STATISTICALLY SPEAKING

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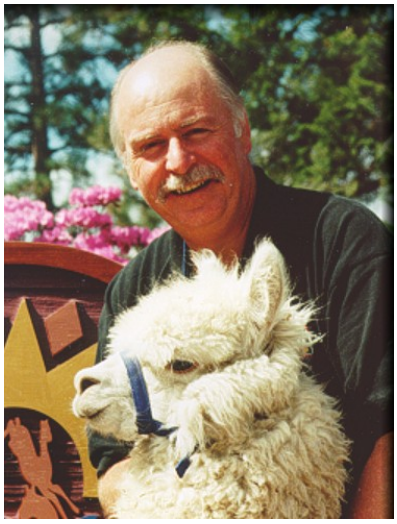


STATISTICS

"Numerical facts assembled and classified so as to present significant information." (Websters New World 1977)

Some 10 years has now passed since we got serious about breeding alpacas. In the early days microns were never mentioned, let alone fleece weights, C of V's or statistics. All we wanted to know was – is it good looking and can I make money. Well, of course with any fibre-producing animal the end result is production of textiles along with stud stock.

Few breeders of this time kept data of any sort on their alpacas. The new breeders of today tend to pick up on testing and recording data, more readily than some of those original breeders did when they started. If we compare today to yesterday most people now test for micron and C of V and keep statistics on their animals, but not all measure for fleece production. Today we are moving very much into the realities of what the alpaca industry is about – textile production. The **Co Op** at Geelong where they value-add and make alpaca products, **AAFMO** who class and sell fibre to local and overseas textile manufacturers, local breeders who not only supply cottage industries, shops, but also value-add, by making (or have made) their own fibre into garments. Yes we are moving towards the textile end of alpaca breeding and in the future we will be running large herds of wethers for fibre production as well as studs and general breeding herds. The major aim will be conformationally sound stock with low microns and lots of fleece.

So how do we work towards this, simply with good breeding knowledge and statistics. IT IS TIME to start weighing your fleece, testing for medullation on white animals along with your micron, C of V and keeping records. I feel like I did when promoting micron testing, get out the drum and pound it until people listen, but the fact is to get maximum $ return from an animal you want not only low microns but maximum fleece production.

Recently I received data from a number of large breeders to help me try to establish where we were with average microns, weights etc. We need to know how our own animals compare to the average. Are they better than the average or below.

If they are below, then you know you have some important decision making to do.

In 1992 Dr Ian Stapleton and I (Cameron Holt) commenced the first Australian research on alpacas. This was carried out on Roger Haldane's herd of Huacayas. This research, helped create fleece preparation standards as well as fleece sampling procedures which are still used today. The midside position was identified using statistics from site sampling compared to full grid sampling. The grid sampling in this research included the middle leg area. This area now produces, on latter bred animals, fibre similar to the bulk of the fleece (saddle).

My colleague and laboratory manager (known to many alpaca breeders), Sue Scott, corroborated with me in researching Suri fleece characteristics, looking at similar areas as done in the previous research on the Huacayas. To get an understanding of what statistics can tell us, I will revise there projects and discuss them as well as recent findings.

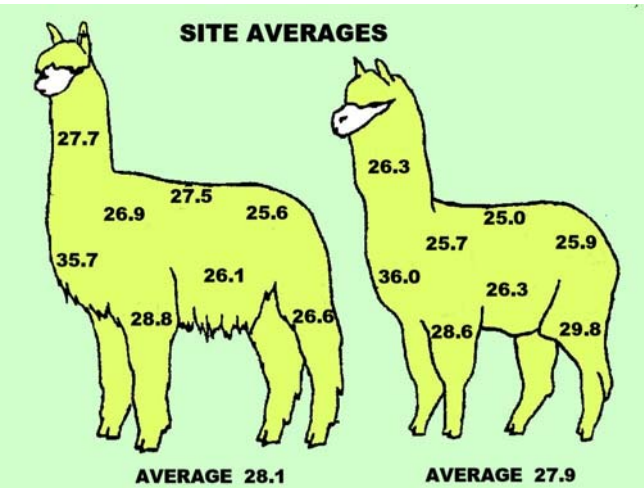
The first research project in 1992 was to get an understanding of alpaca fibre characteristics as well as variance of micron over the body. This was to help establish the best single site for testing fibre. Some 8 positions were used. These same sites were used in 1997 for the study on the Suris.

The findings in many areas were similar between the Huacaya and Suri. So let us look at these statistical similarities and variances.

BODY SITES

These were the

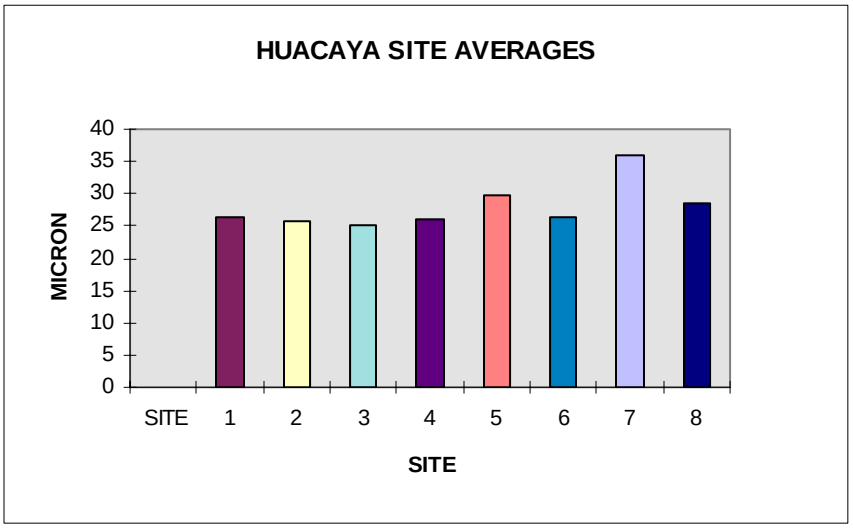
1 Neck
2 Shoulder pin bone
3 Mid back
4 Hind pin bone
5 Middle hind leg
6 Midside
7 Apron
8 Middle front leg



Both groups of animals had similar average microns –**Suri 28.15 and Huacaya 27.95.** It was good that the averages were as close as it makes the findings more meaningful.

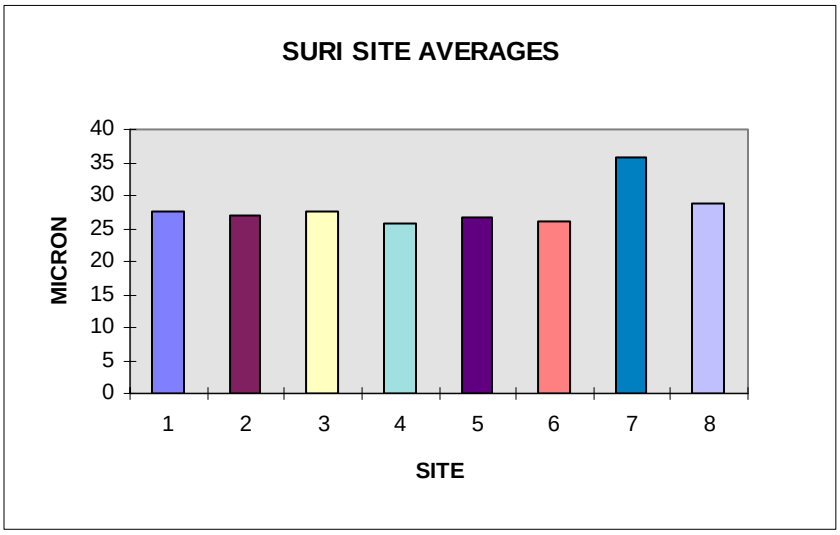
Example of the variance can be seen on the individual animals (left)

HUACAYA



AVE 27,95
SD 3.63
CV 12.97

SURI



AVE 28.15
SD 3.23
CV 11.5

Within each breed of alpacas there was a variation between sites.

There was no significant variability between the Suri and Huacaya in variability between sites. In both cases the site "apron" was significantly coarser in micron as well as having a higher C of V reading than other sites.

MEDULLATION

The results for medullation testing proved to be different. The Suri statistics appeared to indicate a lower reading than that of a similar micron for Huacayas.

It was noted that as the fibre became stronger in micron there was an increase in medullation.

Some statistics are

MEDULLATION

Micron	Huacaya	Suri
20	**12.9%**	**4.7%**
26	**36%**	**16%**
36	**60%**	**42.4%**

CO EFFICIENT OF VARIATION

The average C of V over the individual sites tested for the Suris was 24.4% with the Huacaya being 23.2%.

The Co Efficient of Variation was seen to be independent of fibre diameter. That is fibre diameter was not seen to have any effect / influence on the C of V.

PRICKLE FACTOR
(%AE30)

This is a term given to the perceived sensations from contact of clothing with the skin. The main sensation is the itch or prickle, which some (few) people identify as giving discomfort. Research suggests that the itch is not an allergy but a response from the pain nerve receptors in the skin to the coarse fibres (over 30 micron) protruding from yarn in the fabric.

In the research little difference between Huacaya and Suri fibre could be found for this characteristic.

Micron	Huacaya %AE30	Suri %AE30
20	5.16	6.03
25	19.57	20.06
30	53.76	51.30

Prickle factor is now being quoted as "comfort factor" and is shown in reverse to that of prickle factor, EG PF 5.16, would now read CF 94.84. The research being quoted in this article was done when the term " prickle factor" was in use.

RESISTANCE TO COMPRESSION AND BULK
(Separate research data for this characteristic in both Huacaya and Suri)

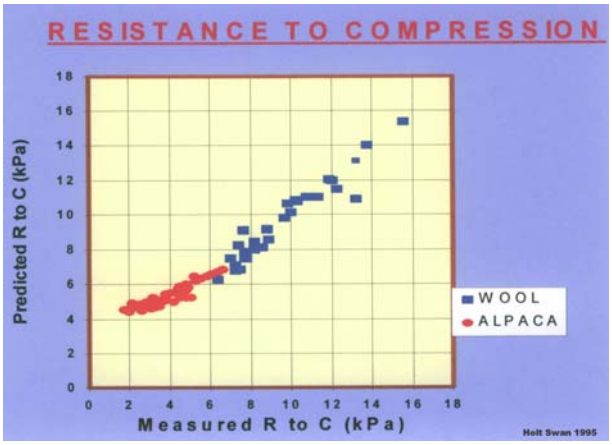
Resistance to compression and bulk is the resistance offered by a known mass of wool fibre when compressed to a known volume. It is similar to a handful of fibre when squeezed.

The **Suri** fibre was shown to have the lowest reading of compression when compared to the crimpier fibred Huacaya. Suri (range 18 g.sq.cm - 35.5 g.sq.cm)

Huacaya ranged for compression from 36 g.sq.cm - 55 g.sq.cm. **It was also evident that those lustrous Huacaya fibres with the lower fibre amplitude tended to have a lower resistance to compression to those of the more crimpy Huacayas.**

High crimpy wools will have good bulking properties whereas straight fibres like suri will have minimal bulking properties.

Dr Paul Swan, when he compared my results for alpaca resistance to compression and curvature readings, to similar data that he had from sheep's wool said "that the alpaca adheres to the same basic relationship between compressibility, diameter and curvature as does wool".



Although when graphed, the slope of the relationship for alpaca differed slightly to that of sheep's wool.

This may have been because of the different curvature measurement systems being used between the two sets of data or there may have been a difference between the keratin of the alpaca or wool fibre. A formula can be used to predict compressibility using diameter and curvature data.

The physical laws governing the compressibility of alpaca and wool fibres are the same.

CURVATURE

Fibre curvature is the measure of the fibre amplitude (crinkle) and is related to "resistance to compression". The curvature value is expressed in degrees per mm fibre length. There is a correlation between fibre curvature and staple crimp frequency. As the frequency of the crimp increases the curvature value is increased, and conversely the lower the curvature value the lower the staple crimp frequency. Fibre curvature can be measured at all stages of processing e.g. greasy to fabric. The curvature (amplitude) of the fibre influences how the fibre will process, particularly during top making and spinning.

Curvature in Suris tended to give a range from 17 to 33 with the Huacaya showing a range from 35 to 55. It was noted that the coarser the micron the lower the curvature value. Also when the C of V was more variable (higher) the curvature value also tended to be lower.

GENERAL AVERAGES

The following averages were obtained from various test results

HUACAYA

MICRON	SD	"CV"	"%AE30"
16	4.04	24.20	1.32
17	4.41	25.06	2.09
18	4.70	25.16	2.75
19	4.80	24.47	3.61
20	5.18	25.23	5.16
21	5.32	24.74	6.53
22	5.56	24.73	8.96
23	5.75	24.48	11.75
24	6.03	24.62	15.21
25	6.22	24.38	19.57
26	6.38	24.05	25.05
27	6.46	23.52	30.81
28	6.65	23.38	37.36
29	6.93	23.59	43.17
30	6.75	22.10	53.76
31	8.29	26.50	55.33
32	8.16	24.80	68.00
33	9.01	26.85	65.80
34	8.78	25.70	71.40

SURI

MICRON	SD	CV	%AE30
19	4.90	24.90	4.15
20	5.30	25.66	5.62
21	5.72	26.55	7.98
22	5.11	22.82	7.25
23	5.68	24.14	12.59
24	5.92	24.15	15.73
25	5.99	23.48	20.06
26	6.62	24.97	25.80
27	6.39	23.34	31.41
28	7.31	25.53	37.22
29	6.94	23.44	44.05
30	6.95	22.79	50.69
31	7.28	23.25	55.35
32	7.68	23.70	61.91
33	8.62	25.73	65.37
34	8.17	23.80	71.70

BENCHMARKING YOUR ANIMALS

Have you ever compared your top animals to other breeders. Are you breeding finer or heavy fleece cutting animals. You should use statistics to see where you are now in your breeding plan. A first step I would think would be to make sure you are breeding animals above the "average". You should be seeing each year in your progeny, improvements over their mothers (assuming you always use a better male than a female). You can see the alpacas in the show ring, feel them, guess their fineness, but you really need to see their statistical analysis of micron, C of V etc plus fleece weights to know how good these animals are. **Then of course you need to see their progeny.**

FLEECE DATA (Huacaya)

Back in the early 90's it was thought that the average micron (all ages) for the Australian herd was some where around **27/29 microns**. **At the end of the year 2000** I believe the average is somewhere around **25.5 /26.5 microns** (these figures based on data I have received, was taken from a range of fibre types, all colours and all ages).

The recent A.A.A. fleece audit on alpaca fleece so far, has come up with an average of 27.5 microns. **This audit was taken from the age of 2yrs – 6yrs inclusive (did not include 1yr animals fleece)**. There are still samples to be tested to complete this project.

It is interesting to note that when removing the 1yr fleece data from my research (22.5 microns), the average for the balance (2yr – 7yr) was in the range 27/27.5 microns.

To give you an indication of where the statistics lay today I list the following. The raw data was supplied by a number of large breeders as well as some smaller ones.

Average fleece weights based on AGE (all colours) 1999

AGE	MICRON (ave)	SADDLE (KGS)	TOTAL FLC (KGS)
1	22.5	1.35	2.25
2	25.5	1.55	2.6
3	26.5	1.6	2.7
4	26.5	1.8	3.0
5	27.0	1.7	2.8
6	27.5	1.5	2.5
7	29.0	1.5	2.5

Some important facts which do not show up in the above statistics

- Statistics only represent those animals in the research, but should be a guide to the balance of the herd.
- Ages 1-3 have an influence from the recent Peruvian imports.
- Ages 5-7 contain data biased towards the early animals from Chile. I realise a few did come from Peru but not the quantity that are included in the ages 1-3.

It is noticeable that the fleece weights tail off from 5 year old on. This may partly be due to age, but more likely to be the effect of the improvement of the fleece production of the recent imports. And remember that these are averages, with good to fair animals being measured.

Below is some average total fleece weights based on micron.

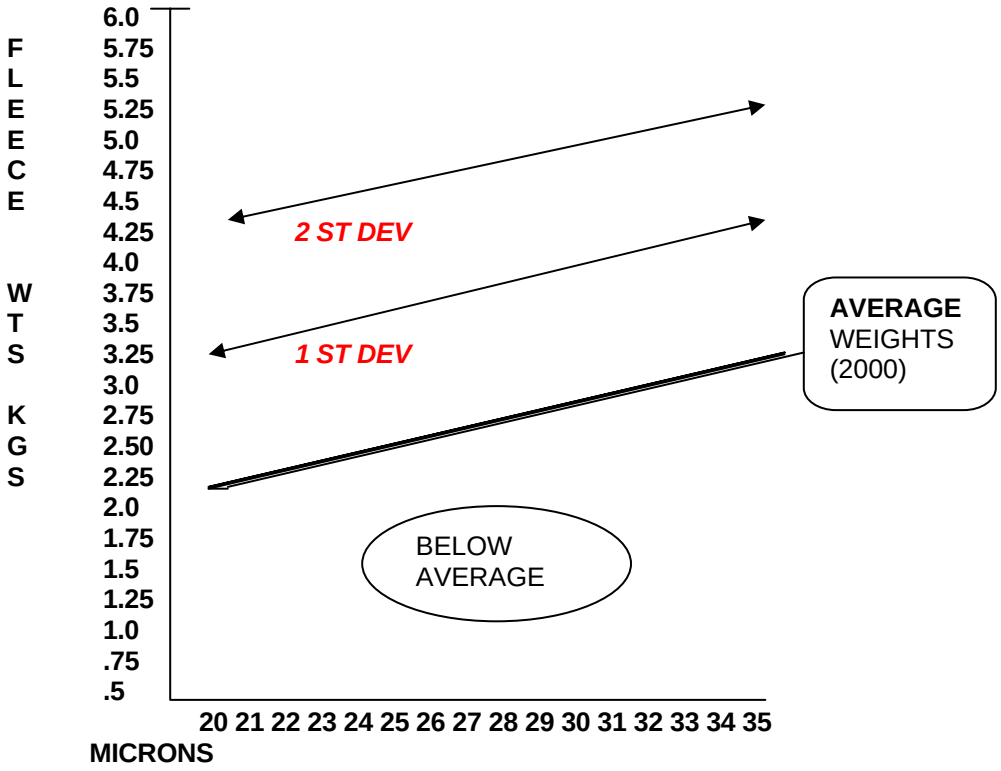
In the diagram below this chart is an estimated line of "best-fit" to represent a guide over a spread of microns. The Standard Deviation for weight within each micron group was around **.98** of a kilo for **Total Fleece Weight**. (Overall average over all the micron groups).

When analysing the **Saddle Fleece Weights**, one Standard Deviation equalled **.51** per kilo in the young alpacas and .**57** in the adult.

Average fleece weights based on MICRON (all colours) 2000

MICRON	TOTAL FLC (KGS)
15	**1.9**
20	**2.25**
25	**2.8**
30	**2.7**

(C Holt unpublished 2000)



The following data was compiled from a lesser number of animals as the colour was not known on some of the other research data above. Again it is important to emphasise that these are averages from a given number of animals, not the entire herd.

Average MICRONS by COLOUR

COLOUR	YR 1	YR 2	YR 3
BLACK	26.7	29.4	32.4
BROWN	25.0	26.7	29.4
FAWN	21.9	26.0	26.7
GREY	22.6	26.9	28.2
WHITE	21.4	23.5	25.2

(C Holt unpublished 1999)

FLEECE PRODUCTION VERSUS $ PER HEAD

Having looked at the above data (which should only be used as a guide not as absolute) it is time to look at your micron across your alpaca herd and the fleece production from these animals. It is the overall weight of clean fibre that will determine along with the micron what each animal will produce for you in fibre production. This will add to your revenue of general and stud animal sales.

Buyers of specialty fibres usually work with what they call a "clean limit". This is the cost of the fibre with the dirt, grease and vegetable matter out. The buyers have to apply an estimated yield (a % figure of what they think will be the amount of fibre left after it has been cleaned compared to the greasy fibre in front of them).

A base from which to work would be approximately 90% for an alpaca fleece that is relatively clean of dirt, vegetable matter and grease. These are the type of fleeces that are normally found in well-grassed paddocks with a reasonable rainfall. Most alpacas grazing on normal well-grassed pastures will yield between 85/92%. Some that are open in the fleece and have been rolling a lot in their sand roll and with some grease in the fibre may yield down to 80%. Alpacas below 80% will normally have excess grease (yolk) and be quite dusty and gritty (sand), as well as possible increase in VM. These fleeces are easily recognised.

After calculating your yield, you will need to refer to a clean costing schedule, which can be obtained by any organisation purchasing alpaca fibre.

This schedule below details the **gross prices being paid by an Alpaca fleece buyer (Feb 2001).** This schedule takes into account micron, length, fibre type and style.

Remember that prices fluctuate with supply and demand and are also influenced by increases in costs of production.

AN EXAMPLE OF A BUYERS PRICE SCHEDULE

(These prices are **CLEAN** not greasy, and are also **GROSS PRICES**- Costs for selling to be deducted)

(AUS$ Per KGS CLEAN Feb 2001)

MICRON	COLOUR			
RANGE	WHITE	FAWN GREY	L BROWN BROWN	BLACK L FAWN L GREY, R GREY
<20	85	55	35	60
20-22.9	45	30	25	33
23-26.9	25	15	10	20
27-30.9	20	13	10	15
31>	8	5	5	5

DISCOUNTS

VM

LVM 2% off cost
MVM 5% off cost
HVM 10% off cost

TENDER

STRETCHY 5% off cost
PT TENDER 20% off cost
ROTTEN 50% off cost

The fleece is appraised for fineness (can be tested) clean fibre content (%yield) and type of vegetable matter. The fleece is also assessed for trueness to type (excellence). A price structure from the commercial industry ,like above, would be used for costing.

e.g. <20 microns, Huacaya , A length, of good style, $85 per kilo clean, free vm, sound.
20– 22.9 microns, $45 kilo etc
23- 26.9 microns, $25 kilo etc

The appropriate clean is calculated

$$\frac{Clean}{1} \times \frac{yield}{100} = greasy\ price \times weight = \$?$$

e.g. 22 microns, Huacaya , A length, good style, $45 per kilo clean ,90% yield, free of vm

$$\frac{45}{1} \times \frac{90}{100} = \$40.50 \times 3\ kilos = \$121.50$$ **for the fleece.**

Now go and assess some of your fleeces and identify your most productive animals for fleece production in dollar terms.

FLEECE CLASSING RECEIVALS

(AAFMO)

The following chart, kindly supplied by AAFMO, represents the percentages of each micron group received for classing in the year 2000 collection.

A rough averaging based on the predicted averages of each classing line would indicate an average of around **26 microns** for the fibre received. One must remember that quite a large amount of fibre also went to the Co Op in Geelong as well as a percentage of good fleeces which would have been used in the cottage industries as well as fibre sold direct to commercial processors. Bearing all this in mind, it must give some indication of where our Australian alpaca is in regard to micron being produced. These figures are for Huacaya fleece only. The second chart represents the colour percentages.

AAFMO YEAR 2000 C0LLECTION				
CLASSING LINES	**SUPERFINE <20mic**	**FINE 20-22.9 mic**	**MEDIUM 23-27.9 mic**	**STRONG >28 mic**
PERCENTAGE	**6%**	**12%**	**50.6%**	**31.4%**

AAFMO YEAR 2000 C0LLECTION					
COLOUR	**WHITE**	**FAWN**	**BLACK**	**GREY (RG)**	**BROWN**
PERCENTAGE	**26.6%**	**25.9%**	**9.8%**	**12.1%**	**25.6%**

(CO-OP)

Some data from the Co Op kindly supplied by Carl Dowd has given the following percentages for classing lines and in the second chart the percentages by colour. It should be pointed out that the classing lines depicted below have been altered for the year 2001.

HUACAYA

CO-OP YEAR 1999 / 2000 C0LLECTION				
CLASSING LINES	**SUPERFINE <20mic**	**FINE 20-25 mic**	**MEDIUM 25-30 mic**	**STRONG >30 mic**
PERCENTAGE	**.4%**	**15.1%**	**38.3%**	**46.2%**

SURI receival was 5% of overall total fibre processed at the CO-OP.

CO-OP YEAR 1999 / 2000 C0LLECTION					
COLOUR	**WHITE**	**FAWN**	**BLACK**	**GREY (RG)**	**BROWN**
PERCENTAGE	**26.7%**	**21%**	**12.8%**	**4.7%**	**34.8%**

In Carl Dowds address to the AAA National Conference last year he pointed out that with some 30,000 alpacas in Australia, with a skirted fleece cut of 1.25 kilos, there should be some 37,500 kilos (37.5 tonne) available for commercial processing.

He indicated that **between the Co-Op and AAFMO only some 12,000 to 13,000 kilos had been received. That of course leaves some 66 % either still sitting in the shed, being sold to hand spinners or other craft people, or being processed by the owners into alpaca garments.** I would tend to think that a lot of it is still in the shed.

It is very important at this stage of the growth of our industry that we support processors wherever they may be so that the Australian alpaca garments can be seen not only here in this country, but also overseas.

SOMEWHERE, SOMETIME, FIBRE PRODUCTION HAS TO BE ADDRESSED BY ALL BREEDERS.

I hope this article has given you an insight to where we are and has prompted you to keep statistical data as an aid in your breeding program.

Good Breeding,

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