt donated by the Alpaca Cooperative. It was won by the S.A. region's merchandising officer, Leanne Pearce.

Kate Graham, S.A. Region's Newsletter editor commented, 'All in all it was a very successful promotion, and the breeders who were there agreed that the bleary feeling on Sunday morning was a fair result for two days of promoting from 8 am to 5.30 pm. The trip into "sheep territory" was most worthwhile.

The alpaca enclosure attracted plenty of visitors.

'My own impression after talking to participating alpaca breeders was that they were pleased with the attendances and interest shown by visitors. More serious interest seemed to be shown on the Friday when it was basically the farmers who were looking.

'On the Saturday there were greater numbers through but, of course, more of the general public. The trade displays seemed to have plenty of people looking and touching and sales of garments certainly made the exhibits worthwhile.'

To be staged every two years, the next Kapunda Agricultural Trade Fair will take place in 2001.

FLEECE JUDGING RESULTS

Section F01: *First Fleece from alpaca 9-18 months*

Class 101: White
2. Adela Haus Amos, Adela Haus

Class 102: Fawn
1. Eurilla Mogo, Eurilla
2. Leajay Duststorm, Leajay
3. Jolimont Tejuana, Treegoodwill

Class 103: Brown
1. Whitehorn Ranch Masquerade, Ambersun
2. Leajay Brutessa, Leajay
3. Yacka Ridge Twyla, Yacka Ridge

Class 104: Grey
2. Samarjim Thunderstorm, Samarjim
3. Leajay Venus, Leajay

Class 105: Black
1. Kakaba Mashona, Kakaba

Section F02: *Second Fleece from alpaca 18-30 months*

Class 202: Fawn
1. Parnabrae Brutus, Hahndorf Hills P/L
2. Coonawarra Goldstein, Treegoodwill
3. Leajay Duststorm, Leajay

Class 203: Brown
1. Nachilda Ramos, Nachilda
2. Hildalwood Hof Martina, Hildalwood Hof

Class 204: Grey
2. Kakaba Moonshadow, Kakaba
3. Jendi Felise, Jendi

Class 205: Black
1. Terrosery Hill Espresso, Terrosery Hill
2. Yacka Ridge Sakima, Yacka Ridge
3. Ambersun Jasmine, Ambersun

Section F03: *Fleece from alpaca 30 months and over*

Class 301: White
1. Peruvian Cuzco, Fine Choice Alpaca Sires
2. Peruvian Auzengate, Fine Choice Alpaca Sires
3. Somerset Miss Peru, Shantas

Class 302: Fawn
1. Parnabrae Brutus, Hahndorf Hills P/L
2. NWA Ltd El Sol, Fine Choice Alpaca Sires
3. PCA Marathon, Fine Choice Alpaca Sires

Class 304: Grey
3. Crystalea Rusty, Terrosery Hill

Best of colour

Best White Peruvian Cuzco (301) Fine Choice Alpaca Sires

Best Fawn Parnabrae Brutus (302) Hahndorf Hills P/L

Best Brown Whitehorn Ranch Masquerade (103) Ambersun

Best Grey Not awarded

Best Black Kakaba Moshona (105) Kakaba

Champion alpaca fleece

Whitehorn Ranch Masquerade (103), Ambersun

Reserve Champion fleece

Nachilda Ramos (203), Nachilda

Fleece entries, described by judge, Cameron Holt, as reflecting '...the gains breeders are making with their breeding program'.

PUREBLOOD

PART 3

by Mike Safley

Breeding systems

The Quechua Indians are basically animistic in their religious beliefs. Their gods are called Apus and they have many, including a few Catholic saints whom they throw in for good measure. Their Apus reside in earth, water, air and animals. Let's pretend for a moment that we are the Alpaca Apu and we have been given the job of creating a mating plan for the North American alpaca herd which will allow the expression of its fullest genetic potential. In fact, let's imagine that we are not only Alpaca Apus, but trained geneticists as well. What should we do?

The first step to creating any future plan is to analyze the current circumstance. Today, the United States alpaca industry is generally following a breeding system known as outcrossing. Breeders work hard to ensure that their alpacas' pedigrees do not include any relatives. This may be the best plan, it may not, but before breeders decide which mating system is optimal they should understand all of their alternatives.

All alpaca breeders make two basic choices in their breeding programs. First, they select the alpacas which make up their herd. (We talked extensively about selection in Pure Blood Part 2.) Second, breeders decide which alpaca they will mate with each of the alpacas in their individual herds and how many offspring each parent will have. The second decision they make, the mating system or who to breed to whom, is every bit as important as their initial selection decision. Most breeders practice selection but, for many, selection also substitutes for their breeding system.

CREATING A BREEDING PROGRAM

To create an effective mating plan, we must understand how the elements of selection fit into the plan and impact upon genetic gain. Selection is used to identify superior animals. A mating plan is used to consolidate and perpetuate the gains made from selection. Understanding this relationship, together with possessing a thorough knowledge of how the various mating plans operate, will guide the creation of our breeding program and allow us to answer questions, such as:

1. should I use a wide variety of males or a select few?
2. should I use proven older males or unproven younger males?
3. how important is pedigree?
4. should I buy replacements or breed them from my herd?
5. how many replacement females should I save?
6. should I outcross, linebreed or mate like-to-like?
7. is corrective mating important?

The answers aren't easy, but by understanding how selection impacts upon genetic gain, then combining that knowledge with our mating plan, we will begin to close in on effective breeding strategies, which will be discussed in great detail later in this article.

FOUR KEYS TO GENETIC CHANGE

Selection accuracy is important if any gain is to be made. This means the traits you are selecting for must be heritable and the animals you choose as parents must have high breeding value for the traits under selection.

For instance, if you are selecting for a heritable characteristic, such as fleece density, you must use stud males whose offspring have higher than average fleece weights. The same goes for fineness, crimp, staple length, etc.

If you are purchasing foundation stock, replacements or breeding services and density is your goal, ask for records of shear weights for all of a male's offspring. Inspect as many of his offspring in a given environment as possible. The same goes for any heritable trait under selection. By inspecting the offspring, you are determining the breeding value of the parents. Parents with high breeding values assure a higher degree of selection accuracy for the progeny.

Selection intensity is a key element of the rate of genetic gain. If a breeder is highly selective and chooses only the offspring exhibiting superior traits for heritable characters, from parents who are consistently transmitting these traits, the breeding values

Shanbrooke Alpaca Stud

~AUSTRALIA'S MOST SUCCESSFUL STUD~

1997 National Show

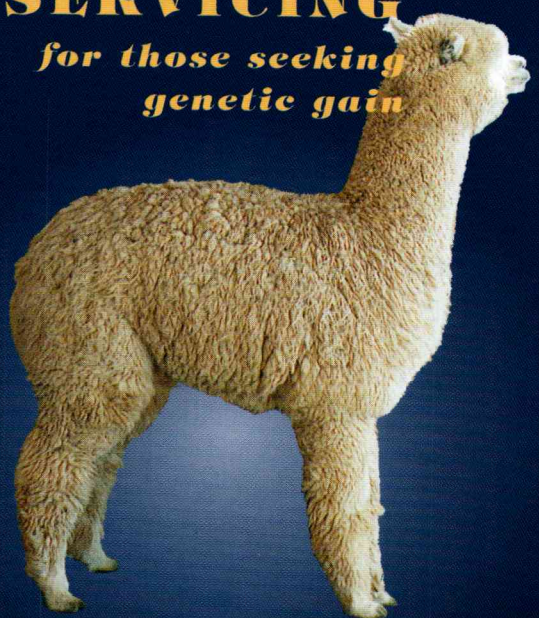
- **SUPREME CHAMPION**
  Shanbrooke High Society
- **Junior Champion Female**
- **Junior Champion Male**
- **Intermediate Champion Female**
- **Senior Champion Female**

Melbourne Royal 1997

- **SUPREME CHAMPION**
  Shanbrooke Society Lass
- **Junior Champion Female**
- **Junior Champion Male**
- **Intermediate Champion Male**
- **Most successful exhibitor**

ELITE STUD SERVICING

for those seeking genetic gain



SHANBROOKE PERUVIAN SIGNATURE

At 3 years: micron 20.28, SD 4.47, CV 22.0
(Melb. School of Textiles)

Our No. 1 choice in Peru, Signature has the presence of a champion with bundles of dense, crimpy fleece from head to toe. This stunning Light Fawn male carries brilliant lustre and handle that will enhance your females.

Shanbrooke High Society; Shanbrooke Society Lass; Shanbrooke Enchanter

SOMERSET PERUVIAN EXCELLENCE

At 1.8 years: micron 17.8, SD 3.6, CV 22 (Yocom McColl)
At 2 years: micron 16.48, 0.3% over 30 micron
(Melb. School of Textiles)

The finest huacaya male in the shipment and chosen from the Alianza Plantel herd. Excellence has the lot: density that's unmatched with his fineness, softness that melts in your hands and bundles of crimpy, lustrous fibre, even throughout. This Light Fawn male is a must for your Show Champions.

SUPERIOR STOCK FOR SALE

Including pregnant Peruvian females, weanlings and males

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will be high and the offspring should improve from generation to generation.

Breeders may decide to select animals scoring in the top twenty-five per cent on their selection index. (See Pure Blood Part 2.) If they later select only those alpacas scoring in the top twenty per cent of the index, they would then be selecting more intensely. The higher the selection intensity, the higher the rate of gain.

Genetic variation is extremely important to the rate of gain. Assuming there is a wide variety of animals to choose from, a breeder has the option of selecting alpacas with very different traits, such as ones with high or low fleece weights. If there is a high breeding value for a trait, such as density, progress can be rapid in the direction the breeder chooses.

On the other hand, if there is little genetic variation in a population of alpacas, it is very difficult to effect change. How could you expect to rapidly affect fleece weight if there was little difference between the high and the low? In other words, the more variation for a particular trait in a population, the more potential there is for change.

Northwest Alpacas' 1998 crias, a work in progress.

Generation interval is the final element that affects the rate of genetic change. Simply put, the more rapidly one generation replaces the other, the faster the potential gain. Mice reproduce more quickly than humans, producing one hundred and fifty generations in the time it takes humans to produce one. (Please note, this makes mice far easier to improve than humans and explains why mice are preferable over humans as laboratory animals.)

Three peas in a pod, Northwest Alpacas spring 1999 crias.

Generational interval is determined by the average age of the producing males and females in a given herd. Alpacas have a generational interval of four to six years for females and approximately five years for males. The interval will vary from herd to herd. Figure 1 identifies some common generational intervals for livestock.

Fig. 1: Common generation intervals

Species	Generation interval (years)
Horses	8.0 to 12.0
Dairy cattle	4.0 to 6.0
Beef cattle	4.0 to 6.0
Sheep	3.0 to 5.0
Swine	1.5 to 2.0
Chickens	1.0 to 1.5

The interaction of the four elements above, combined with an effective mating plan, will determine the direction and rate of gain in any herd. Selecting alpacas with high breeding values is a major key to success. Each of the five mating systems discussed will use these keys for genetic gain in differing degrees.

MATING SYSTEMS

The five types of mating systems are: random; outbreeding based on pedigree; like-to-like, or inbreeding based on pedigree; like-to-like based on phenotype; and unlike-to-unlike or corrective mating based on phenotype. Outbreeding involves joining alpacas which are *less* closely related by blood than would be the case with random mating. Inbreeding involves joining alpacas that are *more* closely related by blood than would be the case with random mating. The mating of like-to-like or the mating of unlikes, regardless of pedigree, is different from outbreeding and inbreeding.

Using some form of these five basic systems, together with selection, is the only way an alpaca breeder can change the inheritance pattern of their alpacas. It is important to know which changes will likely occur under each system. What are the strengths and weaknesses of inbreeding, outbreeding, mating like-to-like, and unlike-to-unlike? What does each system do, both poorly and well?

Any of these mating systems can be practised in combination with any of the others. Each system is almost always accompanied by some degree of selection. This makes possible an almost infinite number of specific breeding plans. The consequences of each decision may be predicted in a general way, but the random nature of Mendelian segregation and recombination leaves room for surprising results in individual cases. Precise predictions about the outcome of breeding plans will never remove the sporting elements of hope and chance, which have historically held the farmers' fascination and led many wealthy men to take up livestock breeding as a hobby.

The alpaca breeder cannot change the laws of Mendelism, the number of genes which make an alpaca, or their interrelationship. They cannot change the

expression of dominance or the negative effects of recessive genes. This leaves, as the practical means of controlling the heredity of animals, the decision about how many offspring each animal shall have and which alpaca shall be mated with which alpaca.

The organizational chart 'Mating Systems' sets out the five basic breeding systems. If you think about each of the breeding decisions you have made, you will find that they fall into one of these categories.

Random mating

Random mating is a system in which mates are chosen at random. With truly random mating, all conceivable matings are equally possible. To make random matings, a breeder with a statistical inclination might assign each female a number from a random number table, then allocate those females with the lowest random numbers to one male, those females with higher random numbers to another male, and so on. More typical procedures for random mating include 'gate cutting,' or sorting females according to the order they choose to approach a gate, or turning a number of unselected males in with females and allowing nature to take its course, as they do in Peru.

Random mating is easy. It requires no performance records or genetic predictions, and little time is involved in making mating decisions. Random mating is often used in commercial breeding programs where there are so many animals that other approaches are impractical. Few, if any, purebred breeders use random mating.

Random mating can be very helpful in the progeny testing of studs. If each sire is assigned to a large number of mates, and those mates are chosen at random, it is unlikely that the individual sire's evaluation will benefit from having good mates or suffer from having poor ones. An analysis of the progeny should be a reliable indicator of which sire is most desirable for the traits under selection.

There is no art in random mating. Many breeders feel that, by using random mating, they give up power over nature. But random mating is underrated and it relinquishes less control than you might think. The 'culls' that result from random mating are often balanced by superior specimens. There is no opportunity to use selection intensity or accuracy to impact upon the outcomes of random matings. Genetic variation can be enhanced using this system.

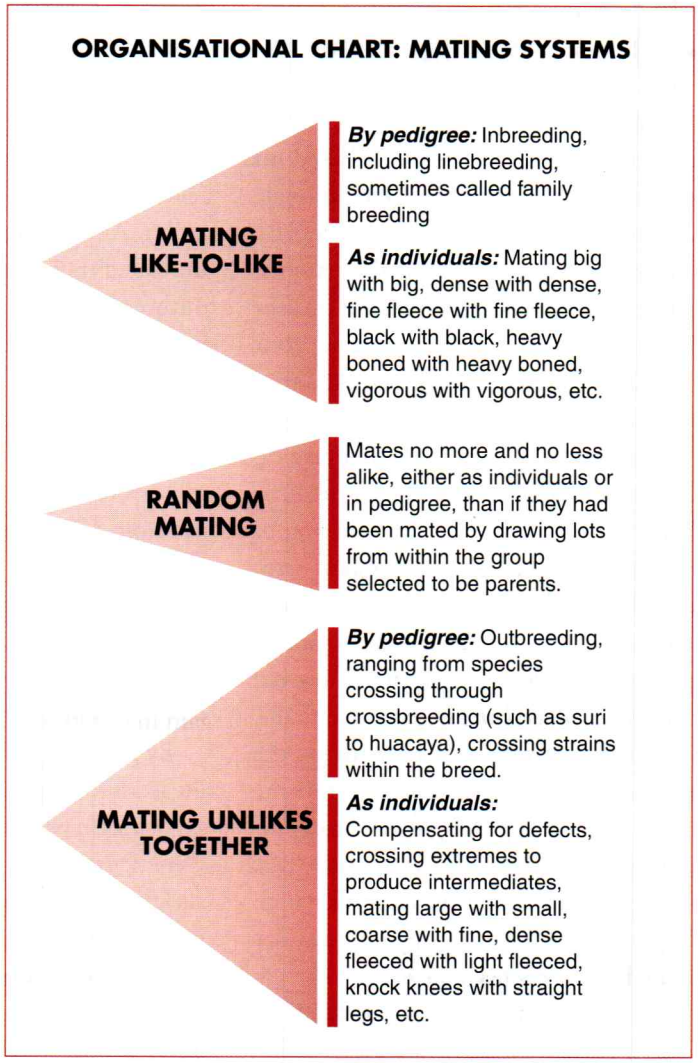
Like-to-like or positive assortative mating

The like-to-like breeding system in the following discussion is based on phenotype, not genotype or pedigree. This system is also called positive assortative mating. A like-to-like system based on pedigree would be called inbreeding, which will be discussed later.

When alpaca breeders talk about mating like-to-like, they are often talking about selection. They usually mean breeding the best to the best. Most breeders don't mean that they would also breed their worst alpacas to their worst alpacas, as would be the case in true like-to-like breeding. They might breed their best stud to their worst dam, which is unlike-to-unlike mating, but they wouldn't breed their worst stud to their worst female. So, when alpaca breeders talk about breeding like-to-like, they may be talking about using selection as a substitute for a mating system.

An example of like-to-like mating would be the mating of the tallest males to the tallest females or the smallest to the smallest, the fastest to the fastest, and so on. Positive assortative, or like-to-like, mating tends to create more genetic and phenotypic variation in the offspring than would be found in a comparable, randomly mated population. This is because the mating of the largest to the largest creates a portion of the herd which, in alpacas, are much larger alpacas as opposed to the portion of the herd where the smallest was mated to the smallest and smaller alpacas were the result.

Uniformity for traits like fineness, crimp, and luster in alpacas or speed in horses is usually valuable to pure blood breeders. The increased phenotypic variation caused by true like-to-like assortative mating is normally considered a drawback of the strategy. However, the increased genetic variation obtained from like-to-like breeding can be beneficial from a selection standpoint. The greater the genetic variation, the faster the rate of genetic change.



Few breeders use like-to-like breeding for the express purpose of increasing genetic variation. They are more likely to mate their best males to their best females in order to increase the probability of producing superior offspring. They often use positive assortative mating to produce extreme individuals, which makes sense if the breeding goal is to produce show animals.

Like-to-like mating is sometimes advocated in the belief that this will lead to a fixation of characters. When an animal's characters or traits are 'fixed' or homozygous, they will breed true for these same characters. The problem is that like-to-like mating perpetuates characters, but does not fix them. Most of the benefits of like-to-like matings occur in the first few generations. After that, there are diminishing returns. This approach does facilitate both selection accuracy and intensity.

Mating unlike-to-unlike or negative assortative mating

The reverse of mating like-to-like is the mating of unlikes or negative assortative mating. Again, this system is based on phenotype, not pedigree. One rationale for unlike mating is corrective mating. By compensating for faults in the parents, you help ensure that they are not present in the offspring. For example, if your favorite alpaca dam is sickle-hocked (too much bend in the hind legs), you might correct the fault in her cria by breeding her to a stud that is post-legged (too little bend in the hind legs). The mating of unlikes should be regarded as a short-term expedient and breeders should attempt to move on to like-to-like mating as soon as possible. It is extremely important to avoid the mating of animals with similar faults.

With the use of unlike matings, the parent's faults may disappear from the offspring, but they will probably reappear in later generations. This is especially true if there is 'over compensation', which happens when very good alpacas are mated with very poor alpacas.

Just as like-to-like mating tends to increase genetic and phenotypic variation in the offspring, unlike mating tends to decrease variation. Mating animals that are extreme in one direction to animals that are extreme in the opposite direction tends to produce more intermediate types and reduce the variability of the offspring.

Negative assortative mating is not a good strategy if you want to speed the rate and direction of genetic change. Reduced genetic variation decreases response to selection. However, if your chief goal is to increase phenotypic uniformity about some intermediate optimum, this mating strategy can be good. An example of unlike mating might be the pairing of roosters with high breeding values for egg size to hens that produce small eggs. This mating should tend to create layers producing moderate-sized eggs.

Outbreeding

Outbreeding or outcrossing is the opposite of inbreeding. It is the mating of individuals unrelated by pedigree. Because no animals within a population are completely unrelated, a more technically correct definition of outbreeding is the mating of individuals more distantly related than the average for the population. Any mating involving essentially unrelated individuals can be considered outbreeding. As a mating strategy, outbreeding often refers to crossbreeding or to linecrossing, which is the mating of sires of one line to dams of another line or breed. Mating suri males to huacaya females to create suri cria is the clearest example of crossbreeding in the alpaca industry.

The primary effect of outbreeding is an increase in heterozygosity. Most of the effects of outbreeding result from the increase of heterozygosity.

By increasing heterozygosity, outbreeding tends to keep most bad genes in heterozygous form where they are not expressed. Geneticists say the expression of recessive alleles is 'masked' in the heterozygote. That is why mutts exhibit fewer genetic defects than purebred dogs, and why outcross individuals in general appear to suffer from fewer genetic problems.

It is important to understand that outbreeding does not eliminate bad genes. It actually perpetuates them by masking their expression, making selection against them ineffective. If these recessive alleles occur at low frequencies, their impact on outbred populations is minimal.

Outbreeding for hybrid vigor

The most important genetic reason for outbreeding is to add hybrid vigor and genetic variation to a herd. Hybrid vigor is critically important to production in a number of species. It has major effects on fertility and survivability; it is manifested in traits such as conception rate, litter size, and weaning rate – traits that are very important economically. For this reason, crossbreeding, the most common form of outbreeding, is typically used to increase hybrid vigor.

Outbreeding is practised primarily by commercial producers who sell phenotypic value in the form of meat, milk, wool or eggs. Because outbreeding boosts production and efficiency by adding hybrid vigor, it is an important breeding tool.

The risks of outbreeding

Outbreeding systems risk half the merit of the offspring on the selection of the next sire to head the herd. If selection has already made the herd superior to the average of the breed, half of that superiority might be lost in the next generation unless selection is again as effective as it was before. Every breeder will occasionally make mistakes in selections. The breeder who continually practises outbreeding can therefore expect to have the merit of his/her herd regress at times toward the average of the breed.

The breeder who wants to keep the quality of his herd far different from the average of the breed must put some kind of a pedigree barrier between it and the rest of the breed. This will ensure that the quality differences continually being produced will tend to accumulate and not be halved with each successive sire.

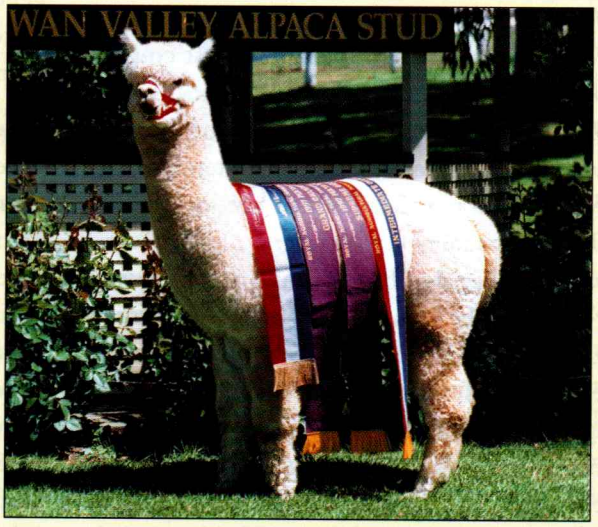
The following analogy, which is found in Jay L. Lush's famous animal breeding

SWAN VALLEY
Alpaca Stud
HENLEY BROOK WEST AUSTRALIA

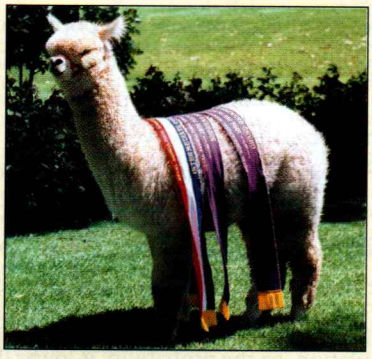
Leading the Way

ONLY STUD IN W.A. TO WIN 'BACK TO BACK' SUPREME CHAMPIONS
1997–98 PERTH ROYAL SHOW 1996–97 ALBANY SHOW

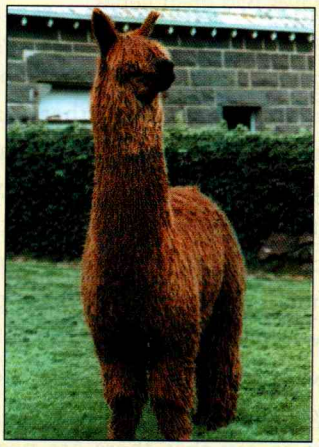
Outstanding Sires At Stud



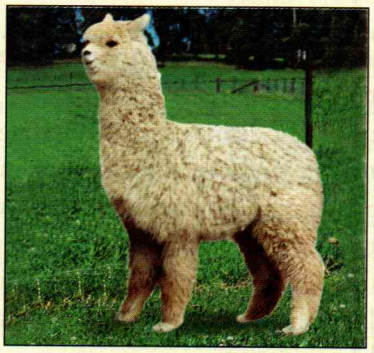
Shanbrooke Elite
His record speaks for itself. Winner of 7 championships T/O Aust. Incl. National Classic
3 Supreme Championships in WA. Res. Champion Fleece National Classic 1997 & 1998



Swan Valley Majestic
Supreme Champion 1998 Perth Royal Show & Albany Show. Outstanding genetics.
Sire: Peruvian Sonoma
Dam: Purrumbete Portia



Two Ways Royal Russet
A rare and outstanding solid brown pure suri, incredible handle and lustre.



Ellenvale Peruvian Valley Prince
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Sundial	*El Dorado*
Ledger's Dream	*Compass Rose*

Let

Purrumbete Monarch

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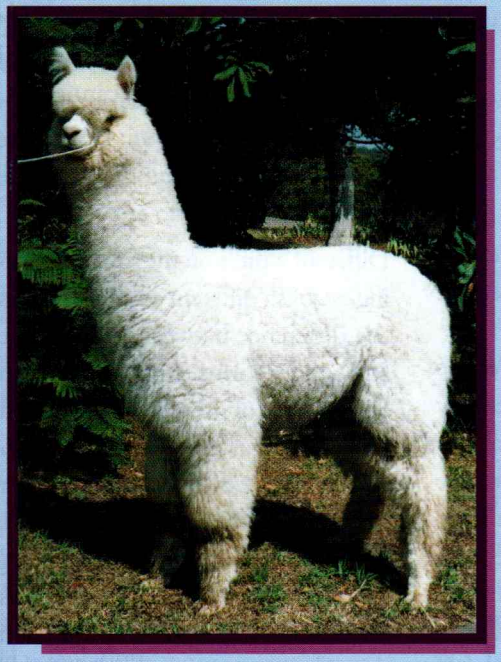
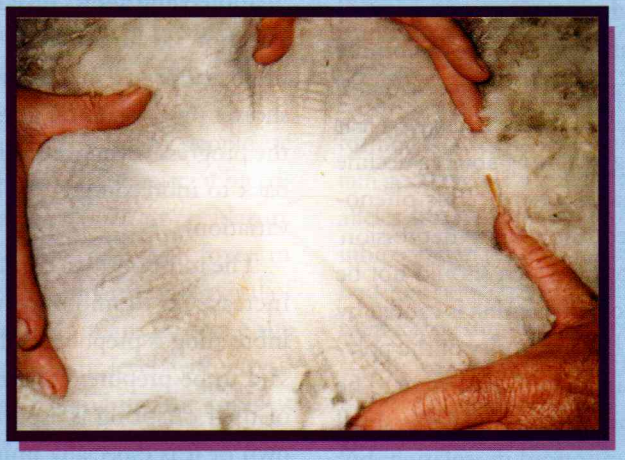


Solid White

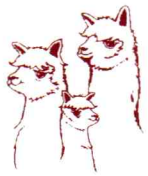


A 20u : 20cv Vision

Standing at Stud

Co-owned by

Gorge Alpacas



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Fax: 02 9652 2157

LIFESTYLE Alpacas

a sample half of the chromosomes it carries to make the pairs of chromosomes in its offspring. For instance, full brothers and sisters have 50 per cent of each parent. However, they may not have the same 50 per cent. They will be similar in some respects, but the odds are as great that they will be totally different, as they are that they will be entirely the same.

To work out the degree to which an animal is inbred, multiply the values of the fraction (or decimal) of each parent's relationship to the animal being considered. Full brother *A* and sister *B* are 50 per cent related; in fractions, ½ related, in decimals 0.5 related. The progeny of A x B is ½ x ½ = ¼, or 0.5 x 0.5 = .25 or 25 per cent inbred. Following this approach, the degree of various relationships works out as follows:

sire & daughter	¼ or 25.000%
full-brother & full-sister	¼ or 25.000%
sire & granddaughter	⅛ or 12.500%
half-brother & sister	⅛ or 12.500%
nephew & aunt	⅛ or 12.500%
niece &uncle	⅛ or 12.500%
full first cousins	1/16 or 6.250%
half first cousins	1/32 or 3.125%

This approach to determining the percentage of inbreeding is open to a certain amount of criticism since relatives may have more in common than the average possible.

Coefficient of inbreeding

The above calculations hold if the parents themselves are not inbred. However, if the ancestor is common to both parents and is itself from an inbred line of descent, this has to be taken into account. The inbreeding coefficient of an individual then becomes slightly larger, or $\frac{1}{2}E[(\frac{1}{2})^n \times (1 + \text{inbreeding coefficient of the common ancestor})]$. *E* stands for the sum of all lines of descent.; *n* stands for the number of intervening gene segregations in a line of descent on which its sire and dam are related. Should more than one common ancestor of the parents be inbred, each will be accounted for when the calculation is made for the appropriate line of descent. Corrections made in this way account for very little once the ancestors are several generations behind the animal whose inbreeding is being calculated. (See Galton's Law, Pure Blood Part 1.)

Another method of determining the coefficient of inbreeding is the path method which is a calculation that simulates the 'path' taken by identical genes as they flow from ancestors to descendants. The method is simple and can be done by hand without a computer. Most genetic texts contain the 'path' protocol used to determine the degree of inbreeding in an individual.

Rate of increase of inbreeding in a herd

The rates of increase in inbreeding in closed herds of 50, 100, 200, 500, 1000, and 3000 breeding sheep are shown in Figure 2 for the different numbers of rams which may be used. To use the figure for a 500 ewe flock joined to 2% of rams, first calculate the average number of ewes per ram, in this case 50. Then look along the '500 ewe flock' line to a point level with '50 ewes mated' on the bottom of the diagram. The value of the left margin which is level with this point, in this case 1.25%, is the inbreeding increase per generation.

As you can see, the progression of inbreeding in a herd is very slow when more males are used. Some people have said the Accoyo herd is highly inbred but, based on the fact that Barreda uses over 100 sires on about 1,000 females, this assertion is doubtful, especially given that the Accoyo herd has only been closed since 1946. The fact that Don Julio has practised rigorous selection, together with mild inbreeding, explains why his males breed true for so many positive traits.

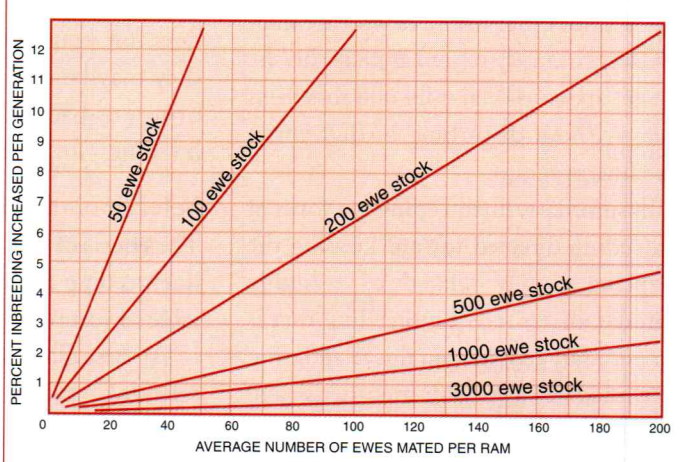
Line breeding

Linebreeding is a term commonly used by breeders of purebred stock. Linebreeding is the mating of animals related to a highly regarded ancestor. It is accomplished by using parents which are closely related to the admired ancestor but are little, if at all, related to each other through any other ancestors. If a breeder says an animal is linebred, this instantly raises the question: 'Linebred to what?' Typical answers are, 'This bull is a linebred Domino' or these, '...are linebred Accoyo alpacas', or, 'This horse is linebred to Secretariat.'

Linebreeding differs from other forms of inbreeding primarily because it is directed toward maintaining a close relationship to a certain ancestor and secondarily, because it is less intense than extreme inbreeding. The relationship to the admired ancestor, rather than intensity of inbreeding, usually dominates the breeders' thoughts when they linebreed.

Linebreeding, more than any other breeding system, combines selection with inbreeding. In a certain sense, linebreeding is selection among the ancestors rather than among living animals. Often, the ancestors being considered will have many offspring and be proven sires and proven dams. In this context, linebreeding can be considered selecting from among progeny tested ancestors.

Figure 2 Rates of increase in inbreeding in a herd



Rates of increase in inbreeding in flocks from 50 to 3000 breeding ewes which are joined to different numbers of rams. The rates depicted are maximum rates, or those encountered in a herd in which the generation interval is equal to the average number of years a ram is used.

The linebreeding advantage is partially offset by the fact that the individuals used to preserve the traits of their ancestors will vary in how much they are really alike. Breeders cannot depend entirely upon pedigree in making selections. The linebreeding process involves deciding approximately which pedigree the next sire or dam of a sire must have, and then choosing, from among several different animals with the desired pedigree, the one which seems to be the best individual. If breeders can progeny test several of the selected individuals and postpone the final decision of which sires will eventually carry on the breeding program, they will be on safer grounds.

The goal of linebreeding is to perpetuate the good traits of an outstanding sire or dam and increase the number of progeny they create without lessening their resemblance to the ancestor. The more superior breeders' herds or flocks are to the average merit of their breed, the more reason they have to linebreed their very best animals to the best of their recent ancestors. The risk involved in linebreeding depends upon how much undesirable inheritance is in a herd when the linebreeding begins.

Breeders' linebreeding successes depend on their selection skills; how much use they make of progeny tests before they decide whether to use a sire extensively; how large the herd is; and whether they work alone. If a breeder can cooperate with several other breeders who are linebreeding to closely related animals, he/she can get an occasional mild outcross from them without disturbing his/her entire breeding program.

In summary, linebreeding is a form of inbreeding directed toward keeping the offspring closely related to a highly admired ancestor. All inbreeding that is not necessary to maintain this relationship is avoided. That is why the intensity of inbreeding is usually moderate in linebreeding systems. The relationship to a chosen ancestor, usually a male, is the main feature which distinguishes linebreeding from other forms of inbreeding. More than one author of animal breeding books has commented that line breeding rarely results in problems. If there were problems, they would be attributed to inbreeding.

To inbreed or not inbreed

The dilemma of whether or not to inbred is not an easy one for most people to resolve. However, one thing is certain. If a breeder wishes to create a strain of excellent alpacas, with its own characteristics and uniformity of offspring, some degree of inbreeding is necessary. The reason is that a pure breeding, largely homozygous strain cannot be developed by any other means. Selection alone will not do it.

Parents may have similar phenotypes because a certain type has been intensely selected. But what about their progeny? These may be variable, with only an occasional cria tending to resemble the parents. This is why, in the livestock breeder's jargon, inbreeding is necessary to 'fix' the characters under selection.

There is no doubt that inbreeding is valuable in stabilizing the results of selection. It may be a good idea to defer inbreeding for a few generations to let selection have its maximum effect. The most significant advances with selection are usually accomplished during the initial stages. Eventually, diminishing returns set in and it is more difficult to make further progress. This is where the inbreeding or linebreeding might begin.

Inbreeding also has financial or market considerations. The current alpaca market does not value inbreds. To the contrary, they may be considered defective. This brings us back to the question, are we breeding – for 'pure blood or pure money'?

Selection and inbreeding

The effects of selection and inbreeding or linebreeding are briefly contrasted in the table 'Selection v inbreeding' below.

At first glance, the consequences of selection and inbreeding appear to complement one another. The comparison would suggest that all a breeder has to do is to select the right animals and inbreed closely, which will lead automatically to the fixation of advantageous genes and the breeding of high quality animals. The problem is that it is very difficult to concentrate all the desirable genes in a few animals. Another problem is that close inbreeding produces a situation where all of the genetic variability is used up quickly and further progress becomes impossible.

A compromise can be found in the form of moderate to mild inbreeding, or linebreeding. If breeders decide to inbreed, they cannot compromise their selections, which must be as intense as possible, after making allowance for the quality of the available stock. The goal is the fixation of positive genes, but progress cannot be so rapid that both good and bad features are fixed before the bad genes have been identified and weeded out.

In certain situations, selection and like-to-like mating with the minimum or absence of inbreeding may be the best plan. This is particularly true if the initial stock is poor. There are no quick and easy solutions.

How to do inbreeding and linebreeding

There are several ways alpacas breeders, both large and small, can inbreed their stock. Three types of inbreeding are common: close inbreeding, linebreeding, and closed stud mating. But, before anyone undertakes any of these approaches, there are a few steadfast rules that must be observed.

1. Only the highest quality foundation stock should be inbred.
2. Selection intensity should be high in inbred or linebred herds.
3. No alpacas with similar faults should be mated.

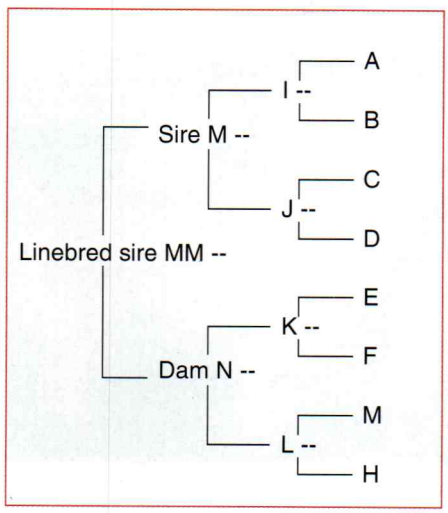
Selection v inbreeding

Selection	Inbreeding/Linebreeding
Perpetuation of certain genes	Fixation of all genes
Small decrease of heterozygosity	Steady decrease of heterozygosity
Increasing phenotypic similarity	Increasing genotypic similarity

4. Remember that no stable is better than its mares. High quality females are every bit as important as highly selected males.
5. Before you inbreed, you must have a clear picture of the breed standard that you wish to create. (There will be a thorough discussion of breed standards in Pure Blood Part 4.)

Alpaca breeders can begin inbreeding by simply buying a few superior females and then breeding them to their relatives. This is simple, since almost every alpaca in North America has a scientifically verifiable pedigree. Intense inbreeding on the sire's side, such as father to daughter, emphasizes the blood of the male. If it is repeated for several generations, the offspring will soon have almost none of the dam's genes. The same is true of son to mother mating, which is used when the dam's qualities are the breeder's objective. Full sister and brother matings are also considered close inbreeding, especially if they are repeated in subsequent generations.

As we discussed earlier, linebreeding involves focusing on the blood of an outstanding ancestor, generally a sire. A classic linebred mating which is used in many livestock breeds goes like this: let the sire of the sire be the grandsire on the dam's side. This breeding usually produces excellent stock down the line if the sire himself is excellent, without fault and his ancestors were the same. To see how a pedigree for this mating might be arranged, study the following diagram:



As you can see, this breeding takes some planning. Three generations, seven matings, and fourteen individuals are involved. There are many variations to this approach. For instance, the sire of the sire might be the grandsire of the dam on the sire's side. Half sister-half brother matings are also common linebred pairings and so on.

Another form of inbreeding, the 'closed stud' system, which is essentially the Accoyo method used by Julio Barreda, is detailed in many animal breeding textbooks. This is a flexible mating system which allows intense selection to be combined with linebreeding and mild inbreeding. When this system is working correctly, there is a steady decrease in heterozygosity, the elimination of negative traits, and a steady fixing of desirable traits.

Most closed studs operate with a high proportion of females to males. All replacement animals are selected from the closed herd. Ideally, replacement sires are progeny tested for prepotency before being widely used. This would involve at least ten test matings, preferably more.

By maintaining a closed stud and using females for several generations, a breeder can see which dam consistently produces outstanding cria. She should be highly valued and her male offspring preferred as replacements, all things being equal.

The coefficient of inbreeding can be kept at acceptable levels in closed studs say, at no more than 25%, by simply adding males. The 25% threshold is suggested because most strains exhibit little or no inbreeding depression at this level. If you are lucky and your foundation stock is pure, you may never experience inbreeding depression.

The closed stud, linebreeding, or inbreeding methods discussed above allow selection to be backed up by the power of genetics. The simplicity and strength of the ancestry allow good genes to be locked in and the 'pulls' of the breeding system will all be in the right direction. If, on the other hand, you are working with flawed stock, the closed system of breeding lets you know sooner, rather than later. Nobody wants to perpetuate genetic defects.

Remember, in a broad genetic context, homozygosity denotes genetic purity while heterozygosity denotes genetic impurity. If the genes you start with are free of negative recessive alleles, that purity will be enhanced by inbreeding. If not, and there are bad genes, the homozygotic herd can become pure for the bad genes as well.

Linebreeding or inbreeding is not going to be embraced by every alpaca breeder, nor should it be. The more diverse our collective mating plans and selection systems, the more progress we will make on a national level. Our common vision should be to breed the most productive alpacas in the world. Inbreeding is but one possible path to that goal.

CREATING A STRAIN OR A BREED WITHIN A BREED

In 1991 I made my first trip to Peru. While I was there, my host, Alonso Burgos invited me to visit the Colca Valley. We stopped on the way to visit Grupo Inca's breeding operation, Sallalli, where they had just purchased 24 male alpacas from Accoyo. As I inspected the males, I said to myself, 'These must be a different breed of alpacas.' Upon returning to Arequipa, I managed to meet Don Julio for the first time. I will never forget those 24 males (see photos B, C, and D). Since then, I have often dreamed about creating my own strain or breed of alpacas, much the same as Don Julio Barreda has done.

My dream prompts the question, 'What is a strain?' A breeder can assemble a few similar alpacas and maybe talk about a strain. This approach is encouraged by the registration of breeder identifiers with the Alpaca Registry, but there is much more to the term than that. Many years and a certain depth of pedigree need to be created before it is legitimate to even speak of a blood line, let alone a breed within a breed. To be considered a strain, or a breed within a breed, the members of the exalted group must consistently breed true to their type.

Photos B & C: Mike Safley at Estancia Sallalli, Grupo Inca's experimental alpaca breeding ranch, in 1991 on his first visit to Peru. This was Mike's first exposure to Don Julio Barreda's Accoyo alpacas.

In my dreams, people talk about the quality of Northwest Alpacas' animals. Maybe in the future, the terms 'strain' or 'breed within a breed' will be used to describe my alpacas. My dream will become reality when knowledgeable people remark, 'That alpaca is from Northwest Alpacas. I can spot them every time.' I believe that for people to accomplish anything significant, they have 'gotta dream'.

BLOODLINES

The word 'bloodline' is often used by breeders. The term is found in many advertisements and is mentioned in many articles. It is rarely found, however, in books on animal breeding and it is still rarer in textbooks on genetics.

In general, 'bloodline' is synonymous with 'pedigree', though not as definite. It indicates family. Breeders might test many animals in a breed to find out which bloodlines are the most productive and valuable, or maybe they want to learn which are the most prominent bloodlines of the breed.

Sometimes bloodline is used to convey the idea of relationship. It can be said that two animals 'have nearly the same bloodlines.' This implies that the two animals are closely related. It may imply that an animal is closely related to some famous ancestor. Usually, the term makes the relationship seem much higher than it is in any genetic context.

Bloodline is also used to describe a linebreeding or an inbreeding program, which involves mating together animals of similar, but not identical, bloodlines. The term conveys a vague idea of the inbreeding coefficient.

Because of its vagueness, bloodline is not a good scientific word. It is widely used in breeders' conversations and people think they understand, at least in a general way, what it means. The terms 'relationship coefficient', and 'inbreeding coefficient' are not widely used nor understood, they would often require a long translation or explanation. There is no way to make the term bloodline quantitative and it is only useful where a qualitative meaning is intended.

Once in a while, bloodline is used to infer that a whole complex of inheritance is transmitted as a unit, unchanged from parent to offspring, generation after generation. This misconception comes from studying pedigrees backward. A living, well regarded animal is often traced through his sire back to a grandsire or great grandsire, who was an outstanding individual. Looking at what happened in retrospect, we sometimes think we see an unbroken succession of outstanding genetic merit. This impression about an animal's 'bloodline' could be formed even if most of the ancestors were essentially unrelated.

If we could turn the pedigree around and look forward from the first famous animal in the line, we might see a different picture. This outstanding individual, the first identified with the bloodline, was probably used in one of his era's leading herds. He sired many sons and daughters and only the best of his sons were selected for use in other leading herds, where they were mated to better-than-average females. That son whose offspring proved him to be the best, then became the leading sire of his generation and his supposedly best sons were eagerly sought and in turn were tried out in the leading herds of their time. This may

Photo D: Accoyo males from 'Shere Khan's' family.

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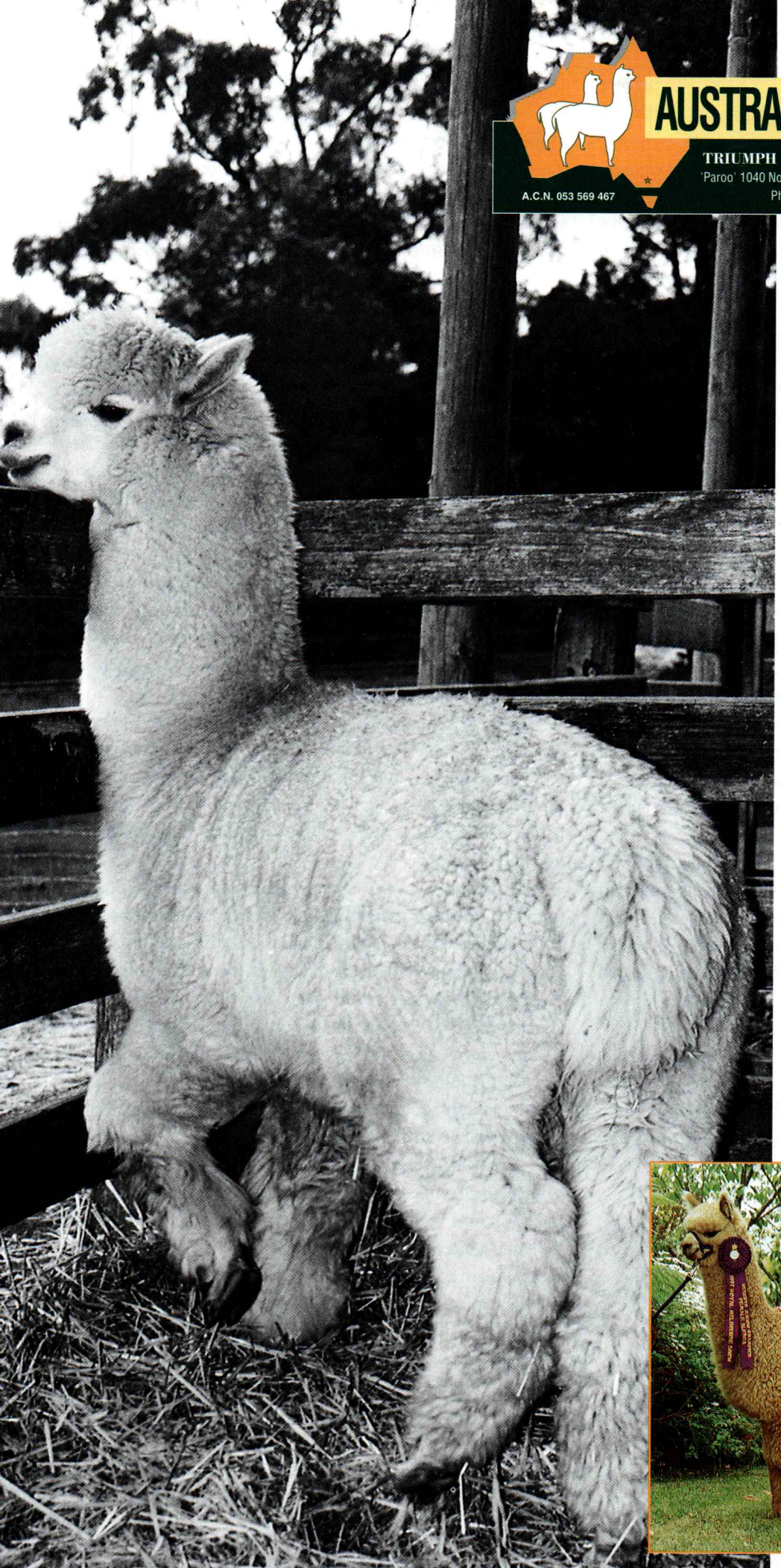

His progeny took out a first place and two seconds in class at Royal Melbourne Show 1997

(Below)
Australian Centeno Sunrise
Reserve Junior Champion Female, 1997 Royal Melbourne Show
Second in Class, National Classic Show

Sire: Peruvian Centeno
Dam: World Class Dawn (Chilean)

Call or fax Bev Brennan (03) 5782 1800

have lasted several generations, or at least as long as even one outstanding son of the original outstanding sire in each generation could be found. What really happened was nothing more fundamental than selection intensity operating to choose the best of the original sire's sons in each generation. The truth is that the original sire's blood was probably fully diluted in very short order by mating the sons with unrelated females.

In the above example, the original sire becomes familiar to everyone who studies pedigrees of the breed, and many breeders will refer to the current relatives as having 'very valuable bloodlines'. Advertising will be used to reinforce this misconception. This claim of a superior bloodline is genetically dubious, but that won't stop claims of quality based on 'bloodline.'

USING THE FIVE MATING SYSTEMS

The mating systems we have discussed each serve a different purpose. None of them would be used in a vacuum. Each has its place. The North American alpaca industry currently places an emphasis on pedigree breeding. Most, if not all, breeders are raising breeding stock and are intent on improving the quality for use in breeding operations, not commercial herds. But breeding for small, uniquely colored pet alpacas with good dispositions, or fine fleeced geldings for sale to the hand spinner market, are also examples of legitimate alpaca breeding goals. The point is that breeders should use the mating plan most suited for their goal.

All the imported South American stock was the product of mating alpacas on a random basis. Many imported alpacas from small Indian herds were highly inbred. Very few of the South American alpaca breeders even practise selection, except for color and maybe, density, in the larger herds. Julio Barreda's Accoyo herd is a notable exception, since he selects for size, density, fineness, and a certain type or look, as well as color.

Once alpacas were selected by importers from herds in Chile, Bolivia, and Peru, and they made their way to the U.S., they were bred using an outcross system. The result has been an increase in heterozygosity and hybrid vigor. Genes from many sources have been blended into the North American crias creating a wide band of genetic variability.

It should be clear that, from here forward, based on the fact that our registry is closed, there will no longer be 'breeds' based on country of origin. There never really was such a thing as a Peruvian, Chilean, or Bolivian breed. That concept is genetic nonsense. What we really have are alpacas with traits, characters, alleles, genes, gene frequencies and gene combinations. None of these are identifiable in a genetic sense with a country of origin. This foundation stock is the genetic raw material of future generations of North American alpacas.

From our current base, there is a large number of breeding strategies available. For instance, breeders can decide to mate unrelated animals on a like-to-like basis, selecting for traits such as size, density, crimp, fineness, luster, or color. Once breeders have produced or selected a population of animals which exhibits the traits they desire, they might begin to linebreed the alpacas with sires exhibiting the best examples of these traits. Thus lines of animals will be created which are homozygous for the traits under selection. The progeny of alpacas bred in this manner have the potential to become prepotent and breed true.

Once closely bred, or intensely selected alpacas have become consistent and uniform for specific traits, they can be outcrossed with other lines to take advantage of hybrid vigor, creating an even higher frequency of favorable dominant gene combinations. Closely bred herds could use outcrosses to import favorable alleles for specific traits, or to introduce hybrid vigor to the inbred line.

Pet breeders might use an outcross system to create unique individual alpacas. Breeders intent on creating extreme individual alpacas that will do well in the show ring might use like-to-like breeding. Each mating plan can serve a purpose.

None of this can be accomplished quickly. Breeding high quality animals is a long term prospect. I once asked Don Julio Barreda if he had any regrets about spending 60 years of his life breeding alpacas. 'Yes,' he said, 'it is a great disappointment that I have only completed half the job.'

Most exceptional herds of any breed are created over one or more lifetimes. This is especially true of large farm animals which reproduce slowly. Since the benefits of selection and pedigree can be dissipated very quickly (see Pure Blood Part 1, Galton's Law) once a breeder dies or retires, the fruits of his lifetime can quickly disappear.

This means we need to get started immediately. Breeding purebred stock has maintained man's fascination for thousands of years. Breeders can rejoice in the successful application of the creative powers afforded them through the science of genetics.

A breeder doesn't need to spend fifty years to see results. By researching pedigrees, practising selection, inspecting progeny, and making specific matings based on a plan, even the novice alpaca breeder can quickly begin to see the improvement. When breeders begin making mating decisions based on to whom the resulting progeny will be bred, the results will follow. If their vision is true, the results will be good and the next breeding better.

Creating a breeding program involves the use of judicious selection and conscious choices according to a mating plan. Whether a breeder chooses to mate like-to-like, outcross, inbreed, or create a nucleus herd, the probability of reaching a specific goal increases when a precise plan is operating. Adjustments may need to be made, but the plan and its goals allow a breeder to check progress. Another element in the overall plan is the animal standard or ideal which a breeder is attempting to attain.

We will discuss breed standards in detail in Pure Blood Part 4

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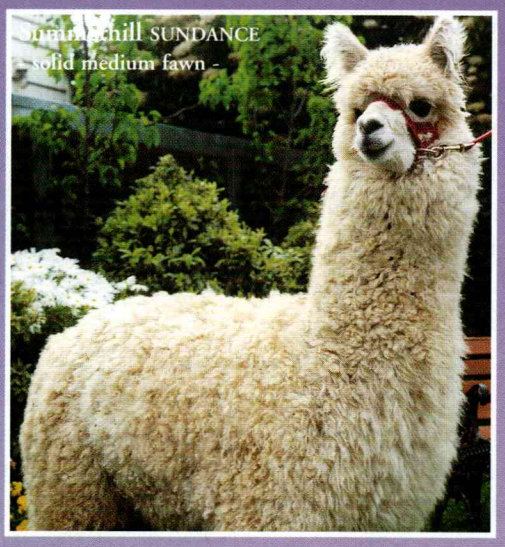
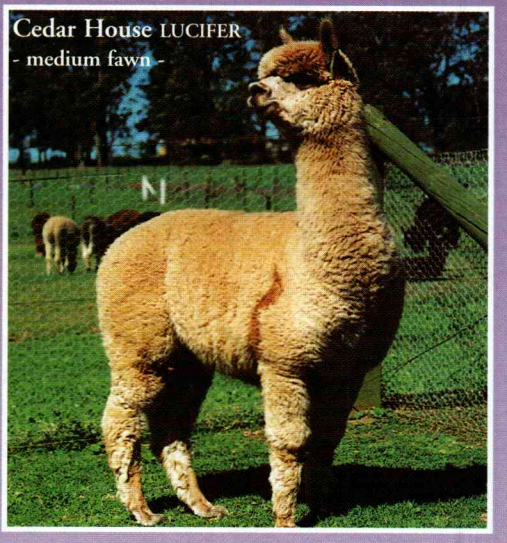
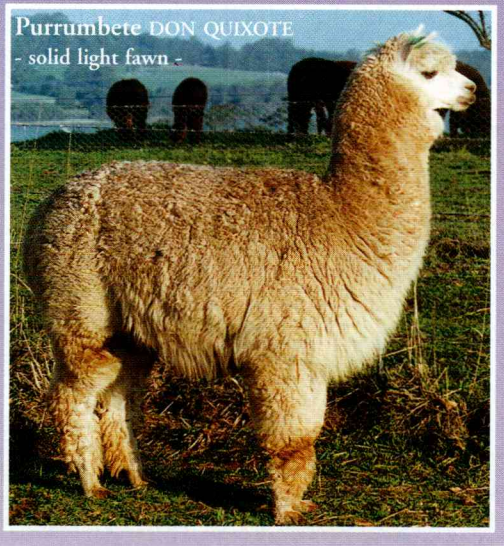


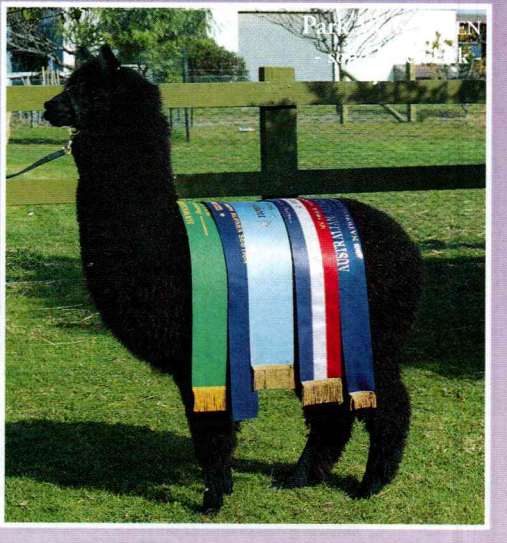
SUNDANCE, a beautiful upstanding young male by Purrumbete El Dorado & out of Purrumbete Flamingo Sunrise (Purrumbete Showpiece). This boy oozes style, density, coverage, crimp & a lovely soft fine fleece. We are confident Sundance will add some outstanding genetics and stunning cria to any herd.



LUCIFER (son of the famous Purrumbete Highlander) has stunning apricot fleece with beautiful character, density & lustre. Some show results – Supreme Alpaca Picton '97, Champion Fleece Castle Hill '97 & Hawkesbury '97, Champion Adult Fleece Sydney Royal '97, Res. Champion Adult Fleece Sydney Royal '98, Champion & Res. Champion Adult Fleece Hawkesbury Spring Show '98.



The legendary DON QUIXOTE needs little introduction. His outstanding fleece qualities can still be seen in his offspring, proving that at a regal 14 years of age he continues to impress.



RAVEN still retains the beautiful soft, lustrous, crimpy & dense fleece which has brought him numerous blue and Championship ribbons at shows up to National levels. His cria exhibit superb conformation and soft handling lustrous fleece of great character.

Keith, Jeanette & Kylie Hollingworth 76 Arcadia Road Galston NSW 2159 Ph: (02) 9653 1696 Fax: (02) 9653 1040

Cedar House moves into fine-wool country

by Wendy Billington

The move into wool country is already paying dividends for Cedar House.

The recent move from the Southern Highlands to the fine-wool growing area of the Southern Tablelands area of Yass has been a major step forward for Cedar House. With the purchase of 'Kenilworth', we are now on 900 acres with the breeding part of our operation on 300 acres. The fibre production animals have separate areas and we have room to expand without compromise to the animals' health.

Peter and I see it as a positive step towards the refining of our enterprise and to the future expansion of our stud herd.

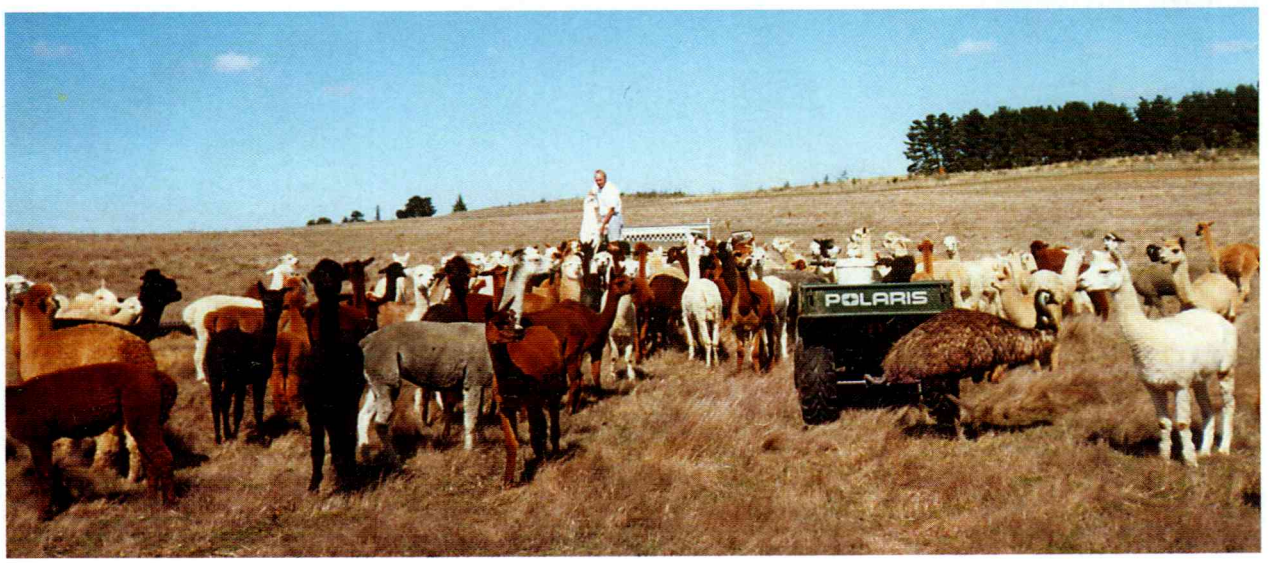
At the turn of the century, the property was the home of Sir Walter Merriman's rams. It is ideally suited to alpaca production with a balance of phalaris, rye and clovers as well as native medics. The soil is rich and the property has a boundary of seven kms of river frontage, allowing animals to graze on some of the best river flats around.

Facilities allow us to shed up to 1000 alpacas giving, as my partner, Peter says, 'a very comfortable night in extreme weather conditions'.

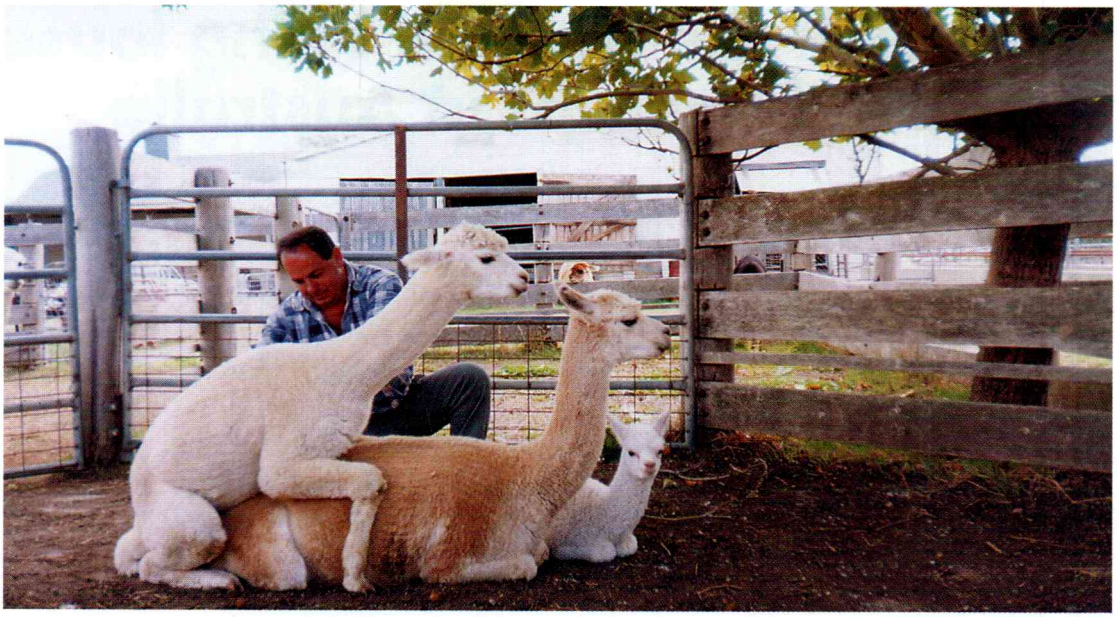
We have seen an enormous improvement in the condition of our animals and noticed that new-born cria seem to be more active sooner after birth. We believe the climate is closer to that of alpacas' natural environment, with virtually no humidity and short bouts of rainfall. They are certainly thriving in these drier, low humidity conditions – so different to the heavy deluges we used to get on our former property at Wildes Meadow.

The Australian alpaca industry is not a boutique industry. We see it as an incredible opportunity to be at the forefront of the development of one of the world's most precious fibres. Its rarity by no means make it non-commercial – in fact, just the opposite. A commodity as desirable as this fine soft-to-the-touch, extra warm, lightweight and natural fibre leaves everyone saying, 'Where can I buy it?' We see this demand as a green light for production.

Production, in our terms, means a superior breeding stock carrying the best fibre for genetic improvement; and, secondly, a fibre herd producing valuable fibre that fetches from $40 to $90 per kg. We aim for fleece weights at 6 kg per head as breeding is improved.



Note: Erik the emu – he thinks he is an alpaca.



The 'new Cedar House' mating yards with Peter Sultan enthusiastically directing the stud's breeding program.

Australian breeders are here to lead the industry towards the next stage, selecting and breeding the 'perfect' alpaca. Much has been said, over the years, as to which way breeders should go. We believe that if you are an owner, you must now look towards your own backyard and critically assess your breeding plans and progress. If this is difficult, call in professional breeders in your area and get an honest appraisal. Then, go and learn some more, through visiting other breeders' studs and attending courses. Maybe it will be necessary to start again with a prime goal held firmly in your mind: the production of wearable, soft-to-the-touch fibre.

The demand for this superb fibre will be there when we are all producing the quantity and quality that the manufacturing industry needs to start the big wheels turning.

Here at Cedar House, we have very carefully selected only those stud sires we believe will improve the next year's breeding. Nothing is more rewarding then having new crias arrive from your females and the sires you selected especially for them. These births are probably the most exciting events you can experience – and, of course, will bring enormous rewards if you've planned properly.

This should be every alpaca owner's aim – the striving to produce that perfect alpaca that will eventually lift the whole industry. In striving for this aim, not only do you see improvement, the value of your stock is lifted.

Later this year, Cedar House will conduct its first on-farm auction. We're planning to make it an annual event. Our plan is to gradually extend invitations to our clients to also participate in this auction with some of their improved stock.

As a judge, I get to see most of what is happening around Australia and I feel very confident about the quality of the fleeces and animals that are being produced.

If there are newcomers or existing breeders looking for agistment or help with herd development, we'd be happy to assist. Our move has placed us in a region where industry growth is outstanding. I believe we have more AAA members and animals here than in any other region. We are enjoying being part of the community and look forward to contributing our expertise to help further its progress and development.

[Wendy Billington and Peter Sultan are the force behind Cedar House, phone 02 6226 4888 or 0416 237 082.]

It's not all hard work. Wendy Billington takes some time for a little alpaca bonding.

Control of the camelid biting louse, *Bovicola breviceps* in Australia

by Jane Vaughan[1] and Ian Carmichael[2]

BACKGROUND

Shearing time in spring 1998 revealed numerous cases of infection of alpacas with the camelid biting or chewing louse, *Bovicola breviceps* in Western Australia, New South Wales, and Victoria. The parasite was first identified in Australia in October 1996 by one of the authors (IC) in a single alpaca from a herd near Adelaide, South Australia. The herd had been closed for some years, apart from some limited contact with alpacas for mating on another South Australian farm. The owner was advised of 'the likelihood that it (*B breviceps*) is fairly widespread, albeit at low levels', and that 'it will surface again somewhere in due course.' The herd was treated and subsequent examinations failed to detect the parasite. In August 1997, the Western Australian Department of Agriculture reported that it had identified *B breviceps* from material collected in 1996 from an alpaca imported two months earlier from Victoria. Once again, treatment was apparently successful. The increasing frequency of detection of *B breviceps* since 1997 has led to questions concerning its potential impact on the industry: how transmission of lice from animal to animal and movement of them between properties may occur; and possible means for their control or eradication.

There have been no studies on the transmission, adverse effects or control of *B breviceps* either in South America or Australia upon which to base answers to these questions and, given the example of the general failure to effectively control biting lice in sheep throughout Australia, no useful model to follow. It would seem prudent at this stage to survey the prevalence and intensity of infection of alpaca biting lice in the national herd as an initial step in deciding upon whether there is a potential threat to the industry; this would need to include some evaluation of adverse effects which may be ascribed to *B breviceps*.

In the meantime this article has been prepared for the information of owners and veterinarians to increase their awareness of biting louse infestations in camelids and provide them with what we believe are the best current options, given the paucity of relevant information available.

THE PARASITE

Bovicola breviceps is a biting (chewing) louse which has been recorded from the alpaca, llama and guanaco. Lice are very host specific parasites. Those found on the alpaca or llama are different from those found on cattle, sheep or goats. There has been no recorded transmission of lice to or from camelids and ruminant livestock.

Biting lice are found at the base of hair shafts, close to or on the surface of the skin. On alpacas they may be found on any part of the body but are more common around the base of the tail, along the sides of the thorax and abdomen, on the upper part of the limbs, and in the flank. Shearers tend to find them initially when they do the first broad cut on the hind leg.

Biting lice do not, in fact, bite their host or directly damage the skin. They feed by chewing on scurf which is sloughed off from the skin, hence the alternative name 'chewing lice'.

Life cycle and survival

As with other *Bovicola* species, the life cycle of *B breviceps* is simple. The life cycle details given by Fowler (1998) are unlikely to be based on specific laboratory examinations of *B breviceps*. We have therefore extrapolated from local and overseas data referring to related louse species to project some general lifecycle details which might be expected in the Australian environment. Adult lice copulate, then the female deposits fertilised eggs onto hair fibres. The eggs hatch within 1-2 weeks to give rise to a first stage nymph. The nymph undergoes 3 moults as it matures to adult size. Maturation takes 2-3 weeks. The life cycle can be completed in as little as 3-5 weeks. Adults may live on average for 30-50 days.

In most associations of lice with their host there is a seasonality in the natural levels of infestation, with lice numbers increasing over winter and declining in hot weather. The earlier reports of *B breviceps* on alpacas in Australia were in winter, but most current reports are of lice detected at shearing in late spring or early summer. This is probably due to a build up in lice numbers in the cooler months preceding shearing. The infestations would probably have been even heavier a few months earlier, whereas lice may not have been detectable on the same animals in summer after shearing.

It is generally thought that lice do not survive for more than a few days off the host, however, Dr Chris Mayberry (W.A. Department of Agriculture) has observed live camelid biting lice in alpaca fibre that had been removed from alpacas two weeks previously (R Dixon, personal communication). Dr Peter James (SARDI, South Australia) confirms that sheep lice can also persist for a similar time in shorn fleece.

The survival of lice which are freed from their host on inanimate objects or shed into the environment, and thereby

1. Central Queensland University, Bruce Hwy, North Rockhampton, Qld 4702
2. South Australian Research & Development Institute, 33 Flemington St., Glenside, SA 5065

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starved, is another matter. Longevity of starved arthropods is governed to a large degree by their metabolic rate and this is, in turn, dependent upon temperature. Over a limited range, metabolic rate is directly proportional to environmental temperature, which means that lice off the animal will live longer at lower temperatures, but they cannot survive for extended periods. Studies in New Zealand (Heath, 1973) on cattle and goat lice showed that at least half of the adult female lice were dead within 2 days of being removed from their host and all were dead within 5 days. Nymphs survived for 4-6 days. Some eggs hatched in 8-12 days, but the unfed newly emerged first stage nymphs lived no longer than 12 hours.

Transmission

On the basis of these findings the chance of transfer of lice via inanimate objects such as common grooming utensils, blankets or harnesses which are in constant use may be quite high and owners should be aware of this and disinfect them accordingly. In the case of housing, bedding or pasture, a 14 day period based on the incubation of the egg, or 7 days if only adult or nymphal lice are considered, would be sufficient to ensure absolute protection in the absence of any additional control by chemical or physical means.

Louse eggs are firmly attached to whole hair fibres. Alpacas are unlikely to shed whole hairs when rolling and even if they happen to do so and a small percentage of attached eggs survive and hatch, the newly emerged nymphs are likely to perish within hours. Spread of lice amongst alpacas via communal rolling areas is one of the least likely mechanisms of transmission.

The major source of transmission of lice from animal to animal is most probably associated with situations where close body contact occurs. There are numerous such occasions which owners will readily recognise (e.g. mating, lactating hembra with cria at foot, communal transport or shared stables). In addition, as mentioned above, the use of contaminated grooming and harness equipment on multiple animals could be very important.

Diagnosis

Adult *B breviceps* are 1-1.5mm long, as measured by one of the authors (IC). They are smaller than adult sheep or cattle lice, and are thus harder to see with the naked eye. Alpacas should be examined for lice in good light, preferably outdoors in sunlight. The base of the hair fibres in several of the favoured sites (see above) should be carefully observed for lice or attached eggs. Lice tend to move away from the light as the fleece is opened so it is necessary to make numerous partings in the favoured sites. Some individuals are much more adept at detecting lice than others, hence it is unwise to assume that a single negative examination of a herd or a few animals in a herd guarantees that they are completely free from lice. Another factor is that lice numbers are likely to be at their lowest, perhaps even undetectable levels, in summer; failure to find lice at that time of the year is not conclusive evidence that all animals are negative. Because of the direct animal to animal transmission of lice, the variation in susceptibility of individuals and the difficulty in detecting very low numbers of lice on animals, a single infected animal on a property suggests that all animals on that property are potentially exposed.

Adverse effects on camelids

In most animal hosts, heavy infestations of biting lice cause irritation which leads to rubbing and scratching. In sheep and goats this can lead to severe fleece derangement with loss in fleece value. Fowler (1998) reports that in heavy infestations in llamas the coat lacks lustre and has a ragged appearance and the animal may bite and rub itself. To our knowledge this has not yet been observed in alpacas infested with biting lice in Australia. Heavily infested animals in New South Wales and South Australia were detected only at shearing and gave no indication through extra rolling, rubbing or scratching that they were irritated by the infestation. Furthermore, obvious detrimental effects were not present in the fleeces of these infested animals. We can therefore expect most infestations of lice in alpacas not to cause clinical signs or noticeable fleece damage and to be only detected at shearing or during a specific search for them. Moreover, only certain stressed animals in the herd (e.g. debilitated animals or those with concurrent disease, lactating hembras, working machos), or genetically susceptible or immunocompromised individuals are likely to develop heavy infestations; the remaining animals may harbour only small residual infestations (e.g. at the base of the neck), or no detectable infestation at all.

These comments do not imply that *B breviceps* cannot be responsible for fleece damage or skin irritation in alpacas, simply that there are no available publications which confirm this idea, nor, as yet, is there subjective or documented evidence from the Australian experience to support it.

CONTROL AND ERADICATION

Alpaca and llama owners and breeders need to understand the following:

- Lice are host specific, therefore infected animals could only have caught lice from other alpacas or llamas.
- Lice are eradicable. If the herd is treated correctly, the louse population can be removed permanently.
- At this stage, there is insufficient evidence to conclude that fleece quality in heavily infested alpacas could be compromised, but this possibility should be taken seriously.

The major reasons why louse eradication fails in sheep are:

- *Mismustering.* This is less of a problem in alpaca and llama herds as numbers within herds are much lower than sheep flocks.
- *Recontamination by wandering stock.* Alpacas and llamas rarely have an

opportunity to wander and most camelid farms are non-adjacent.

- *Poor boundary fencing.* Again, most camelid farms do not share common boundary fences. In cases that do, it is important to communicate with the neighbouring camelid farm about lice infestation and control measures being undertaken.
- *Incorrect application of lousicide.*

Eradication on a property is achievable given a determined approach, but is a waste of effort unless steps to prevent reinfestation are instituted. Alpacas and llamas have easy access to other camelid herds through mobile matings, shows, sales and agistment.

Because of the mobility of animals, owners must be aware of possible re-infestation at outside sites or from visiting animals, even after initial eradication on their property.

Mobile matings in particular provide an excellent means of reinfection of camelids by lice because of their prolonged close contact whilst mating.

Treatment

Synthetic pyrethroids such as cypermethrin (e.g. Cypercare Off-Shears Pour-On Sheep Bodylice Treatment®) need to be applied within 24 hours of shearing to cleanly shorn sheep. Alpacas and llamas do not usually have their head or lower legs cleanly shorn, and often have more fibre left along the dorsal midline to prevent sunburn. The distribution of synthetic pyrethroids following backline treatment is very uneven. Synthetic pyrethroids are therefore unsuitable for lice eradication in camelids.

Pour-on organophosphates such as fenthion (e.g. Tiguvon Pour-On Cattle Lice Insecticide®), although used successfully to treat the first infested alpaca in Western Australia involve risk of overdosing. There have been two anecdotal reports that alpaca fibre is stained/becomes greasy at the point of application, and is only removed at shearing time (R Dixon, G Jackson, personal communication). Pour-on applications are easy to use but they will not kill all lice, hence are unsuited for a concentrated attempt at lice eradication on a property.

Insect growth regulators such as triflumuron (e.g. Zapp Pour-On Lousicide for Sheep®) and diflubenzuron (e.g. Fleececare and Strike®) work by inhibiting chitin synthesis, thus killing nymphs which need to synthesise chitin to moult successfully. These products do not kill adult lice, but rely on them dying naturally over several weeks. The period of persistence of these products in alpaca fleece has not been determined and it should not be assumed that it is similar to that in sheep wool. Although these products are possibly suitable for lice control in camelids they do not necessarily guarantee eradication and are therefore not recommended for this purpose.

Treatment of choice

Use an organophosphate spray such as diazinon (e.g. Topclip Blue Shield®, Di-Jet® and Jetdip®) and ensure that the alpacas are *thoroughly* wetted to the skin *all over.* Dilute diazinon in water according to the on-label recommended rate for sheep. No lousicide products are registered for use in camelids and owners using these chemicals need to be aware that use in camelids is off-label. However, this treatment has already been used on several hundred alpacas in South Australia and New South Wales without adverse effects.

Diazinon will kill adult lice and nymphs but not unhatched eggs. Two weeks should be allowed to pass after shearing (to allow shearing cuts to heal) and animals should be treated as soon as possible thereafter. Because alpacas and llamas have little lanolin on their fibre, residual concentrations of diazinon are unknown and may be inadequate to kill nymphs emerging from eggs present on the hair fibres at the time of the initial treatment.

Therefore, a second application of diazinon should be applied 14 days after the first application, before these nymphs can develop to become mature egg-laying adult lice. Under most circumstances all lice eggs from the initial infestation should have hatched by the time that the second treatment is given and all nymphs from them will be killed by this treatment.

To be absolutely sure that no additional nymphs have emerged from eggs which have been extremely slow to hatch or that there has been no possible carry over from lice in the environment, a third application should be applied 14 days later. This third treatment also serves as a backup in case any lice survived the first treatment because animals were insufficiently wetted all over the body. In practice, a third treatment is probably only justified when the initial eradication program is commenced following confirmation of the presence of lice in the herd.

Beware that mechanical and chemical stripping of organophosphates from recycled dipping/jetting fluid will probably still occur, but probably to a lesser degree than in sheep because of the lower lanolin content of camelid fibre. It is vitally important that the entire animal is wet to the skin. Treat all alpacas on the same day, including visiting or sick animals and new born crias.

Procedures and Cautions

It is recommended that breeders consider hiring a sheep-contractor with a high-pressure hand-spray unit or mobile plunge dip to treat their animals correctly. Plunge dipping alpacas is practised in South America, but in most areas of South America alpacas do not have the high commercial value that they do in Australia. In Australia it is an untried technique in camelids so be very careful if you choose to use a plunge dip. Alpacas may aspirate the dipping fluid into their lungs, leading to pneumonia and death. Alpacas do not run well through spray races used for jetting sheep and these should be avoided.

After dipping, place the animals on paddocks that have not had stock on them for at least seven days. Any sheds or shelters should be rested from animal contact for at least 7 days prior to dipping the animals.

provide a good return in terms of making a start our expanding into a new market.

The social side of such an event cannot be underestimated, especially as, this time, it was possible to do some 'inter-regional bonding', as Jill Short (Central Victoria Region) called it. The bonding was definitely needed, after the incessant rain during the night caused the waters collecting upstream to burst the banks of a large puddle. A rivulet thus formed, flowed clean through the middle of our marquee.

A suitcase storing alpaca products was submerged and the water took 10 minutes to drain from it when the case was rescued. But the alpaca products were reported to have survived without a blemish. That's alpaca for you.

Interestingly, there seems to be a trend for alpaca breeders to group together in geographical areas, such as the South Gippsland Alpaca Unlimited and the Mornington Peninsula Alpaca Breeders.

These groups were represented at Farm World by some of their members who, apart from marketing themselves, also handed out information about the existence of the other breeders in their district. In the case of the Mornington Peninsula group, it represents 23 breeders who own around 300 alpacas between them. The information provided was gathered up quite voraciously by eager visitors.

We asked most of the exhibitors whether they intended to come back next year, and found total agreement for the support of this marketing thrust again at Farm World 2000.

Maybe the bonding among members of different regions, so graciously commenced this year will, extend to greater numbers next year.

LETTER TO THE EDITOR

Please address all letters to: The Editor, *Alpacas Australia*, C/- PTW Desktop and Design Unit 9, 663 Victoria Street, Abbotsford Vic 3067

PREFIXES ARE IMPORTANT

For some time it has annoyed us that in many publications there are misrepresentations of the breeding of sires. This is shown by lack of attention to the prefix in the names of the alpacas

It has long been considered within the National Committee that it should be obligatory to provide the prefix of the animal in all advertising material relating to that animal. New owners of animals are living in a false dream if they think they can gain mileage or promotional advantage by eliminating animals' prefixes. In all cases, the breeder of an animal must be recognised, as this is industry protocol in all advertising or articles about a particular animal. The purpose is to give recognition to the breeder, at the same time adding credibility to the new owner for having purchased a leading bloodline. To try to steal this thunder is a mere side track which will not achieve anything – an animal without a recognised prefix is pretty much a non-event. To have a recognised prefix in a herd adds impact, credibility and adds effectiveness to advertising.

It amazes me that the words 'Peruvian' and 'Accoyo' mean so much. However, some leading local bloodlines can be seen as a threat to the new show-winner owner that was produced by *that* male which was purchased some time ago from *that* stud breeder and upon whom we don't want more recognition fostered. What a pity that we need to be so narrow minded!

I would simply like to add that, if we took away names (like the Grand Champion Ram and Ewe at the Sydney Royal 1999 – Nerstane 142 and Nerstane 922) and simply gave our alpacas numbers, then people would be forced to put prefixes in their advertising. No doubt, the prefixes would be added very proudly when they advertised males or females that had been sired from one of their younger males. (The ones that they had produced from *that* male they bought from *that* stud breeder some time ago.) Neither names nor numbers would be nearly so important then – but their prefixes would be.

To end on a lighter note: simply support those that achieve greatness in the smallest way – by giving recognition that is deserved and expected.

Wendy Billington,
Cedar House Alpaca Stud, Yass NSW

[Ed. Note that the Advertising Code of the Association requires that 'Any animal described in an advertisement shall be correctly named' (Item 5).]

Cedar House Alpaca Stud

CEDAR HOUSE Braveheart

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He will be one of Australia's greats

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AT CEDAR HOUSE you will receive expert attention. We offer agistment, stud servicing, stock sales, education, after-sales backup and experienced advice on breeding for your females. We have coloured suri and huacaya.

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Australia's best producing suri sire

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Progeny from No. 14, No. 8, No. 153 & Iceman

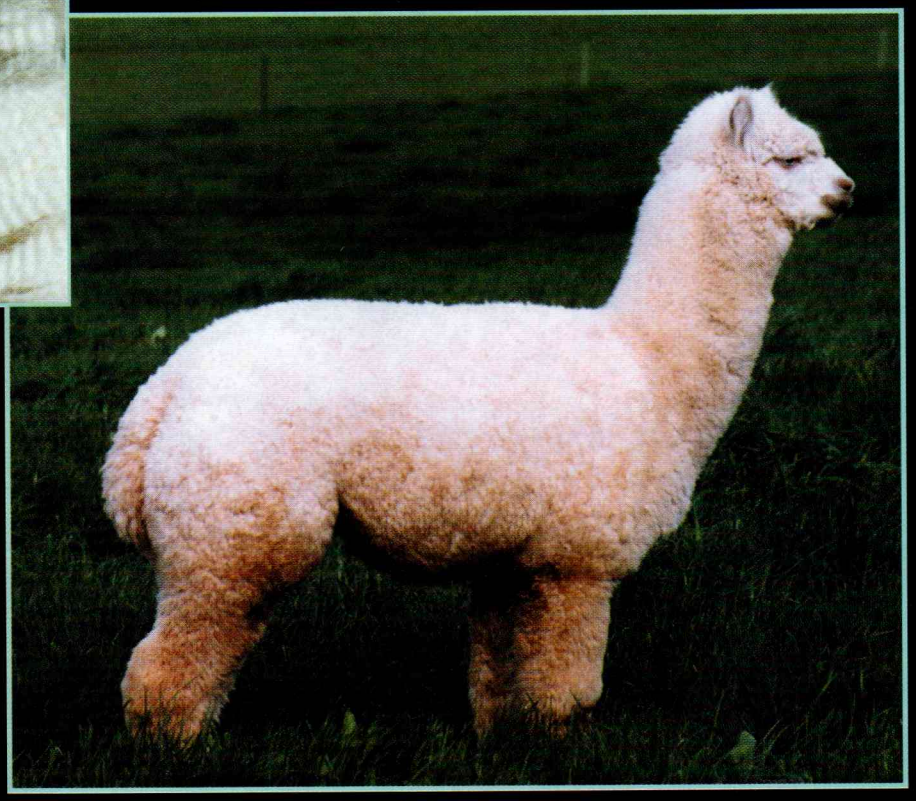
CEDAR HOUSE ALPACA STUD 'Kenilworth', Yass

For more information, phone 02 6226 4888 or 0416 237 082

Blue Grass Alpacas

SUPREME CHAMPION FLEECE

Benleigh Ringleader



Sire:
Purrumbete Inti

Dam:
Purrumbete
Sweet Freedom

18.4μ, 3.6 s.d., 19.6 c.v. – 0.6% of fibres over 30μ

Supreme Champion Fleece
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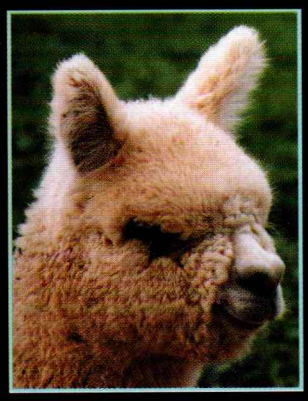

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Supreme Champion of the Charles Ledger Alpaca Show 1998 at 6.5 months of age

Introducing
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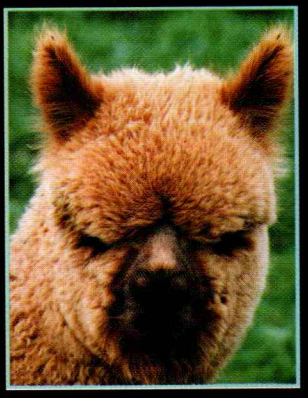


Photography: Portfolio, Young NSW

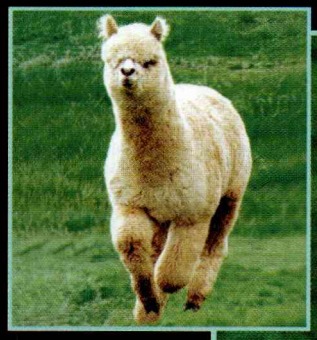
Whole herd tested JD negative

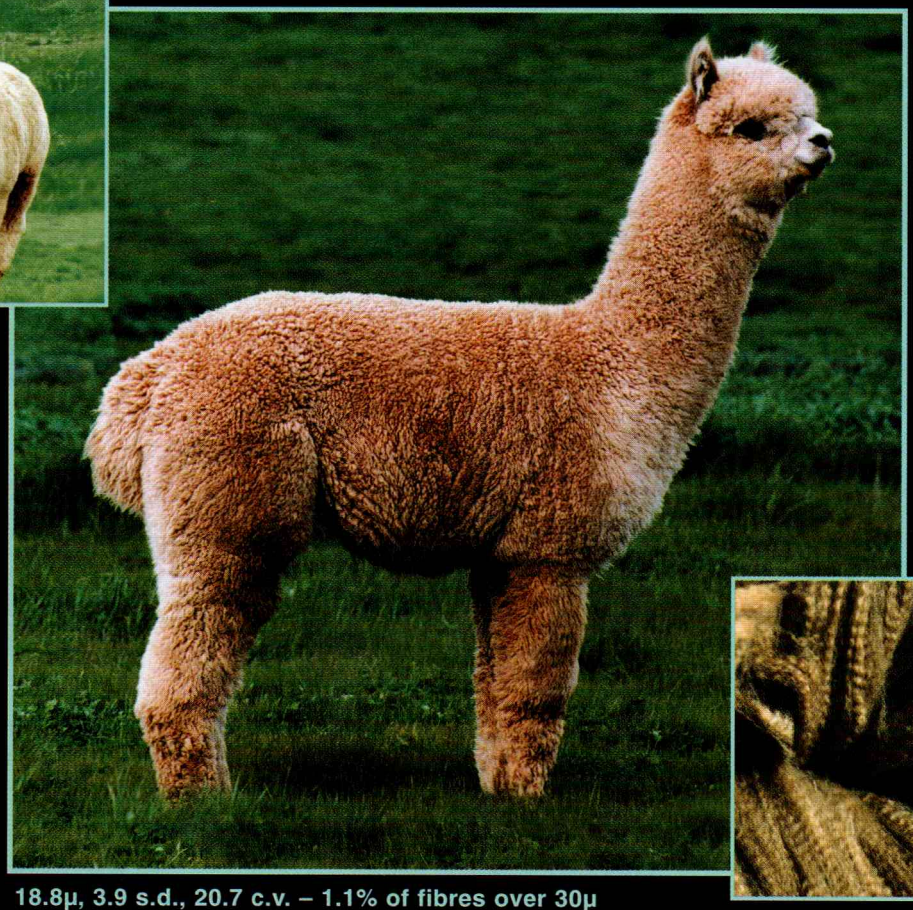
Arthur and Julie Mavros "Tulangi" Kenyu Road, Boorowa N.S.W. 2586 Tel/Fax: 02 6385 3543

Blue Grass Alpacas

THE CHAMPION OF CHAMPIONS

Shanbrooke High Society





Sire:
Purrumbete Ledgers Dream

Dam:
Purrumbete Flamingo Gold

18.8μ, 3.9 s.d., 20.7 c.v. – 1.1% of fibres over 30μ

National Supreme Champion
World Record Price $190,000

This male has an excellent conformation and is extremely well covered with a dense even fleece which extends under the belly and up the neck to the bonnet. The fleece has a merino sheep-like quality which will increase the fleece weights of his offspring The well formed staples are boldly crimped, whilst soft and lustrous. He is the type of animal we are looking for to sire future champions.

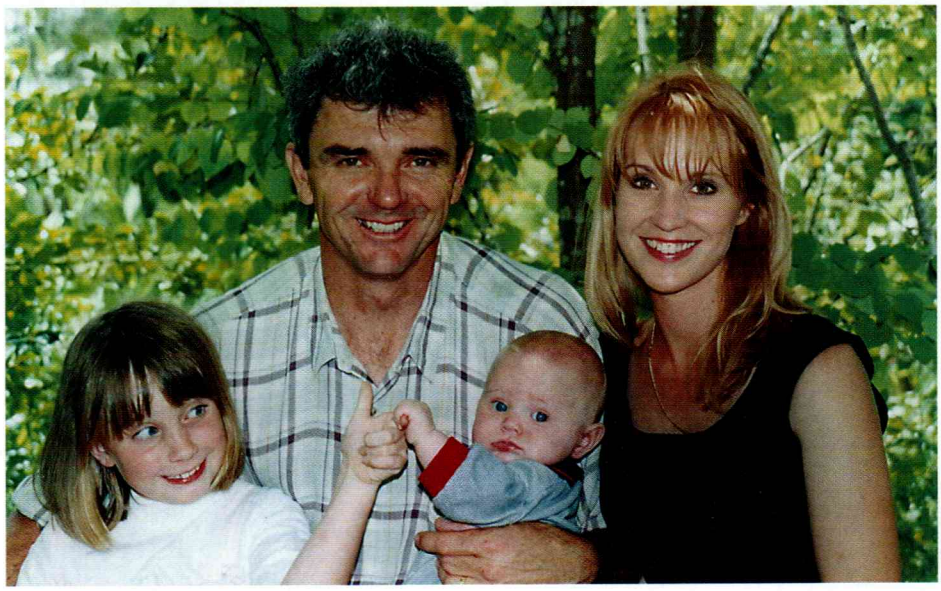
Bill Robbins, National Judge (Nov. '97)

Stud Fee: $1,500

PLAYING BY THE RULES

by Jennie Cohalan

The Cohalans set down their 'rules for success'.



'The Cohalans': Philip, Jennie, Alycia and Keenan.

I decided to write this article in the hope that small and new breeders may be inspired to continue in their quest for alpaca advancement and to disprove the theory that you need hundreds of animals to become successful in our industry.

From the very beginning, we seem to have followed four basic rules which I have outlined below. We've not only developed a strong and dedicated passion for alpacas, we currently hold the title of Best Junior female in Australia (as judged at the 1998 BMW National Classic Alpaca Show) and have buses of people now coming to see us!

OUR HISTORY

Philip and I started out in the alpaca industry about four years ago, after seeing alpacas during a holiday in the Southern Highlands of N.S.W. The decision to buy alpacas came about as a result of my looking for a business opportunity, as well as a way of life that would allow me to stay at home with our children. (Living in an isolated area, my hidden agenda was actually to get out of the house and socialise with interesting people. So it was either alpacas – or become president of the CWA at age 25!)

Once we had decided that alpacas provided a means to that end, we set about looking for a property which was close enough to our home city of Wagga Wagga and one that provided enough acreage for expansion of our enterprise. We found the ideal property, consisting of 70 acres of prime land, near the village of Ladysmith. Even before settlement, 'Alpaca's of Ladysmith' had a nice sound to it. Each night, I would go to sleep dreaming of establishing contracts for alpaca garments with Armani and Versace, of building our alpaca empire to one hundred and beyond... They were good days.

Our property settlement drew nearer and it was two days before we were supposed to be moving into our new home, when we received the interesting news that our house-to-be had been damaged by fire as a result of the owner's freezer over heating.

So, for the thirteen weeks and three days our house was under repair, my castle in the clouds consisted of a caravan in the driveway and 40° heatwaves that led to sleepless nights. Funnily enough, the dreams seemed to disappear as well.

There was a bright side to this situation, however. Because there was no television for thirteen weeks and three days, my husband and I had a unique opportunity to realistically consider what our goals were with the alpacas. Maybe taking the fashion industry by storm needed to take a sideline for the moment. Realistically, the question was, 'What could alpacas do for us?'

Rule No. 1: *write down your goals*

After deciding on our business plan, we wrote down all of our goals, which was a very valuable exercise. I strongly believe that this has contributed to our success because you need to know what a business is supposed to do.

For example, if your goal is tourism, then you need something for the tourist to see and your money can go into buying 100 alpacas.

If you want to breed great animals, then you need quality stock.

You can't always do both.

Along with these goals, we developed a series of questions, such as: 'What colour do we wish to specialise in?' 'What micron are we aiming for?' 'What is more important – brilliant fleece or coverage?' 'How much do we need to spend before seeing any returns?' 'How much do we have to spend?' ...and so on.

Once these things were written down, we could develop a plan to bring our dreams to reality and we could monitor the plan's progress more effectively.

One of our primary goals was to own a stud that would be renowned for great alpaca. Achieving this goal included doing a lot of research, making telephone calls and travelling long miles in the car, searching for the animals that we wanted.

'If you do something, then do it properly,' has always been our motto. Unfortunately, the downside of this philosophy is that it usually involves a lot of work. But, so be it.

In some respects, our selection process was easier for us than for most first-time buyers, because my husband grew up on the land – and I'm sure that I was Dr Dolittle in a past life.

Livestock of any description has always been a passion of mine. It has led to a life of training and showing horses and dogs, as well as latching on to the local vet and doing rounds for most of my childhood.

So, after searching Australia, we had six beautiful alpacas (and pockets a lot lighter) all showing attributes that we valued, such as good conformation, good fibre and a reliable pedigree. One animal soon gave birth – to a male. ('Yuck!' you might say!) but, lo and behold, he passed screening, was selected for exportation to Canada as a cria and was sold for $10,000.

The other females had females which was probably the only bit of luck in this story. (Having female cria wasn't a written goal anyway – that would have been quite unfeasible to rely upon!)

People often say, 'Gee, you are lucky.' But luck has nothing to do with the 110 hours of talking, discussing, arguing (and then making up!) that Phil and I spend on such aspects of business as what sires are we mating our females to, what show circuit we have to look forward to – and who is picking up the poo piles this week.

I don't know what we will be like when we need to have discussions about more than 50 alpacas.

Which brings me to the next rule

Rule No. 2: *focus on your goals and work towards them*

During the last three years, we have seen the fruits of our labour paying off on the show circuit (which is great media for your stock, by the way).

Each time we've arrived at a show, people have asked, 'How many have you got entered?' and the reply is always, 'Just one'.

Right: Ladysmith Celebrity, Junior Female Champion, National Classic Show, 1998.

Below: Ladysmith Enchantress, Supreme Champion, Picton, 1998.

We won! Jennie Colahan takes a well-earned rest with Ladysmith Enchantress after the Picton Show.

In fact, each animal we have shown has won: Supreme Championships, Junior and Intermediate Female Championship Ribbons. Most recently, Ladysmith Celebrity collected the Junior Female Champion at the National Classic Show for 1998. Now, that was a serious goal achievement.

Showing alpacas to their full advantage means that you need to commit yourself to this goal well before the show begins.

It means presenting yourself as well as you can; never taking your eyes off the judge. It means never forgetting that you are supposed to be guiding and reassuring your animal around the ring. Those bright lights and crowds scare them too!

It means training your animal to walk at home by halter training them every day, if you can, and standing straight and still with them for five to ten minutes.

It also means believing that your hard work will pay off – because it will, when the judge notices that well behaved couple standing quietly at the back.

Rule No. 3: *trust yourself; listen to yourself; educate yourself*

If you don't have a good animal, you know it. So, why did you buy it? If you can justify the reasons why (many animals needed for tourism; rare colour; very fine, but needs improving in the density department) then that's great. But, if you bought it because the dealer talked you into it, then blame yourself.

We bought one like that and I blame myself every time I think of it. Phil wanted to buy a tractor and I wanted this beautiful and cute, but good for nothing female alpaca because the dealer talked me into it.

Now, I'm not suggesting that alpaca dealers are all bad because I, too, trade in alpacas. What I am saying is: buy something because you believe in the animal. Go see it for yourself! It's much easier to resell what you believe in than to try and offload an animal once you realise you have made a mistake.

But, if you already have these animals, what do you do with them?

Rule No. 4: *improve! improve! improve! and review your goals regularly*

Well, the girl I shouldn't have bought will probably be on our property for the rest of her life, because one of our goals is only to sell great alpacas. Nevertheless, we decided to make the most of the situation by taking a serious look at this animal, accepting the bad things and defining what we could improve – and then, finding a male to match.

Alycia and Tiffany Colahan with 'Tess'.

I have seen a huge improvement in the industry. With good breeding practices and with the range of males that is readily available these days, there are no excuses for our animals going backwards.

If the worst thing about your alpaca is conformation, breed her to a male who has great conformation.

If your animal runs on a 30+ micron, don't choose a male that looks great but runs on 30 micron too.

It might cost a bit, but you eventually break the cycle. If improvement is slower than you want, be prepared to buy – just one, but make it a good one.

CONCLUSION

I would really love to put a fifth rule into my game plan for success but, because I cannot control outside influences, I want to include some food for thought.

Question: Is underestimating the value of your animal a fault of the animal... or your fault?

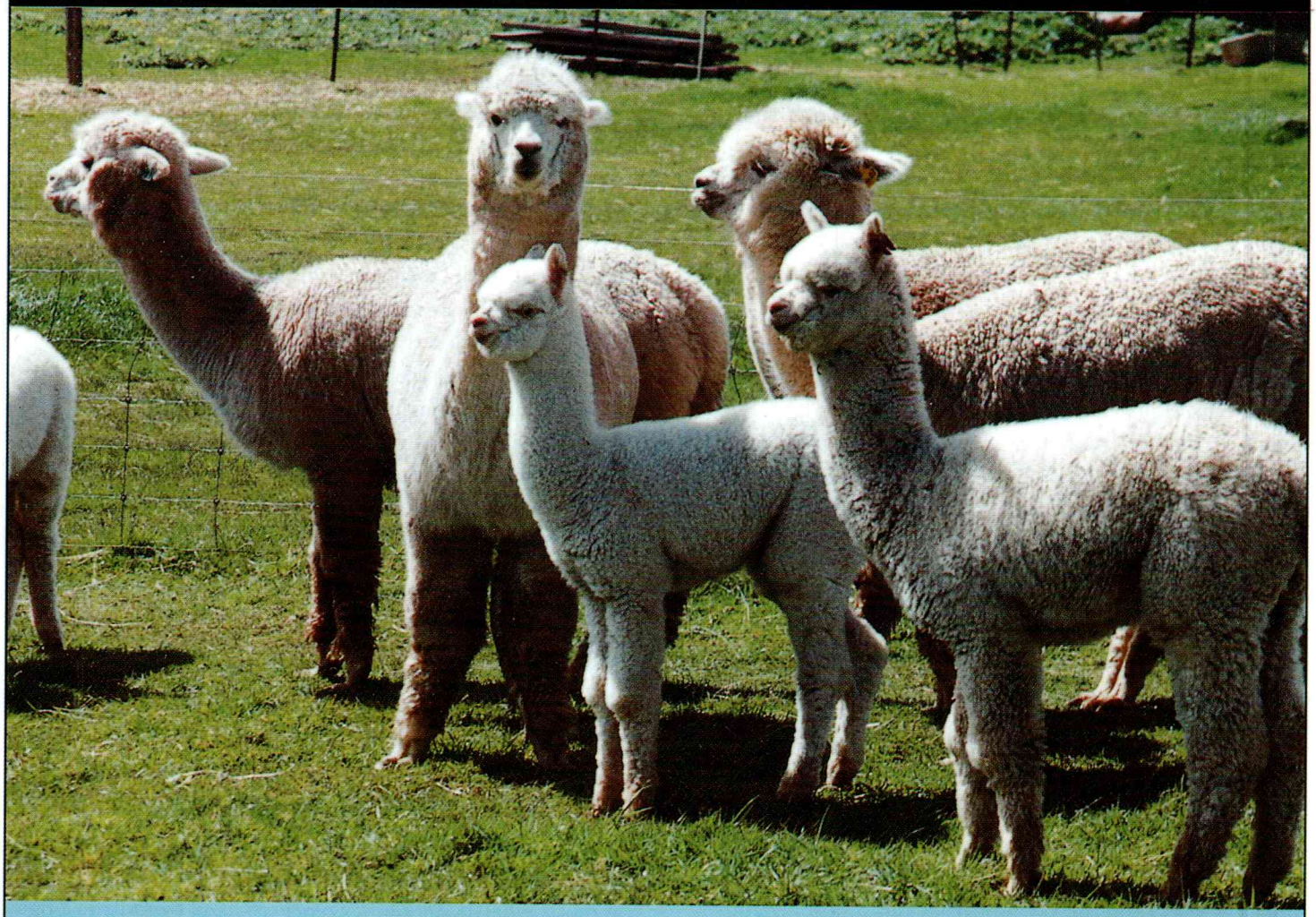
Each animal has a purpose. It is up to you to work out what that purpose is and how much it is worth.

We alpaca breeders are in the unique position of having a niche market of amazing animals that make us pioneers of this new industry for Australia. But, if something is cheap and nasty, why would you want it? It must be bad. And so, it becomes cheaper and cheaper until it is thrown into the bargain basement. If this scenario were to take place with the alpacas, why would we want to breed any more? Why would new breeders want to join?

The AAA recently stated that alpacas are here... for good.

Why not give all our alpacas a chance to be good by ensuring that our breeding practices are the best we can afford. Why not promote our animals as the exclusive exotics they are... all of us, together.

PEACE OF MIND



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Fibre metrology of wool and its applicability to alpaca

Peter Lamb
CSIRO Wool Technology

We are extremely grateful to have received permission to reprint this article from its author, Dr Peter Lamb. It is taken from Fibre Science and Technology: Lessons from the Wool Industry, *proceedings of a conference held at CSIRO Animal Production, Prospect, N.S.W. on 7 November 1998.*

The conference was presented by CSIRO Animal Production and Australian Alpaca Fibre Marketing Organisation Pty Ltd (AAFMO).

SUMMARY

The measurements made on wool and the reasons for those measurements are examined. It is suggested that, if the alpaca fibre-processing industry is to move beyond being a cottage industry, it will have to adopt modern total quality management. It will also have to respond to customer demands for end-products at competitive prices and processor demands for repeatable quality. This will mean price will be determined by measured fibre properties and the key properties will almost certainly be diameter and whiteness (freedom from coloured fibre).

INTRODUCTION

Measurement is essential because subjective assessments of quality are inaccurate and not easily quantified. How would you feel if you were sold a 'bullet-proof' jacket on the basis that someone could not poke their finger through it and it looked OK! The aim is to reduce risk which saves money because failures can have severe consequences. If the wool does not have the visually assessed diameter or is tender then it may not be possible to spin it into the intended yarn. Moreover, the more accurately you can predict performance the closer you can go to the allowed limits. An accurate prediction of yield means just the needed quantity of greasy wool can be bought. Predictability saves money.

For wool's competitors, both cotton and synthetics, it is possible to order by telephone from a range of suppliers a standard product that will be accurately the same each time in almost any quantity desired at a fairly stable and known price and with a short delivery time.

WOOL MEASUREMENTS

Every sale lot of greasy wool going through the auction system is core sampled and measured for yield and vegetable matter (VM), and mean diameter. Currently, the diameter measurement is by air-flow, in which the flow of air for a constant pressure drop through a known mass of washed and opened wool is measured. This method is likely to be supplanted shortly by Sirolan Laserscan (1), a laser-based instrument which measures how much light is occluded [*absorbed or retained*] by two mm long fibre snippets as they flow past in an isopropanol/water mixture designed to condition the wool to a known regain. The measurement also gives the range or distribution of fibre diameters present. This measurement is available (at additional cost) and if it has been made then this is noted in the sale catalogue.

About 70 per cent of sale lots are measured for staple length and staple strength. The method involves taking a grab sample

Fig. 1: Wool fibres

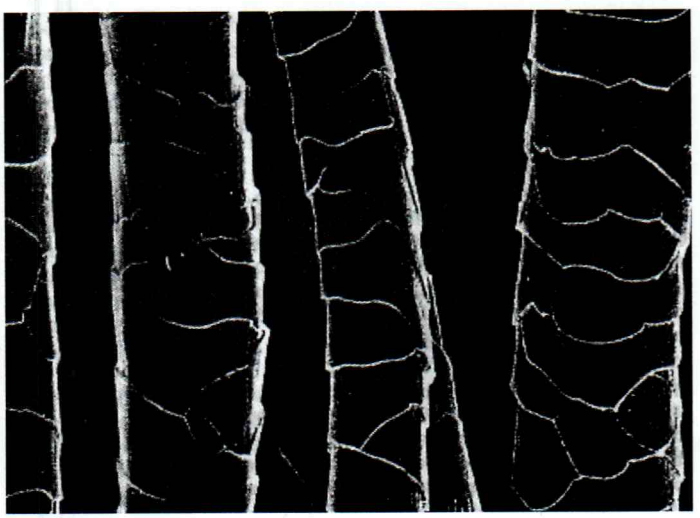


Fig. 2: Alpaca fibres

from a wool bale, randomly selecting tufts and then manually selecting staples and placing them in trays for automated measurement by the Atlas instrument (2). The length of each staple is optically assessed then the staple is gripped at both ends and the peak force required to break the staple is measured. The two broken parts are then weighed. The average staple length, variation in staple length, staple strength (normalised to the weight of the staple), variation in staple strength and the percentage of breaks in top/middle/butt of the staple are calculated. The position of break is determined from the relative weights of the two broken parts.

The advantage of measuring length and strength is in the ability it gives for predicting mean fibre length in the top (Hauteur) and the percentage loss in combing (romaine). This can be seen in the TEAM 2 formulae (3):

Hauteur = 0.52SL + 0.47SS + 0.95D – 0.19M* – 0.45VM – 3.5
Romaine = 0.11SL – 0.14SS – 0.35D + 0.94VM + 27.7

where SL is staple length, SS is staple strength, D is fibre diameter, M* is adjusted % middle breaks, VM is vegetable matter base.

A marked seasonal reduction in along-fibre diameter is particularly detrimental to achievable top length. The change in diameter is the main cause of reduced staple strength and both low staple strength and a high percentage of mid-breaks leads to reduced top length. Improving staple strength through management strategies, for example by additional nutrition, or changing the time of shearing so that the position of break is moved away from the centre of the staple, can lead to substantially higher prices depending on any penalty for increased VM contamination.

The TEAM (Trials Evaluating Additional Measurement) formulae are simple linear regression fits to data obtained from a large number of commercial mills. They have some limitations such as the inherent assumption that staple length is a good measure of average fibre length within the staple, and the lack of good information on along-fibre strength variation. It is expected that similar formulae will hold for alpaca fibre but this needs to be confirmed and is the subject of a current research proposal.

Wool fibres have a wide spread in diameter within sheep. For a sound wool most of the variation in a flock can be found between the fibres of any one staple of any sheep. There is a small component of variation around the sheep and a degree of variation between sheep. The spread of diameters is given in terms of the standard deviation (SD) or the percentage co-efficient of variation ($CV_D\%$ = 100 * SD / D). Additionally, it is quite common to give the percentages of fibres coarser than 30 µm.

It has been observed (4), for sale lots of Australian wool and tops, that the average $CV_D\%$ = 10.5 + D/2, so that $CV_D\%$ = 21 for D = 21 µm and $CV_D\%$ = 25 for D = 29 µm etc. Recent measurements of mid-side samples (5) on alpacas in Australia appear broadly consistent with these average values, although the CVD values of mid-side samples for sheep should be slightly lower than the values for sale lots. Stapleton and Holt (6) examined fleece characteristics on 20 alpacas from one property. Their results showed that the apron fleece averaged about 10 µm coarser than the rest of the fleece and the britch area was slightly broader. At first sight this study seems to be contradicted by another study on 35 animals (7) but in the latter study the apron and britch areas were not examined. A spread of greater than ±3 µm starts to have a significant effect on the CV^D values of whole fleeces. However, the apron area should be separated from the rest of the fleece based on its effect on the mean diameter alone.

The effect of a spread in fibre diameters is to make a collection of fibres behave as though they are a bit coarser than their average diameter. Thus a narrow distribution of diameters is preferable but a change in properties can usually be achieved more easily by breeding for reduced diameter than by breeding for reduced spread in diameter, although it appears possible in sheep to simultaneously select on both parameters.

The Laserscan and its rival the OFDA (Optical Fibre Diameter Analyser) measure the diameter distribution at the same time as the mean diameter. They also measure the curvature of snippets, that is the rate at which the direction of a fibre changes. The measurements of curvature of the two instruments are in good agreement and it is currently proposed that this measurement will be covered by a single new standard. Curvature is of interest because it is closely correlated with the measured crimp frequency of wool and some buyers pay more for highly crimped wools.

Recent research results suggest that high levels of crimp (curvature) are slightly detrimental in processing and lead to tops and fabrics that are rated less soft (8). Crimp recovery when knitted fabrics are relaxed is larger for wools of higher crimp frequency and leads to a more bulky fabric with lower air permeability but there may be other ways to achieve similar bulk.

Historically, high crimp frequency was used to select for finer wool and, across the full spectrum of Merinos, diameter is still negatively correlated with crimp frequency. However, the correlation has been observed to be weak and even reversed in some superfine flocks (9). Ferguson (5) has observed that fibre curvature values are low in huacaya and very low in suri alpacas when compared with Merinos. In the case of the huacaya there was a marked negative correlation between mean curvature and mean fibre diameter while for suri it was weak.

For sheep the whiteness of greasy wool is not a useful indicator for the whiteness of the clean wool. However, a standard spectrophotometric measurement of colour after the greasy sample has been washed and the web randomised is now available (10). The same method should be applicable to coloured alpaca fibre.

An instrument, the Sirolan Staplescan (11), has been developed for use in conjunction with the Atlas instrument. It has sophisticated video analysis capabilities that enable it to measure crimp frequency, crimp definition, amount and penetration of dust, tippiness, etc. The aim of this instrument is to quantify the so-called 'style' properties that are currently visually assessed.

If the need for visual assessment could be eliminated then sale solely by measurement would be possible.

The limitations of the current measurements in achieving very accurate prediction of mean fibre length in top and of romaine point to the need for additional measurements such as along-fibre diameter variation or fibre-to-staple length ratio. It has been suggested that 'handle' is also a needed property. However, experiments have shown a good relationship between the product of crimp and diameter and handle (and resistance-to-compression) (12). It would be interesting to know how much the lower crimp of alpaca contributes to the perceived better handle.

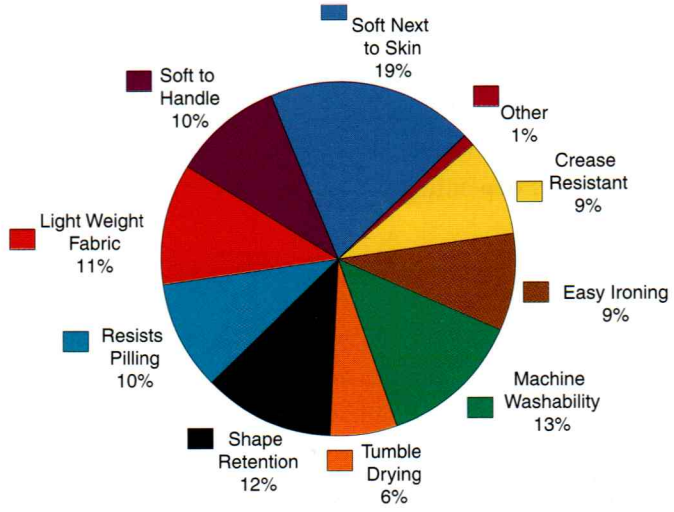
A percentage of fibres in coarser wools are medullated which means they have hollow or part hollow cores. Medullation is almost non-existent in fine Merinos but is significant in alpacas. The OFDA is able to provide an estimate of percentage medullation of non-coloured fibre. As with sheep the percentage medullation has been observed to decrease with decreasing fibre diameter (5, 6). A small hollow core will not significantly affect fibre properties such as bending stiffness or thermal conductivity. The serious disadvantage of medullation is the different dyeing behaviour of these fibres which can lead to skittery dyeing.

The above discussion of measurement has been in the context of the use of measurements for accurately pricing sale lots of wool and for predicting their processing performance. These measurements are normally made by a central test house such as AWTA Ltd on samples taken in the warehouse of a wool handler and following strict IWTO (International Wool Textile Organisation) standards. Currently, there are moves towards in-shed (i.e. on-farm) sampling. It is also quite common to make measurements on fleece samples for breeding purposes or valuation of animals. Recently, a set-up using a Laserscan together with snippet sampling and solvent washing equipment and fleece weighing has been trialled in shearing sheds (13). The equipment takes a representative sample of each fleece and appears capable of keeping pace with a shearing rate of about 1000 sheep/day. When coupled with sheep tagging this enables both the accurate classing of fleeces according to measured properties and the measured assessment of each animal for breeding purposes.

Wool top is sold around the world based on its measured values. The key fibre properties are diameter and length (14). The latter measurement is primarily made with an instrument called an Almeter. Most mills will also put limits on neps (fibre entanglements), VM (particularly that longer than 10 mm) and, according to end-use, dark fibre content. The typical limit is no more than 10 dark fibres per 100 g of wool. Most mills also put limits on the length distribution (CV^{H}) or the short-fibre content, although the importance of these appears to be over-rated (15). A new method, Sirolan Tensor (16), for the measurement of average fibre strength in top has recently been applied to alpaca (5). The bundle tenacity of alpaca was observed to be slightly higher than that for wool of a finer diameter, however, the results were generally consistent with the values that would be expected for wool of similar diameter (17). In the past there have been claims that alpaca fibre is stronger as evidenced by a higher staple strength (6), but it needs to be appreciated that staple strength is predominantly a measure of the change in cross-sectional area of the fibre which is mostly due to changes in nutrition. In one study (18), the changes in along-fibre diameter and the staple strengths of alpacas and sheep grazed together were very similar.

What measurement might be needed for alpacas that is not routinely used for wool? It seems that alpaca may be more severely affected by UV damage than wool. This may be related to the lower grease content, the animal's dust-rolling or the more open structure of some alpaca fleeces. Severe UV damage can reduce top length but the bigger concern is probably the effect on dye uptake. There are chemical staining tests to detect UV damage which have already been used to study the nature and severity of the problem in alpacas (6). It was found that the mid-back site is severely weather-damaged compared with the rest of the fleece. For sheep, a simple UV blocker applied after shearing can be 70 per cent as effective as rugging (19).

Fig 3: Preference share amongst fabric features, US consumers.



CUSTOMER NEEDS

IWS (now The Woolmark Company) consumer surveys have shown that in garments of same fabric construction, style and colour, softness to touch, next-to-skin comfort, lightness, and easy care dominate consumer preference (Figure 3) (20). The first three characteristics are determined largely by fibre diameter. Easy care basically means machine washability and minimum labour to keep the garment looking good. It implies chemical treatments such as shrinkproofing and is little influenced by fibre properties.

As pointed out by Plate (21) eight years ago there has been a continuing trend towards lighter-weight fabrics. In fact, it had even been suggested that if the trend continued for another 20 years we would all be wearing multiple layers of zero weight fabric! This trend, which saw average suiting weights drop from

Reserve Champion Fleece, 18-30 months
Exhibit owned by John Hagedoorn, Hawthorne Cottage Alpacas, NSW.

Champion Fleece 30 months and over
Windsong Valley Royal Inca, Terry and Tena Wheeler, Windsong Valley Alpacas, WA

Reserve Champion Fleece 30 months and over
Exhibit owned by John Hagedoorn, Hawthorne Cottage Alpacas, NSW.

Supreme Champion Fleece
Windsong Valley Sweet Pea, Terry and Tena Wheeler, Windsong Valley, WA.

Suri

Champion Suri Fleece
Exhibit owned by Sue and Phil Mackenzie, Mirrabook Alpacas, NSW.

Julie Mavros with Blue Grass Leading Lady.

RAS photographs courtesy of *The Land* newspaper.

Black alpaca takes out Champion Male trophy

This year, the Royal Canberra Show saw an all-Australian born and bred black alpaca take out the Male Alpaca Championship. From over 70 other entires, Duffield's Captain Moonlight (Cappy) stood out as a perfect example of excellence in Australian breeding, showing evenness in character and crimp from his bonnet to his knees.

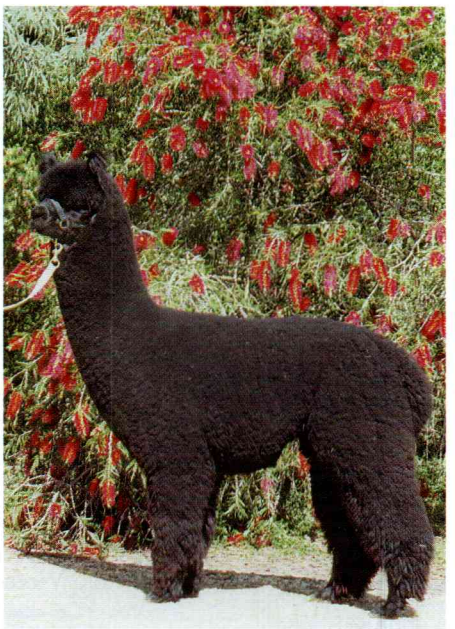
Cappy comes from Sale in Victoria where he has been raised by the very experienced hand of Graeme Hansen of The Birks Alpaca Stud. Graeme, with his wife Sheila, has had a lifetime of breeding and showing cattle and dogs.

Cappy is 26 months of age and from a solid black line stretching back to his grandparents. He is an ultra-imposing blue-black male who has already started his career with a positive ultrasound on a maiden.

Owned, since June last year, by Anne Marie and Trevor Harwood of Echo Beach Alpacas in Coffs Harbour, Captain Moonlight will be travelling to Northern N.S.W. around July and staying until September, before returning to Sale to fulfil stud bookings in the Southern states.

If you're interested in booking Cappy (NSW, Southern Qld) call Graeme Hansen (03) 5149 2428 or Anne Marie Harwood (02) 6653 8444.

A cyberspace visit can be had at *http://www.midcoast.com.au/~alpacas.*



for the 1999 Royal

by Lyn Dickson

MAJOR AWARD WINNERS

Huacaya

Junior Champion Female

Blue Grass Leading Lady, Julie and Arthur Mavros, Blue Grass Alpacas, NSW.

Reserve Junior Champion Female

Alpacandes Serafina, Keith and Jeanette Hollingworth, Alpacandes Alpacas, NSW.

Junior Champion Male

Jolimont Columbus, Pat and Rosa Viceconte, Jolimont Alpacas, Vic.

Reserve Junior Champion Male

Timbertop Armani, Andrew and Peter Brown, Timbertop Alpacas, SA.

Intermediate Champion Female

Dural Toscana, Helen and Michael Fritsch, Dural Alpacas, NSW.

Reserve Intermediate Champion Female

Blue Grass Liebling, Julie and Arthur Mavros, Blue Grass Alpacas, NSW.

Intermediate Champion Male

Roskhill Triple, J, Dougal Macdonald and Tiki Morgan, Roskhill Alpacas, NSW.

Reserve Intermediate Champion Male

Schubert Maestro, Julie and Richard Bird, The Gorge Alpacas, NSW.

Senior Champion Male

Sanctuary Lord Greystoke, Karen and Andrew Caldwell, Wyona Alpaca Stud, NSW and Melanie Tardivel and Graeme Jenkin, Greenvale Alpaca Stud, Vic.

Reserve Senior Champion Male

Wyona Gangster, Mrs K Nemac, Crystal Glen Alpacas, NSW

Grand Champion Female

Blue Grass Leading Lady, Julie and Arthur Mavros, Blue Grass Alpacas, NSW.

Grand Champion Male

Jolimont Columbus, Pat and Rosa Viceconte, Jolimont Alpacas, Vic.

Supreme Champion

Blue Grass Leading Lady, Julie and Arthur Mavros, Blue Grass Alpacas, NSW.

Suri

Champion Suri

Windsong Valley Andean Pride, Terry and Tena Wheeler, Windsong Valley Alpacas, WA.

Sires Progeny (Group of 3)

Silverdale Lord Drummond, Andrew and Karen Caldwell and Mr and Mrs F. De Zwart, NSW.

FLEECE

Huacaya

Champion Fleece, 9-18 months

Windsong Valley Sweet Pea, Terry and Tena Wheeler, Windsong Valley, WA.

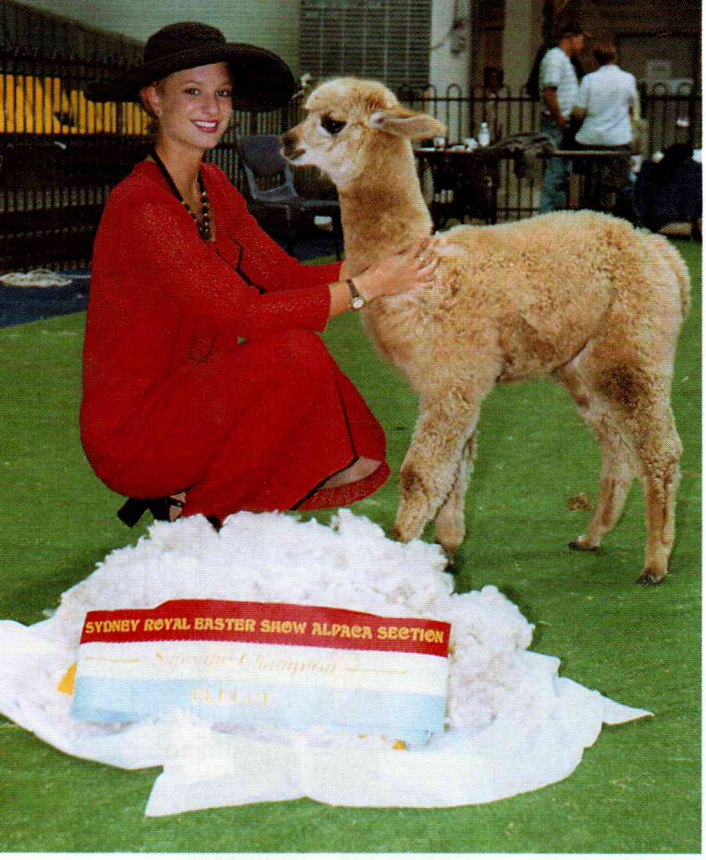
Reserve Champion Fleece 9-18 months

Windsong Valley Snow Fire, Terry and Tena Wheeler, Windsong Valley, WA.

Champion Fleece 18-30 months

Windsong Valley Stardust, Terry and Tena Wheeler, Windsong Valley Alpacas, WA

The Supreme Champion, Blue Grass Leading Lady, with owner Julie Mavros and Michael d'Apice (representing sponsors, Wilburtins and VACC). Trophy with donors, Judith and Philip Street, Coolaroo Alpaca Stud.



Top: What a charming way to tell the alpaca story – from cria, to fleece, to garment. Kelly Hitchcock with friend and The Supreme Champion Fleece from Windsong Valley Sweet Pea.

Above: Judge, Dianne Condon awarded Grand Champion Male to Jolimont Columbus, exhibited by Pat and Rosa Viceconte, shown here with handler, Kate Tulip.

In Sydney...

Easter Sunday was judging day for this year's Sydney Royal and, despite several torrential downpours in the morning before judging commenced, the spirits of alpaca exhibitors remained high. A crowd of about 300 enthusiastic supporters (some of them very wet upon arrival) braved the conditions to form a core group of spectators throughout the day's judging.

One hundred and twenty-seven exhibits (including 14 suri entries) came from as far afield as Western Australia, as well as from South Australia, Victoria and, of course, New South Wales.

The Supreme Champion was awarded to Blue Grass Leading Lady, a superb, solid light fawn female who also took out the Champion Junior Female and Grand Champion Female titles. Blue Grass Leading Lady is owned by Julie and Arthur Mavros of Boorowa, NSW. The judge, Dianne Condon from Yarra Glen in Victoria, stated that she believed that the Supreme Champion was 'as good as any alpaca you would see anywhere in the world. This animal has incredible density with fine fibre to the tip of her toes'. Leading Lady is by Purrumbete El Dorado, out of Purrumbete Vanilla, who also had a highly successful show career.

Eighty fleeces were entered in the alpaca fleece classes. Terry and Tena Wheeler, of Windsong Valley Alpacas in Western Australia, scooped the pool, winning all three fleece sections. The Supreme Champion Fleece was awarded to Windsong Valley Sweet Pea, which was also Champion Fleece, 9-18 months.

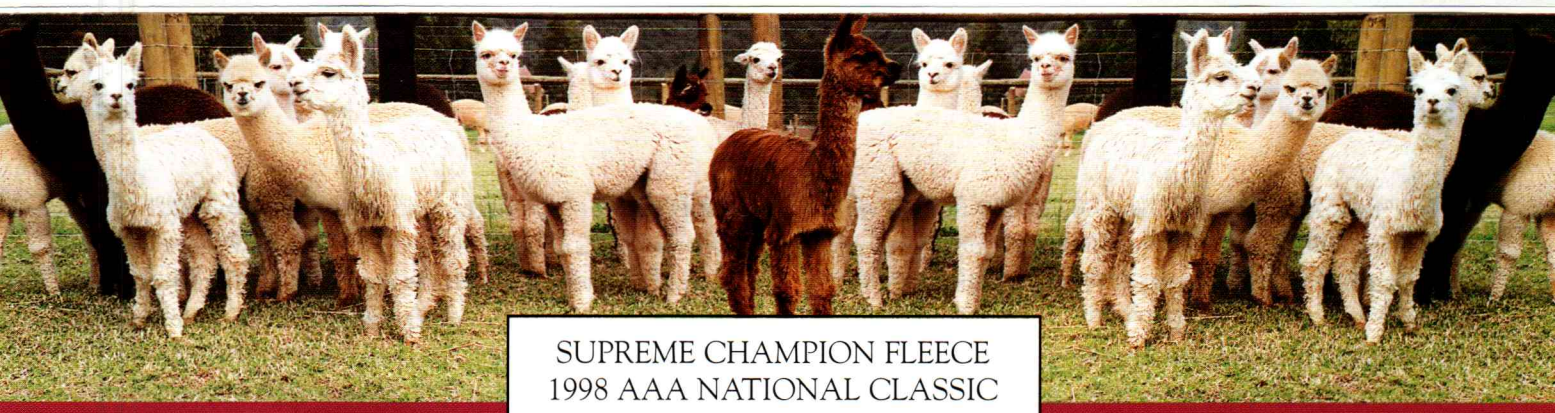
A dedicated bunch of local exhibitors and their alpacas, under the guidance of Breed Captain, Pauline Nelson, undertook the marathon that Sydney Royal has become.

In addition to the necessity for show animals to be present over the Easter period, the RAS also requires a contingent of alpacas to be on display for the 16 day duration of the Show. While sleepless nights and crowded accommodation arrangements take their toll, a great sense of camaraderie develops amongst those who can stay the distance.

Apart from the alpaca and fleece judging events, this year there were a series of alpaca related talks and demonstrations for the general public, ably conducted by volunteers from amongst the ranks of exhibitors.

Of great interest to the public were the shearing demonstrations combined with mini fashion parades – establishing the connection between the animals, fleece harvesting and the finished products. Congratulations to all those who master-minded, and participated in, this fabulous promotion.

The Association's stand was also staffed by volunteers for the entire period of the Show and many genuine contacts were established that should result in a number of new members.



SUPREME CHAMPION FLEECE
1998 AAA NATIONAL CLASSIC

Windsong Valley Royal Inca – Nuie#48

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Windsong Valley Royal Inca	Windsong Valley Snow Legend
Peruvian Conquistador (Suri)	Aymara Talisman

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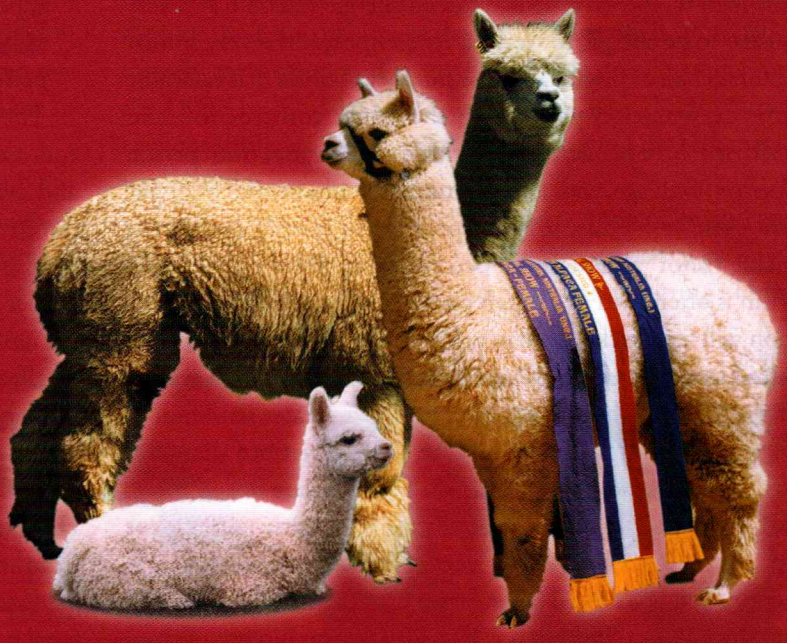

Grand Champion Female – Perth Royal Show '98
'Windsong Valley Stardust'
with her Dam and sister 'Starburst'

Windsong Valley Alpacas

Tena & Terry Wheeler Bedfordale WA
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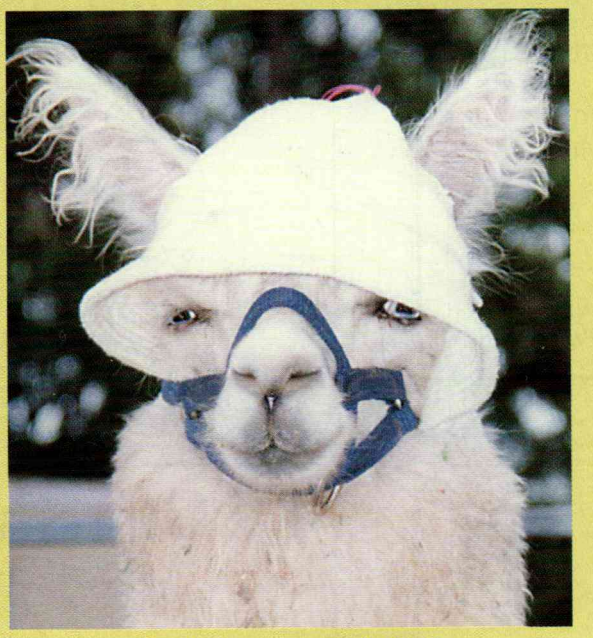

Cool's the name, Cody Cool!
Merril Henriksen, Bellabimbi Alpacas

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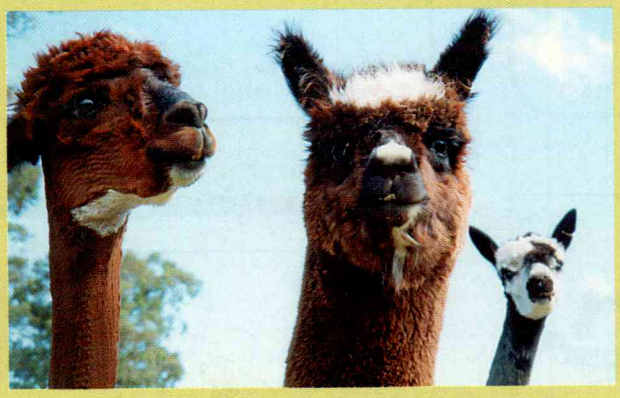
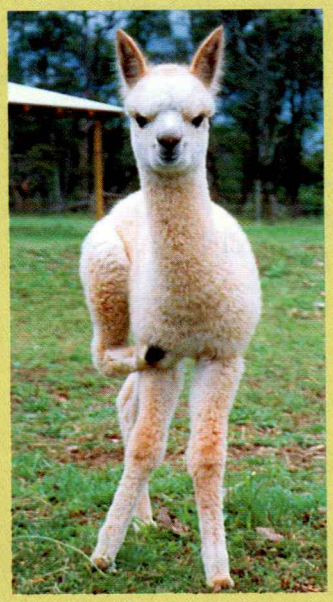


'Well, my favourite book is Day of the Trifids!
Lindy Quin, Summercloud Alpacas.

If I can just pull this string, I can get outa here.
Richard and Barbara Watson, Alpine Alpacas



Anyone for a three-legged race?
Jeanne Brown,
Alleena Alpaca Stud

I shall not be moved...
Geoff and Robyn Britt, Somerset Alpacas

Fleece Evaluation of Stud Alpacas for Selective Mating

A.A. Charry, A. Clymo, J. and J. Lawrie, R. O'Donoghue, P. Savage, D. Owen and G. Sutherland

This paper is a first outcome of the 'Modelling Alpaca Farming Systems' joint research project between The University of Sydney-Orange Agricultural College and the Australian Alpaca Association. Authorship is shared between the researchers and AAA members participating in the Performance Recording Program section of the research project.

Mating decisions are one of the cornerstones to the future of the alpaca industry. An informed mating decision is a necessary condition to ensure superior progeny.

A practical system of evaluation is required for the alpaca breeder to assess the strengths and weaknesses of the body conformation and fleece characteristics of each animal. This will allow a proper grading of females, and a proper selection of sires, which will ensure a sound basis for the development of an elite fibre for the manufacturing, fashion and cottage industries.

Selection of sires, based solely on show results can not be the mainstream sire selection method, considering that show judging patterns do not answer to any particular school of animal selection but to subjective perceptions of superiority from individual judges.

On the other hand, the development of a method of practical selection of animals to be used on-farm, and in the show ring, that may be linked to objective evaluation of performance is a challenging perspective that deserves to be explored.

The aim of this document is to encourage the implementation of a methodology for an integrated 'subjective' phenotypic evaluation of alpacas that may be correlated with objective assessment from performance recording.

This paper discusses the meaning and implications of selective mating, and an integrated method of assessment for alpacas based on body conformation and structural fleece characteristics. A classification and description of 'alpaca types' and their fleece characteristics is proposed for evaluation using a scoring table. Selective mating criteria are recommended for use by alpaca breeders.

SELECTIVE MATING: DEFINITION AND IMPLICATIONS

The concept of selective mating implies the selective use of a superior sire over a female whose structural fleece characteristics and body conformation have previously been identified. This will result in the correction of deficiencies/weaknesses and the enhancement of strengths in the progeny (i.e. improved performance in relation to the dam). Successive generations of animals under such a scheme will demonstrate 'added' value in biological and consequent economic terms.

There are basically two schools for defining selection criteria of stud animals. The first is the traditional *quantitative school* that supports Estimated Breeding Values (EBVs) and selection indexes as its best selection tool. However this school does not offer guidelines for subjective fleece evaluation. The second school, herein called the *qualitative school*, is based on the identification of biological markers that are an indication of high quality heavy fleeces. The only evidence reported in the literature about this school is the emerging *Soft Rolling Skin (SRS®)* theory (Watts 1992; Charry 1998a,b; Ferguson and Watts 1999; Watts 1996 and Watts and Ferguson 1999a,b)). This paper will partially refer to some of the components of this approach. However, this does not imply that the authors, nor the institutions they represent, have rights or commercial interest in the SRS® brand.

Watts (1992, 1996) argues that elite fibre production combined with high fleece weight can better be achieved through the development of secondary fibre follicles in the animal's skin in an additive manner. Further selection components refer to identifiable characteristics in the fleece surface and the fleece structure of the animal These characteristics appear in the skin of the animal in a progressive and sequential manner, with the terminal stage bringing up two new concepts: *deep and bold crimp* of the fibres, and *the fibre bundle* as the basic unit of fleece structure, as *typical biological indicators of the quality of the fleece, and the genetic merit of the animal to fleece production.* It is important to highlight that there may be a different perception from the manufacturer's perspective about these specific fleece characteristics (Knox 1999). The remaining biological markers which appear previously to the above-mentioned markers are, increase in handle and/or softness of the fleece, lack of guard hair and lustre. All of these markers are external indicators of an animal with a high follicular density in the follicular groups of the skin (Watts and Ferguson 1999b).

The follicle group is the basic unit of skin structure. It is comprised of three primary follicles and from 17 to 45 secondary follicles as per early results of the *University of Sydney–AAA, Performance Recording Program (AAA-US, PRP) Research Project* (Charry, 1999, pers. com.).

Whether these biological markers of elite fleece production are correlated with follicular density in alpacas is currently a matter

in evaluation. Initial results from AAA-US, PRP are providing evidences to support this (Charry, 1999, pers. com.).

Evidence of heritability of follicle density for Merino wool is given by Purvis and Swan (1997) as +0.46 (i.e. 46%, a high value in genetic terms) with a genetic correlation between follicular density and fibre diameter of –0.68 and between follicular density and fleece weight of +0.13. The former indicates the advantage of having more follicles in the skin of the animal to improve fineness; and the latter indicates that in spite of having fibres of lighter weight there is still a marginal increase in total fleece weight. These values confirm the worthiness of selection processes, for elite fibre production, based on increasing follicular density in the skin of the animal. The relative low correlation value between follicular density and fleece weight (+0.13) is understandable and justified in technical terms. When more follicles are added to the skin structure they decrease in their diameter as a consequence of crowding, and competition for space and nutrients, which results in a lower weight of the individual fibres. The new fibres are lighter, and the correlation method can not identify this factor. If a positive correlation between follicular density and fleece weight continues to exist, as it does (+0.13), then this is a clear indication that the increased follicular density not only compensates for the lesser weight of the new fibres but, furthermore, contributes to increased fleece weight. Thus the final weighted value of this effect implies that in technical terms an upward adjustment of the nominal correlation value needs to be done.

A major implication of selective mating deals with the design of systematic and complementary methods for a twofold evaluation of structural fleece characteristics on individual animals, and lifetime comparative production performance of parents and progeny (Charry 1998a, 1998b).

The first part of this process (i.e. fleece scoring) is implemented throughout the evaluation of the external markers that are supposedly correlated to fibre quality and high fleece production. In practical terms, this will provide the opportunity for the identification of weaknesses and strengths in each animal; and an appropriate sire selection to correct or improve weaknesses and/or strengths in females.

This type of exercise is the first step in SRS® Merino flocks (Watts, 1998, pers. com) and SRS® Angora flocks (Cowen 1998) where defined methods for fleece scoring and body type are used. Visual selection is practised at the initial stages of the selection process and/or in 'only commercial' herds. However, stud herds require a lifetime production performance recording for breeding and selection processes (Watts and Ferguson 1999b, p. 19). However, methods and institutional support for objective specification, measuring and evaluation of performance recording of SRS® animals are not known to be available to the breeders.

Watts (1998, pers. com.) argues that by using SRS® methods, the level of secondary follicle development may be accurately reflected in the nature of the fleece surface and the fleece structure of the animal. More specifically, there are fibre properties, namely softness of handle, deep and bold crimp, lustre and bundling that are positively correlated with follicular density (i.e. resulting in higher fleece weight), and allow the alpaca breeder to systematically identify and rank animals with a much greater level of assurance of the breeding outcome than has previously been possible.

Therefore if follicular density is demonstrated to be a cornerstone in the production of superior fleeces, it may also be said that the phenotypic characteristics, or *biological markers*, associated with an increased number of secondary follicles can also be considered a critical factor in the overall process of genetic improvement of alpaca fibre (Charry, 1998 and Watts, pers. com. 1998).

For the particular case of stud alpacas (i.e. huacaya type as the main reference for this proposal) the structural characteristics of the fleece considered to be worthy of evaluation and scoring are those proposed by Charry (1998a,b), Knox (1999), Ferguson and Watts (1999), Watts (1992, 1996) and Watts and Ferguson (1999a,b) as follows.

(a) Softness of handle (i.e. handle, softness, fineness)

Softness of handle is expressed as softness, handle or fineness of the fleece. Softness of handle is maximised as the fleece becomes finer, more evenly sized, cylindrically shaped, smoother surfaced and bolder crimped.

Fibre diameter test results are an objective evidence of fineness of the fibres and must be used for fleece scoring purposes. When fibre diameter values are not available a visual and tactile assessment of fineness needs to be done.

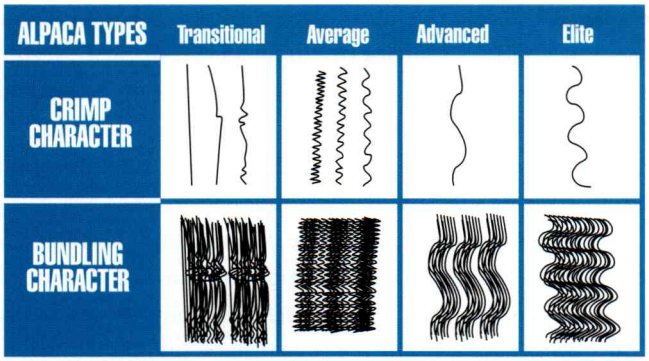
Another element that contributes to the softness of the fleece is the absence of guard hair. Knox (1999) argues that the influence of guard hair in the commercial value of fleece becomes critical only when the primary fibres that constitute the guard hair are beyond 30 microns diameter.

(b) Density

Density is the product of the number of follicles in a follicle group (i.e. the follicle group contains three primary follicles and many more secondary follicles). However, follicular density by itself does not reflect heavy weight cutting if the animal does not have fast-growing fleece reflected in fibre length (Ferguson and Watts 1999a). Results from AAA-US, PRP (Charry, 1999, pers. com.) indicate that a meaningful number of sires with acceptable follicle density values in the follicular groups are not as desirable as expected when 365-day fleece weight is accounted for, comparatively to other sires. This is an indication of a differential factor of *speed of fibre growing* present in the genetics of the animals.

A reference from sheep research has shown that increased follicle density decreases fibre diameter (Carter 1943, 1968; Moore, Jackson and Lax 1989; Watts 1996; Purvis 1997). In consequence, fleece weight of individual fibres decreases, affecting the correlation between follicular density and fleece weight. In spite of the lower positive correlation values between follicular density

Diagram 1: Crimp and bundling character for types of alpacas



and fleece weight, found by Purvis and Swan (1997) the technical explanation of this phenomenon, as outlined before, justifies an adjusted up-weighting of this correlation to a more real dimension in order to better value the genetic merit of follicular density. What remains then is the selection of sires for fast growing fleece to compensate for the lower weight of the fibres as a consequence of the increased follicular density and improved fineness.

Secondary to primary (S/P) follicular ratios are considered objective evidence of the magnitude of the fleece density, and should be used, where possible, for fleece scoring purposes. When S/P follicular ratios are not available visual and tactile assessment of density needs to be made.

(c) Crimp character and crimp distribution

Crimp is the waving of the fibre within the structure of the bundle. A desirable crimp should be bold and deep. Boldness of crimp (as opposed to fine crimp) means the distance between the peaks of each crimp wave. Deep crimp indicates that the concavity of the crimp is high. Watts and Ferguson (1999a,b) clearly explain why this is a faster growing fibre. In consideration to this, it may be said that *deep and bold crimps are the biological consequence and evidence of fast growing fibres.* For the fleece fibres to be collectively deep crimped, high fibre alignment is essential.

Similar to bundling distribution, it is desirable to have an evenly crimped animal throughout the whole body (i.e. saddle, neck, rump and legs). A hands-on crimp evaluation includes not only the character of the crimp but also the crimp distribution.

Diagram 1 is a reference display for crimp character and bundling character for the types of alpacas proposed in this paper.

(d) Lustre

Lustre is a natural reflection of the high alignment of the fibres in the fleece. Evenly sized, cylindrical fibres are able to strongly reflect the light. It is expressed by the intensity of light reflection from the fleece. It depends, for its maximum expression, on the fleece fibres being highly aligned, cylindrical in shape and smooth surfaced. High levels of secondary follicle development deliver this type of light reflection from the fibres (Watts and Ferguson 1999b).

(e) Bundling character and bundling distribution

Bundling is the organised alignment of fibres that grow closely packed from each follicular group in the skin. High number and close packing of secondary follicles in the follicular group of the skin forces the high alignment of alpaca fibres. As a result, *the bundle should be considered, not a commercial characteristic of the fleece but, mainly, a biological consequence of fibre organisation in superior fleece-producing animals.* A specific number of fibres will stick together in a parallel and organised array, not thicker than a match stick, highly aligned and free of fibre entanglement. As per this definition, the bundles are clearly differentiated from locks and/or staples.

Depending upon the stage of evolution of the alpaca the bundles will be located in different parts of the animal's fleece. This location must be evaluated in a hands-on fleece scoring of animals.

TYPES OF ALPACAS IN THE AUSTRALIAN HERD

Four (4) broad types of alpacas are proposed as the reference point for the objectives of this paper:

- transitional
- average
- advanced
- elite

Transitional alpaca

A transitional alpaca usually displays none of the biological markers, or structural fleece characteristics, in a consistent manner. The fleece structure is the one typical of thick staples or entangled fibres without defined organisation. Fibres are harsh and dry usually testing strong, and beyond 30 microns, though some lineages may present lower micron counts. Crinkle of the fibres (or elementary crimp) is a typical characteristic of this type of alpaca.

The follicular density of a transitional alpaca is less than 18 follicles per follicular group, and the S/P follicle ratio is around 5:1 (AAA-US, PRP Research Project – Charry 1999, pers. com.). The presence of guard hair along the overall parts of the body is a major characteristic of this type of animal. It affects the handle of the fleece in a significant manner. The apron and legs of this type of alpaca have evidence of guard hair and no presence of secondary follicles is detected therein.

In the scoring system proposed in this paper a transitional alpaca is one whose overall score of fleece characteristics is between 0.00 and 6 points.

Average alpaca

An average alpaca is an animal that displays a fleece that is attractive to the eye. This type of alpaca is characterised by the demonstration of one or more of the desirable fleece characteristics at basic levels of development. Generally fine-crimped fibres with some degree of bundling appear in the fleece structure of

this animal, which are an indication of light-cutting fleece weights (Watts 1999, pers. com.). Guard hair starts to disappear at least in the more valuable parts of the animal's fleece. Alpacas with fibre diameters between 25 and 30 microns should be ranked as average. The total follicular group density is up to 33 follicles, and the S/P follicle ratio is up to 10:1 (AAA-US, PRP Research Project, Charry 1999, pers. com.).

In the scoring system proposed by this paper an average alpaca is one whose overall score of the fleece characteristics is between 6.1 and 12 points.

Advanced alpaca

An advanced alpaca displays most of the characteristics typical of the high quality fleece package. However one or several of the characteristics do not offer the desired level of development. Alternatively, fibre bundles are not well defined or are still considered thick; crimp is intermediate between the extremely fine crimp of the average alpaca and the deep and bold crimp of the elite alpaca. The softness of handle of the fibre may be affected by the presence of undesirable erratic guard hair in valuable parts of the fleece. Crimp and bundling characters start being evident in no-traditional areas of the body of the alpaca. Overall, the fleece exhibits an excellent quality and surely has an attractive weight.

The fineness of the fleece of an advanced alpaca should not be greater than 25 microns. The follicular counting per follicular group of an advanced alpaca, at this stage, is up to 48 follicles, and the S/P follicle ratio should be up to 15:1 (AAA-US, PRP Research Project, Charry 1999, pers. com.)

In the scoring system proposed by this paper, an advanced alpaca is one whose overall score of the structural fleece characteristics is between 12.1 and 18 points.

Elite alpaca

An elite alpaca displays all of the characteristics or *biological markers* of a high quality and heavy weight fleece. The structure of the fleece is unique in softness of handle. Its fibre diameter should be below 20 microns. The elite alpaca lacks guard hair (i.e. primary fibres beyond 30 microns diameter). Bold and deep crimp comes out of the skin in organised shining bundles of very well aligned fibres. The up-to-date elite alpaca has a follicular density beyond 48 follicles per follicular group, with leading animals of the AAA-US, PRP reporting values up to 78 secondary follicles and 5 primary follicles per square mm of skin. The S/P follicle ratio of an elite alpaca must be at least 15:1 at this point in time (AAA-US, PRP-Charry, 1999, pers. com.).

Without any doubt, selective mating and performance recording will facilitate the identification of elite sires that surpass these parameters of skin performance, and contribute over time to the improvement of the national genetic pool.

In the scoring system proposed by this paper, an elite alpaca is one whose overall score of the structural fleece characteristics is between 18.1 and 24 points.

THE FLEECE SCORING TABLE

Table 1 contains a detailed description of score distribution for the structural fleece characteristics in the different types of alpacas. It also contains a typification of body conformation of the animal.

The score range for the overall marking of structural fleece characteristics is between 0.00 to 16 points. The distribution of values for each of the types and characteristics is as described below:

Softness of handle

A total score of up to eight (8) points has been allocated to this characteristic, distributed in two traits, *fineness* defined by fibre diameter (microns) and *absence of guard hair* (visual and tactile observation of fibres beyond 30 microns) with the following distribution between alpaca types for each of the two characteristics herein in evaluation,

Transitional fleeces:	0.0 to 1 points;	(> 30 microns)
Average fleeces:	1.1 to 2 points;	(> 25 microns)
Advanced fleeces:	2.1 to 3 points;	(> 20 microns)
Elite fleeces:	3.1 to 4 points.	(< 20 microns)

Table 1: Fleece and conformation type scoring criteria for alpaca

CHARACTERISTICS IN EVALUATION / FLEECE RANKING CATEGORIES	SOFTNESS OF HANDLE			DENSITY		CRIMP	LUSTRE	BUNDLING	MAXIMUM SCORE PER TYPE	SCORE RANGE
	Fineness Score	Fibre Diameter (mic)	Absence of Guard Hair	Score	S-P Follicle Ratio					
Transitional	< = 1	> = 30	< = 1	< = 1	< = 5:1	< = 1	< = 1	< = 1	6	0.0 to 6 points
Average	< = 2	> = 25	< = 2	< = 2	< = 10:1	< = 2	< = 2	< = 2	12	6.1 to 12 points
Advanced	< = 3	> = 20	< = 3	< = 3	< = 15:1	< = 3	< = 3	< = 3	18	12.1 to 18 points
Elite	< = 4	< 20	< = 4	< = 4	> = 15:1	< = 4	< = 4	< = 4	24	18.1 to 24 points
BODY CONFORMATION:	TYPE 01: TOP FRAME			TYPE 02: MEDIUM FRAME			TYPE 03: LOW FRAME			

< = means 'less than or equal to' pale blue columns indicate values of reference

Density

A total score of up to four points has been allocated to this characteristic, with the following distribution between alpaca types:

Transitional fleeces:	0.0 to 1 points; (< 5:1 S/P follicle ratio)
Average fleeces:	1.1 to 2 points; (<10:1 S/P follicle ratio)
Advanced fleeces:	2.1 to 3 points; (<15:1 S/P follicle ratio)
Elite fleeces:	3.1 to 4 points. (>15:1 S/P follicle ratio)

Crimp character and crimp distribution

A total score of up to four points has been allocated to this characteristic, with the following distribution between alpaca types:

Transitional fleeces:	0.0 to 1 points;
Average fleeces:	1.1 to 2 points;
Advanced fleeces:	2.1 to 3 points;
Elite fleeces:	3.1 to 4 points.

Lustre

A total score of up to four points has been allocated to this characteristic, with the following distribution between alpaca types:

Transitional fleeces:	0.0 to 1 points;
Average fleeces:	1.1 to 2 points;
Advanced fleeces:	2.1 to 3 points;
Elite fleeces:	3.1 to 4 points.

Bundling character and bundling distribution

A total score of up to four points has been allocated to this characteristic, with the following distribution between alpaca types:

Transitional fleeces:	0.0 to 1 points;
Average fleeces:	1.1 to 2 points;
Advanced fleeces:	2.1 to 3 points;
Elite fleeces:	3.1 to 4 points.

Table 2: Fleece Scoring Table for Individual Alpacas

Scorer:	Stud:	Date:

CONCEPTS / ANIMAL IDENTIFICATION (Gender)						
ANIMAL AGE (in years)						
FINENESS & FIBRE DIAMETER (mic) Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4 Values of Reference: >= 30 mic; >= 25 mic; >= 20 mic; < 20 mic						
ABSENCE OF GUARD HAIR Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4						
DENSITY & S/P FOL. RATIO Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4 Values of Reference: >= 5:1; >= 10:1; >= 15:1; < 15:1						
CRIMP AND CRIMP DISTRIBUTION Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4						
LUSTRE Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4						
BUNDLING & BUNDLING DISTRIBUTION Transitional <= 1 Average <= 2 Advanced <= 3 Elite <= 4						
TOTAL SCORE						
FLEECE SCORE RANKING Transitional 00 to 6 points Average 6.1 to 12 points Advanced 12.1 to 18 points Elite 18.1 to 24 points						
CONFORMATION TYPE						

THE BODY TYPE SCORE

Body type defines the conformation of the animal as per three (3) alternatives. The Type 01 is a well framed animal that does not require further improvement in its body conformation. This conformation Type 01 has been named as 'Top Frame'. The Type 02 is an average framed animal, generally of medium size, but not as impressive in its standing as the Type 01. This conformation Type 02 has been named as 'Medium Frame'. The Type 03 defines an animal with weaknesses in its body structure, not having the conformation of the previous types. This body conformation has been named as Type 03: 'Low Frame'.

Table 2 offers a format for scoring of alpacas as per the guidelines of this paper.

SELECTIVE MATING CRITERIA

The selective mating criteria for body conformation are flexible enough to move between top framed and medium framed sires, providing the latter have from advanced to elite characteristics in their fleece structure. As a rule of thumb, when breeding females with body conformation of Type 03, deficiently framed, need to be mated, sires of body conformation Type 01 should ideally be used. However, sires Type 02 with excellent fleece score continue being an option. Definitely, sires with body conformation Type 03 should not be used.

The selective mating criteria for structural fleece characteristics are as follows.

a. Transitional female alpacas should be mated to a sire that exhibits elite characteristics – *and elite Standardised Deviation Ranking (SDR) values* – in the overall structural components of the fleece and body type conformation. Commercial herds might consider the possibility of using less valued sires over their transitional females.
b. Average female alpacas might be mated to sires of the same characteristics as those used for transitional alpacas. Alternatively, depending on the breeding objectives of the breeder, a sire *with elite performance* is the most desirable.
c. Advanced female alpacas should be mated to *elite sires* that compensate the deficiencies of the females in order to ensure a superior progeny.
d. Elite female alpacas should be mated only to *elite sires* (in body conformation and structural fleece characteristics) of better score than themselves with the objective of optimising the body size and overall fleece characteristics of the progeny.

CONCLUSIONS

- Mating decisions have to be associated with specific targets of genetic improvement. The use of elite sires over scored females for characteristics of economic importance is the best and only way to ensure the improvement of the quality of the Australian alpaca herd.
- The outcome of scoring breeding females is the identification of strengths, and weaknesses, which can be improved, in future progeny, through the use of elite sires.
- Selective mating is the key component for organised mating programs at the herd level. It implies an integrated evaluation (i.e. subjective and performance recording) of stud alpacas in the relevant characteristics that constitute the genetic and economic targets of the breeder.
- The external markers that are sequential indicators of high quality fleece-producing animals are softness of handle, and absence of guard hair (i.e. primary fibres greater than 30 microns). Afterwards, deep and bold crimp, lustre and bundling; all of them, integrated to evidence high follicular density in the follicular groups of the skin of an alpaca.
- Fibre length is becoming an important external indicator to the production of heavy cutting fleeces. However, considering that there are no parameters of reference, at this stage, to evaluate *fast-growing fibre alpacas*, outside the shearing time, deep and bold crimps may be indirect indicators of this characteristic.
- Stud animals cannot be evaluated in a fair manner at different ages. This is particularly important in sires where some of the external markers of high quality fleece diminish with ageing. Reference ages of one year (1YO) and two years (2YO) are proposed for fleece scoring and performance recording purposes.
- The scoring of stud alpacas according to the guidelines set out in this paper, although being a subjective exercise, increases the probability of production of superior animals. The characteristics being evaluated are those that are a consequence of increased follicular density in the skin of the animal.
- Four types of alpacas are proposed for evaluation purposes: Transitional, Average, Advanced and Elite. Breeders should attempt an overall classification of their female herd, without being concerned about the final ranking of individual females. What matters is the breeding objective and the method for choosing sires for selective mating.
- The scoring table encompasses a value-range between 0.00 and 16.00 points strategically distributed between fleece characteristics of economic importance (i.e. softness of handle, density, deep and bold crimp character, crimp distribution, lustre and bundling and bundling distribution).
- An elite sire can certainly be identified as such when performance recorded results are made available and SDR values in the characteristics of economic importance are calculated as proposed by Charry, Lawrie and Johnson (1997) and Charry (1997), through an official Performance Recording Program (PRP). The SDR values of sires for fleece characteristics within the classification types of this paper are: Transitional, SDR values below than –1; Average, SDR values between –1 and +1; Advanced, SDR values between +1 and +2; and Elite, SDR values above +2. The SDR values rank the genetic merit

of sires as per a normal distribution herd-based comparative performance, rather than individual isolated merit.

- The show ring may definitely contribute to the identification of superior elite sires. However, it implies the definition of a systematic method of animal evaluation that adequately reflects the biological standards of animal performance. The judges will have to judge the animals using a *hands-on scoring process* of individual animals, and allocation of championship awards to those animals with the highest scores. The use of computers at shows to average scores coming from more than one judge per show, and showing the results on screens, will surely help to ensure the fairness of the process.
- It remains a challenge to determine the correlation between visual fleece characteristics and genetic performance. If this can be achieved, it will provide the opportunity to convert the show ring and the on-farm evaluation of animals into valuable tools for functional selection of elite alpacas
- If the characteristics subjectively evaluated on the body and fleece structure of the animal can be systematically quantified, there is an opportunity for the alpaca industry to be the first animal industry to integrate in a consistent manner subjective evaluation (i.e. on-farm scoring and show judging) with objective evaluation (performance recording and SDR values) in the genetic selection of stud alpacas.

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From the editor

This is indeed a bumper issue, primarily because of the inclusion of 'Fleece Evaluation of Stud Alpacas for Selective Mating' (AA Charry et al) (See page 57). This is the first paper emanating from the research program 'Modelling Alpaca Farming Systems', a joint venture of the The University of Sydney-Orange Agricultural College and the Association.

Hence, an already large edition of *Alpacas Australia* has now become the largest ever.

Unfortunately, Hal the Heavenly has become a casualty due to lack of space and we were only able to squeeze in one page of Paca-Pics. We are expecting Hal back next issue.

Next issue will be slimmer but, hopefully, no less informative.We will visit Germany and the United States with Dianne Condon and Lyn Dickson and we're hoping to put together a story about alpacas as an investment. We also expect to bring you good coverage of the 'Born to be Worn' Alpaca Industry Conference in South Australia.

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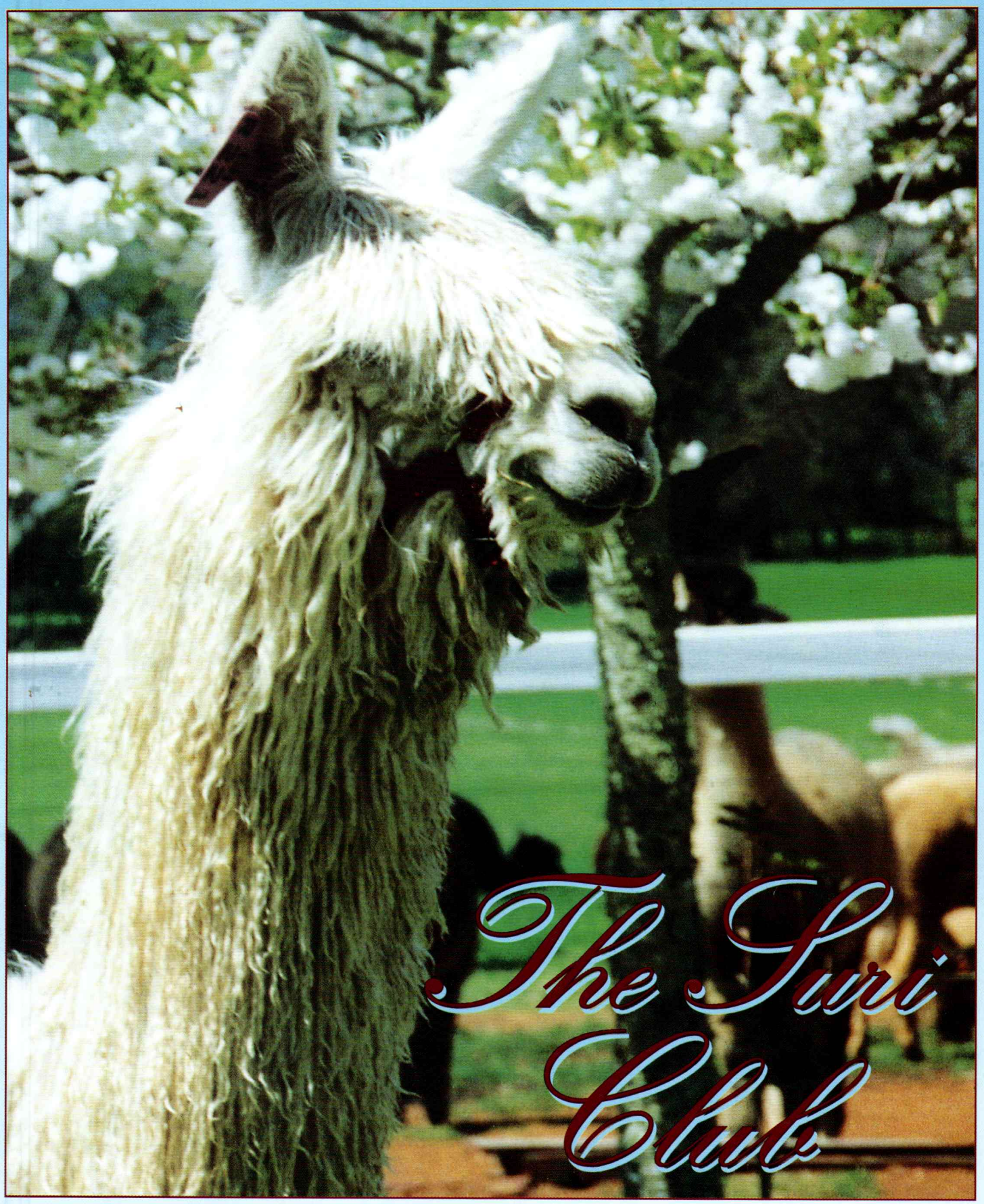

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